A VISUAL REFERENCE · GMT

GMT, one change at a time

From a first map frame to projections, geographic layers and readable map layouts. Complete source. A small change. Its actual result.

The Org file is the canonical source. Read the HTML guide beside your work, or download its PDF and source for offline reading.

> **Last changes: 2026-10-19.** Expanded to 122 examples in 20 chapters. Regional fundamentals now use high-resolution geography, with finer zoom baselines. Eight new European examples compare high/full border detail, river classes and canals, DCW country selections, Germany's 16 Länder and a North Rhine-Westphalia close-up. BKG data dated 1 January 2026 is bundled for offline reproduction, with parameter explanations and source credits.

122
worked examples

20
topic families

1
canonical Org source

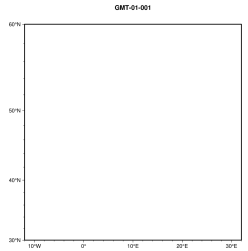
All maps at a glance

Choose a map to open its complete GMT script, explanation and downloads.

Your first map

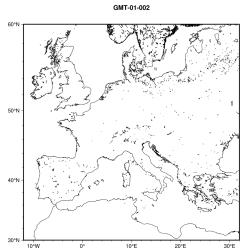
9 maps

A region, a projection and a frame form the smallest useful map.



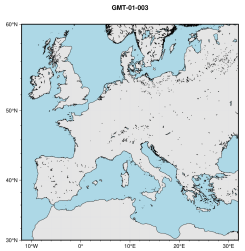
GMT-01-001

Draw a geographic frame



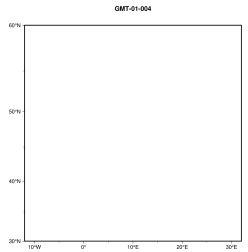
GMT-01-002

Add a coastline



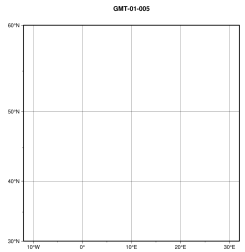
GMT-01-003

Distinguish land and water



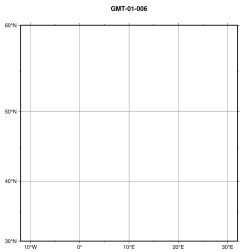
GMT-01-004

Choose annotation and tick intervals



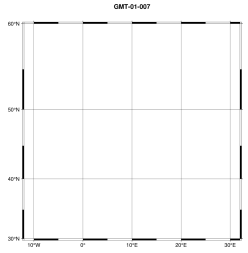
GMT-01-005

Add a regular geographic grid



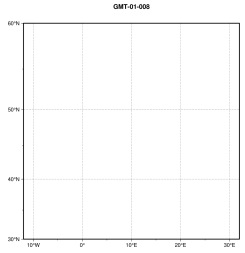
GMT-01-006

Annotate only two sides



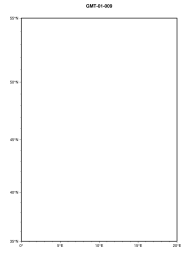
GMT-01-007

Use a fancy map border



GMT-01-008

Style the graticule independently



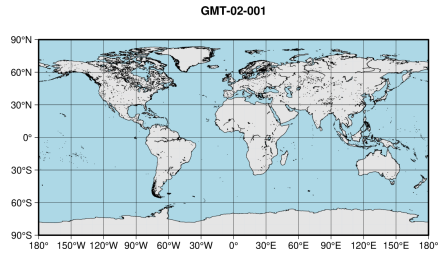
GMT-01-009

Choose a smaller geographic extent

Choose a projection

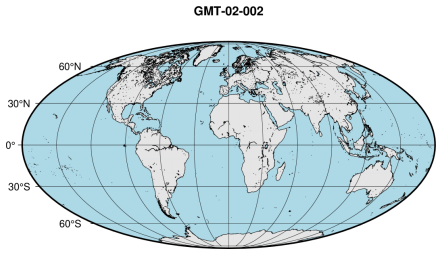
9 maps

Compare world projection shapes, central meridians, standard parallels and a polar-limited Mercator extent.



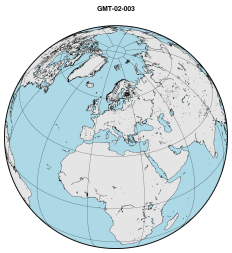
GMT-02-001

A rectangular world map



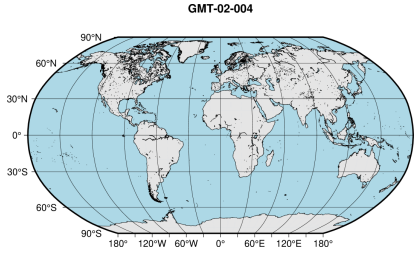
GMT-02-002

Preserve area with Mollweide



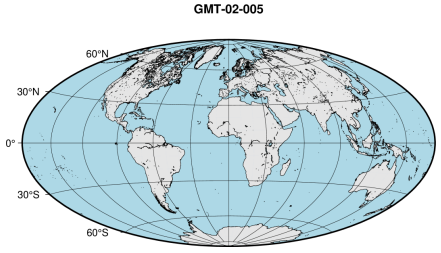
GMT-02-003

Look at a hemisphere



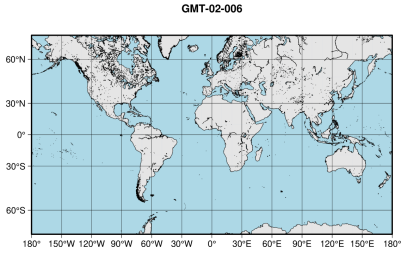
GMT-02-004

Compare the Robinson world projection



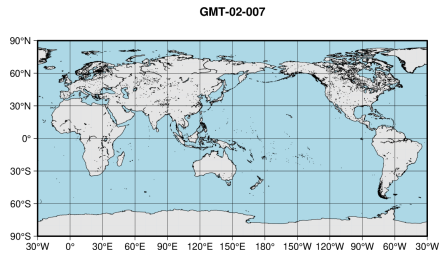
GMT-02-005

Compare the Hammer equal-area world



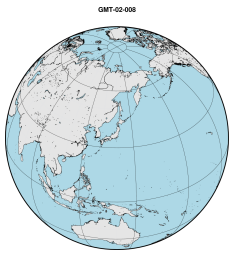
GMT-02-006

Limit a Mercator world map before the poles



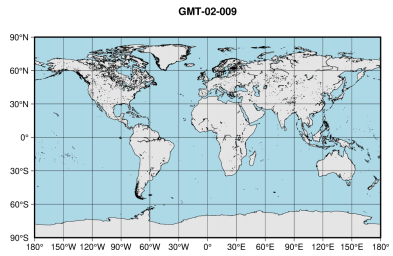
GMT-02-007

Re-centre the rectangular world on the Pacific



GMT-02-008

Choose another visible hemisphere



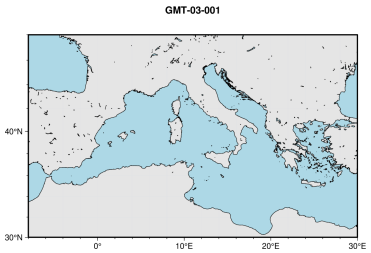
GMT-02-009

Set a cylindrical standard parallel

Coastlines and geographic context

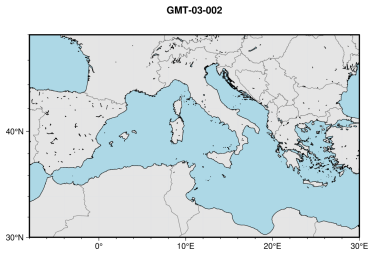
14 maps

Choose coastline detail, then add boundaries and rivers.



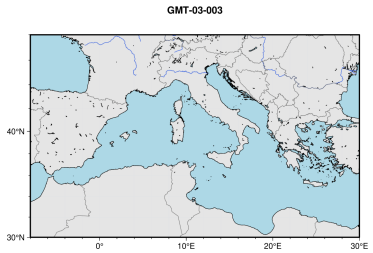
GMT-03-001

Increase coastline detail



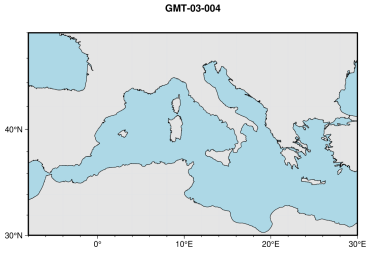
GMT-03-002

Add geographic boundaries



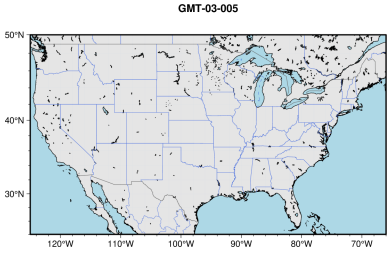
GMT-03-003

Add major rivers and lakes



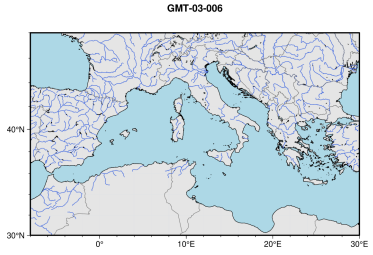
GMT-03-004

Filter out small islands and lakes



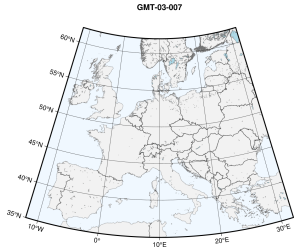
GMT-03-005

Show US state boundaries



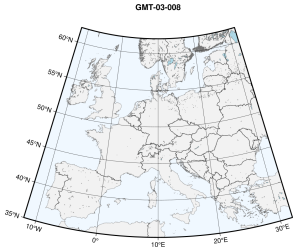
GMT-03-006

Include all permanent river classes



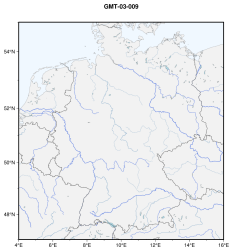
GMT-03-007

Draw European country borders in high detail



GMT-03-008

Use full-resolution European boundaries



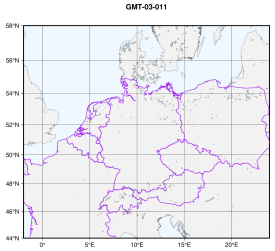
GMT-03-009

Give major and minor rivers separate pens



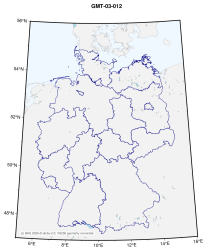
GMT-03-010

Add canals without thickening the river network



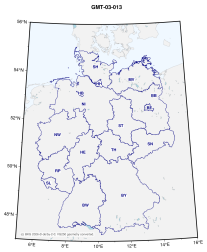
GMT-03-011

Select European countries by their codes



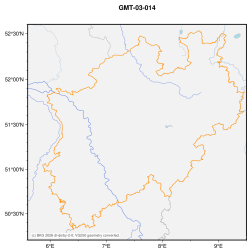
GMT-03-012

Draw Germany and its sixteen federal states



GMT-03-013

Label the German Länder with their state codes



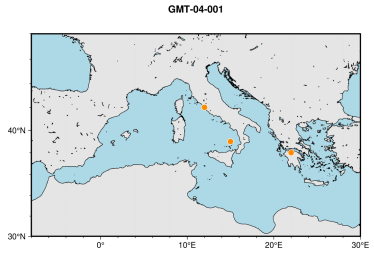
GMT-03-014

Inspect North Rhine-Westphalia beside its rivers

Put points on a map

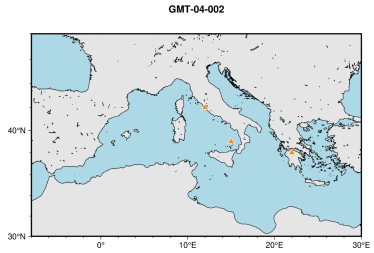
9 maps

Read longitude before latitude, change a symbol and encode its size.



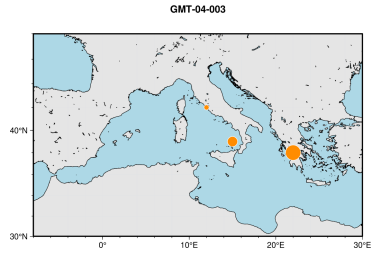
GMT-04-001

Plot longitude and latitude



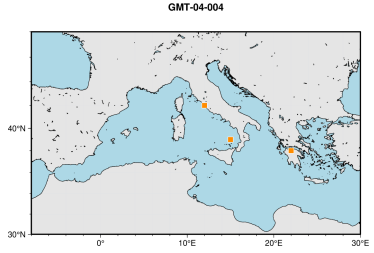
GMT-04-002

Change the point symbol



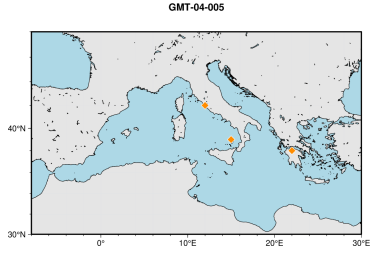
GMT-04-003

Read symbol sizes from a column



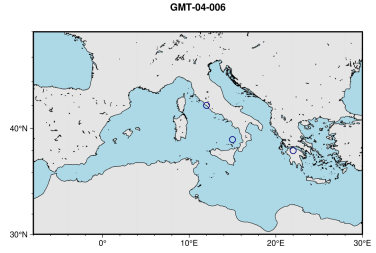
GMT-04-004

Use square point symbols



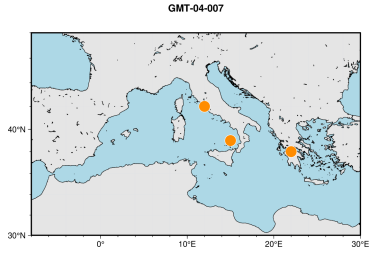
GMT-04-005

Use diamond point symbols



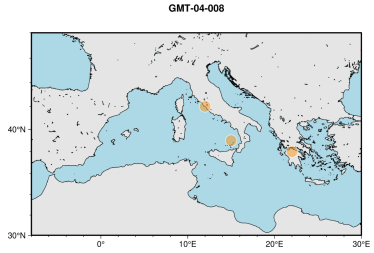
GMT-04-006

Draw hollow station symbols



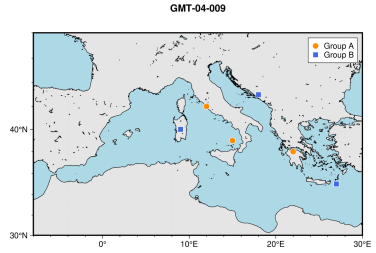
GMT-04-007

Increase a fixed circle diameter



GMT-04-008

Make a symbol fill translucent



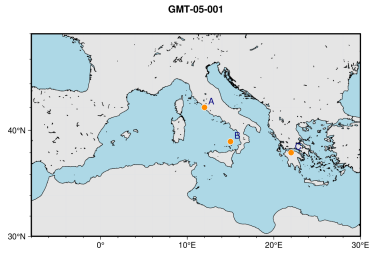
GMT-04-009

Distinguish two groups and explain them

Labels, routes and areas

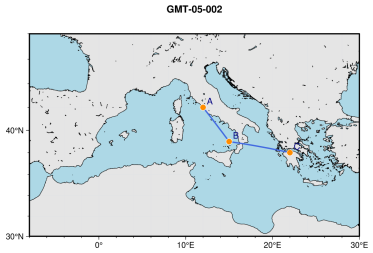
6 maps

Add readable labels, connect a route and fill an illustrative area.



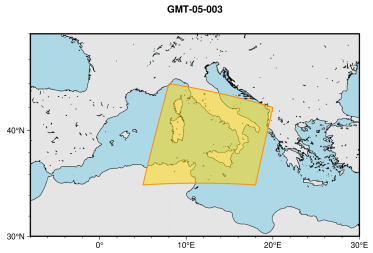
GMT-05-001

Label the stations



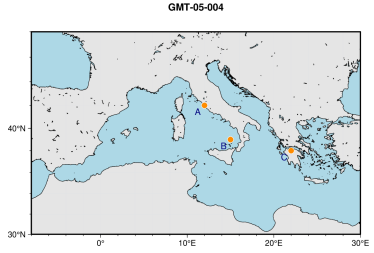
GMT-05-002

Connect a route



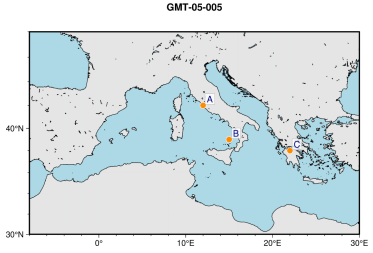
GMT-05-003

Fill an illustrative area



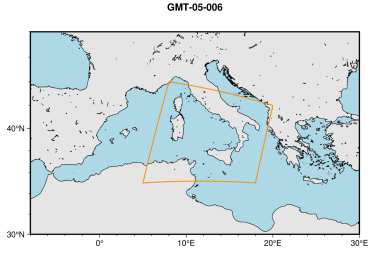
GMT-05-004

Anchor labels above and left of their points



GMT-05-005

Give labels a readable background



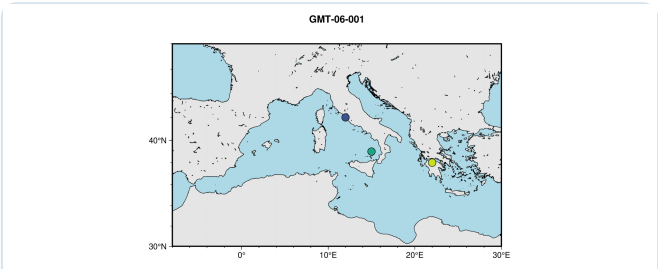
GMT-05-006

Draw an unfilled study-area outline

Values, colour scales and legends

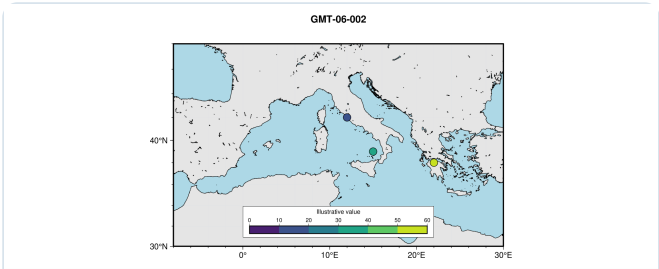
3 maps

Separate numeric values from categories and explain their visual encodings.



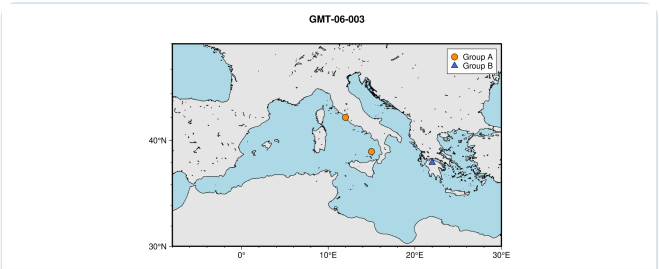
GMT-06-001

Colour points by value



GMT-06-002

Explain the colour scale



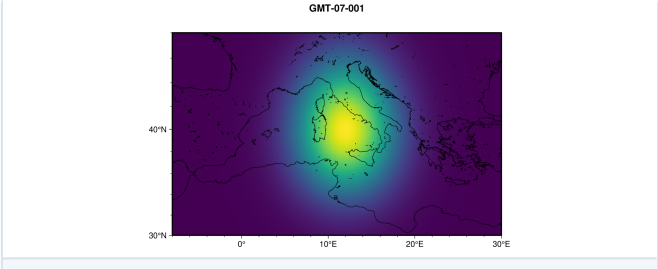
GMT-06-003

Explain categories with a legend

Grids and shaded relief

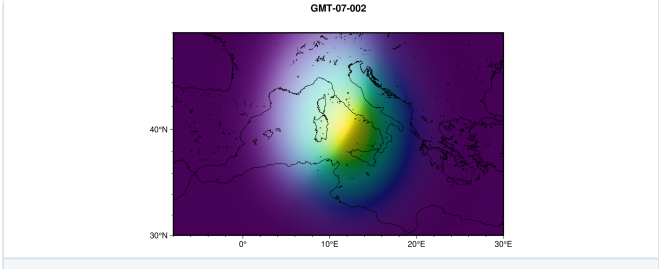
3 maps

Create an explicitly synthetic grid, colour it, illuminate it and add contours.



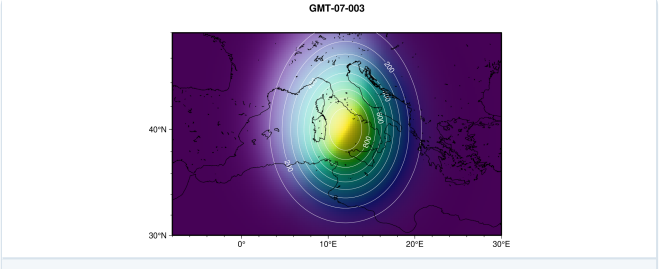
GMT-07-001

Create and colour a synthetic grid



GMT-07-002

Illuminate the synthetic surface



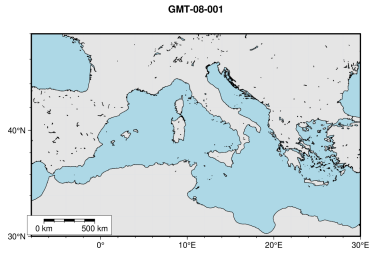
GMT-07-003

Overlay labelled contours

Map furniture and a finished layout

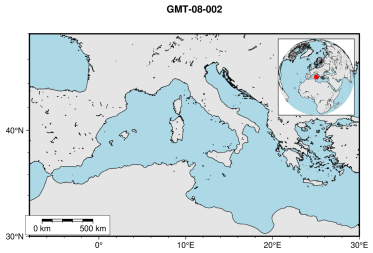
3 maps

Add a scale bar and locator inset, then assemble a complete map.



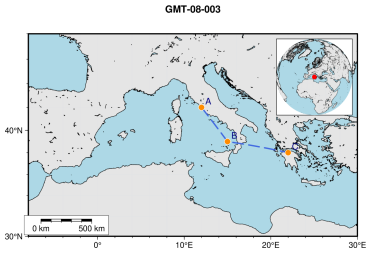
GMT-08-001

Add a geographic scale bar



GMT-08-002

Add a locator inset



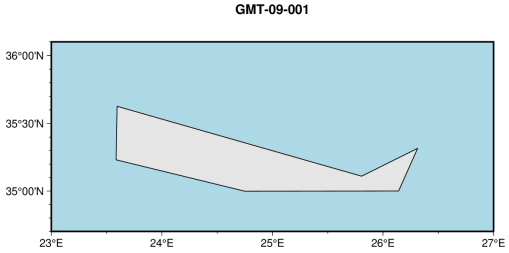
GMT-08-003

Assemble a finished map

Coastline resolution at close range

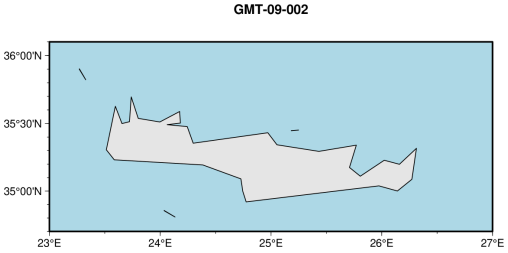
6 maps

Compare five installed shoreline resolutions on the same map of Crete, then refine the pen.



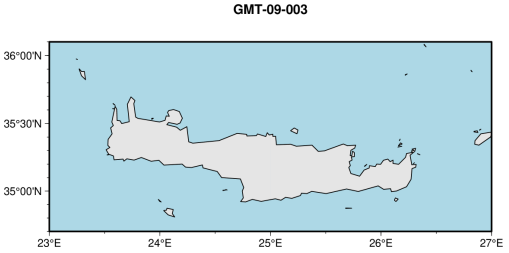
GMT-09-001

Crete with crude shoreline detail



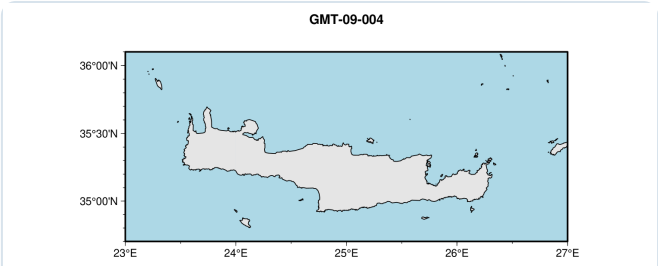
GMT-09-002

Crete with low shoreline detail



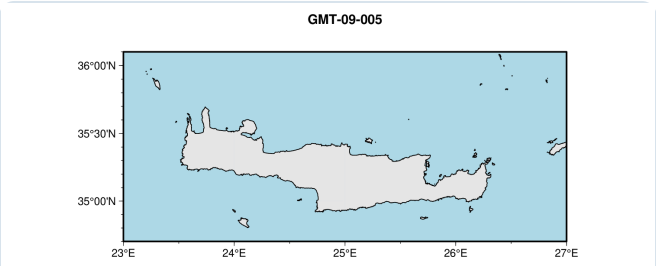
GMT-09-003

Crete with intermediate shoreline detail



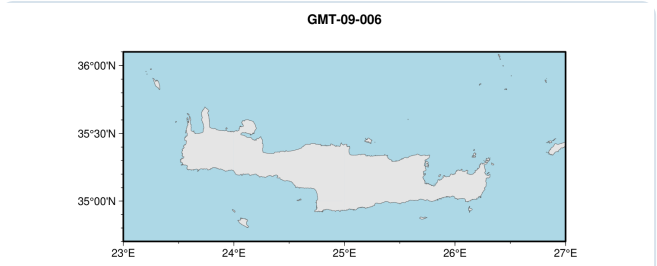
GMT-09-004

Crete with high shoreline detail



GMT-09-005

Crete with full shoreline detail



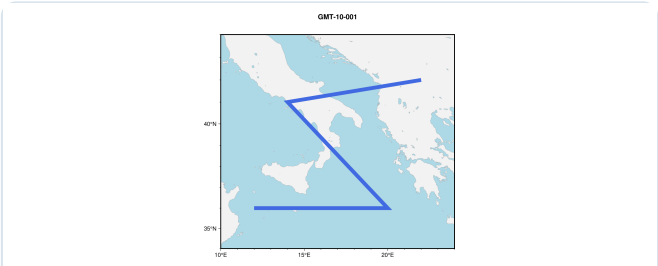
GMT-09-006

Refine the full-resolution shoreline pen

Line ends, corners and border styling

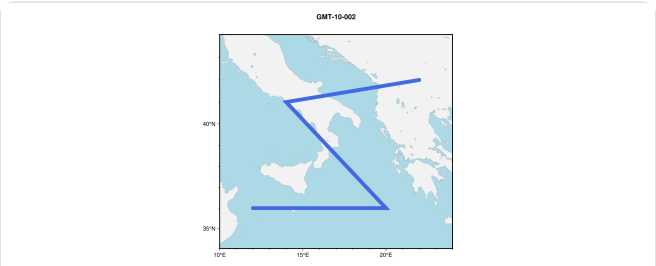
6 maps

Change the drawn stroke while keeping the original vertices fixed.



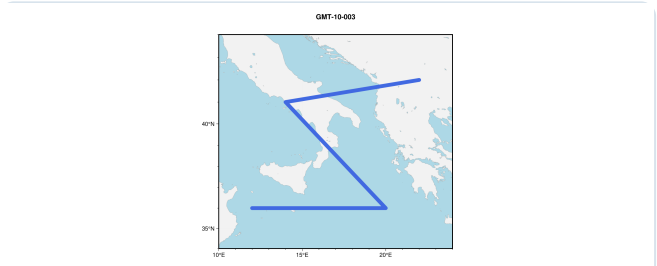
GMT-10-001

Flat ends and miter joins



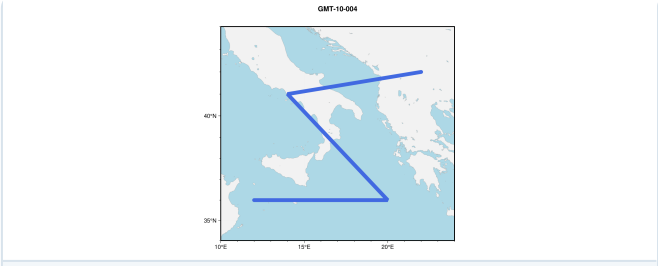
GMT-10-002

Round the line ends



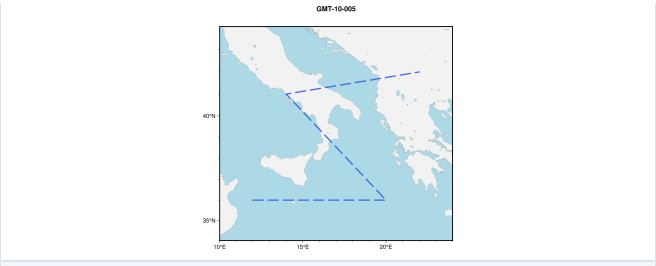
GMT-10-003

Round the corners of the stroke



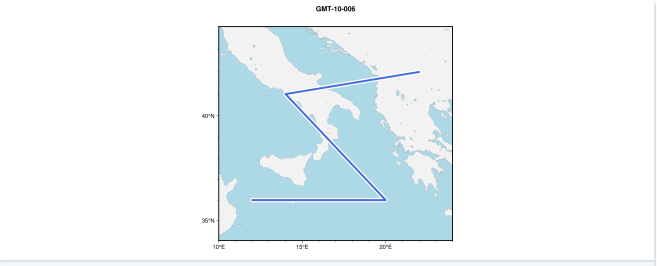
GMT-10-004

Bevel a sharp corner



GMT-10-005

Use a lighter dashed boundary



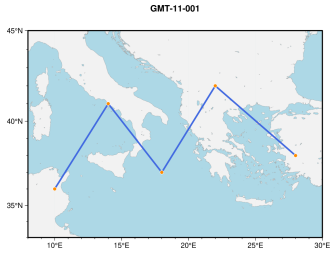
GMT-10-006

Separate a route from its background

Curves, interpolation and smoothing

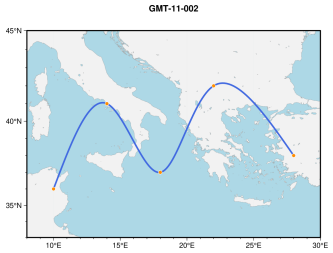
6 maps

Compare straight segments, Bezier curves and explicit interpolation of an invented route.



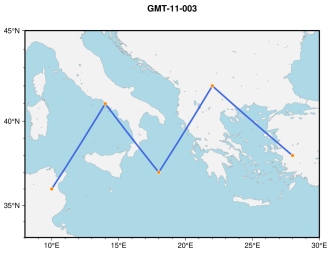
GMT-11-001

Connect a sparse illustrative route



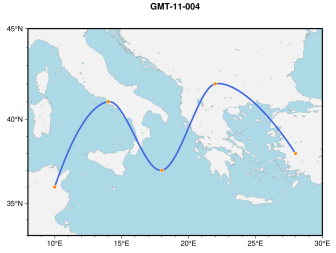
GMT-11-002

Draw a Bezier curve through the route



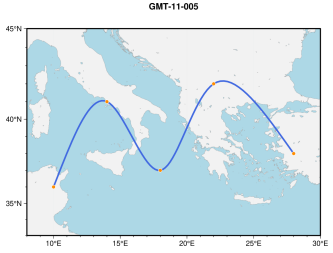
GMT-11-003

Add linearly interpolated positions



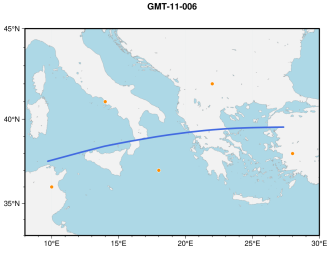
GMT-11-004

Interpolate with an Akima spline



GMT-11-005

Compare a natural cubic spline



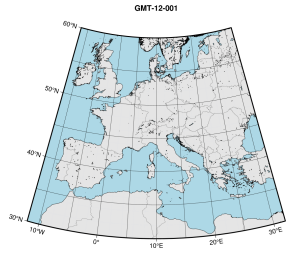
GMT-11-006

Fit a smoothing spline

Regional projections and difficult extents

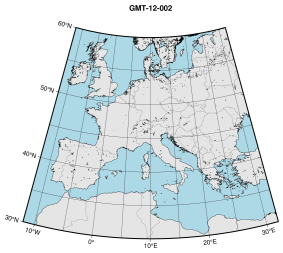
6 maps

Choose regional and polar projections, and cross the date line without splitting the map.



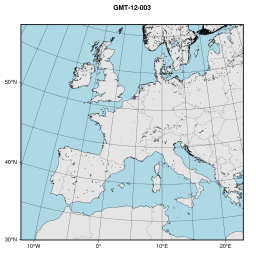
GMT-12-001

Use Lambert conformal conic for a region



GMT-12-002

Compare Albers equal-area conic



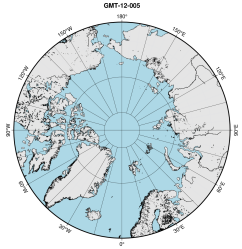
GMT-12-003

Centre a Lambert azimuthal equal-area map



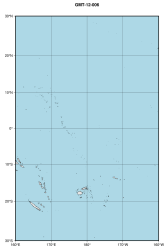
GMT-12-004

Use a local UTM zone



GMT-12-005

Map the Arctic with stereographic projection



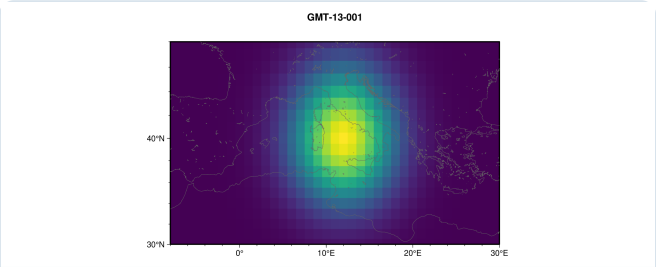
GMT-12-006

Cross the international date line

Grid interpolation and contour quality

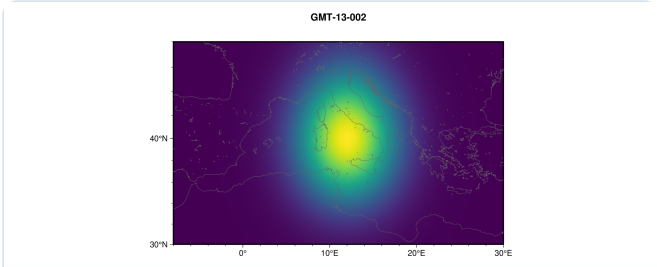
6 maps

Separate grid spacing, image interpolation, resampling and contour smoothing.



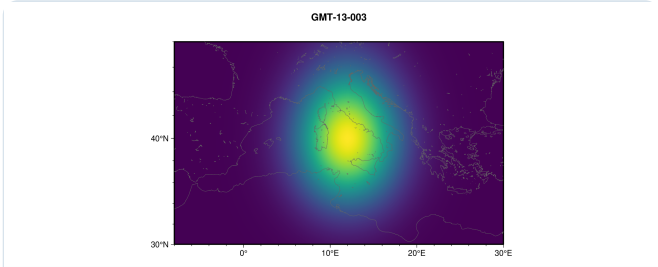
GMT-13-001

Expose a coarse grid with nearest-neighbour display



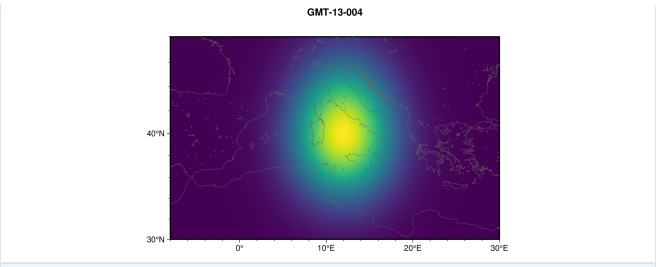
GMT-13-002

Change the image interpolation



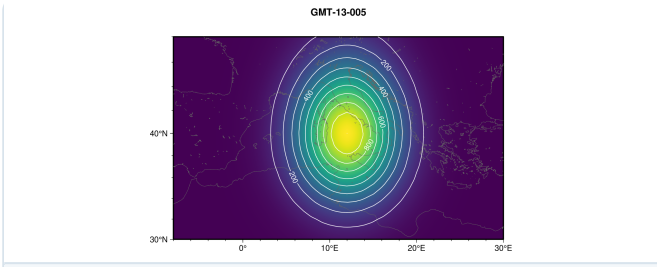
GMT-13-003

Evaluate the model on a finer grid



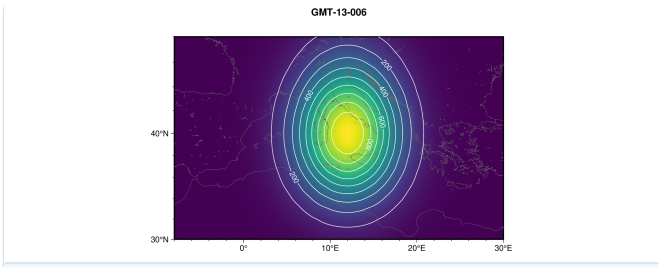
GMT-13-004

Resample the coarse grid explicitly



GMT-13-005

Inspect unsmoothed contour segments



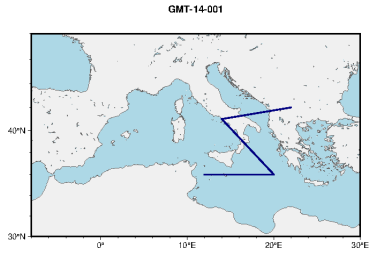
GMT-13-006

Smooth the drawn contour path

Raster quality and a polished map

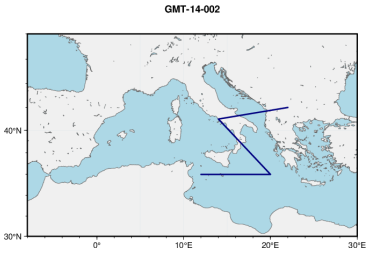
6 maps

Compare anti-aliasing, supersampling and DPI, then finish with a clear hierarchy of lines.



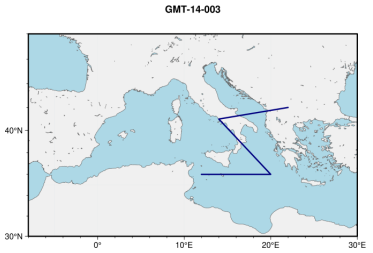
GMT-14-001

A deliberately rough raster export



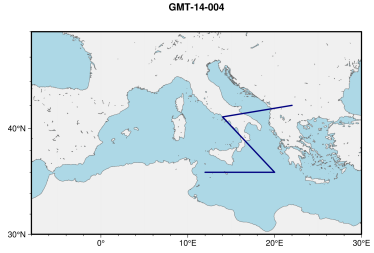
GMT-14-002

Anti-alias graphics and text



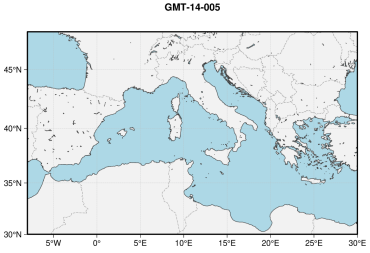
GMT-14-003

Supersample before reducing the PNG



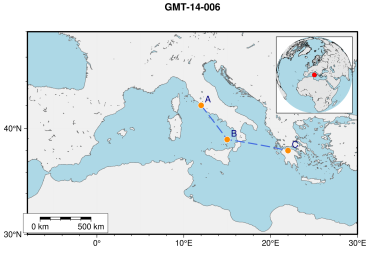
GMT-14-004

Export more pixels for a larger image



GMT-14-005

Give borders and graticules a clear hierarchy



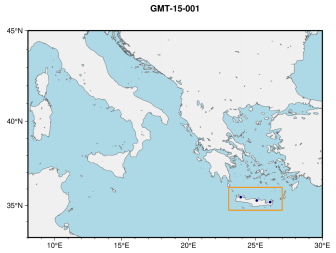
GMT-14-006

Finish a detailed map with smooth raster edges

Zooming into a region

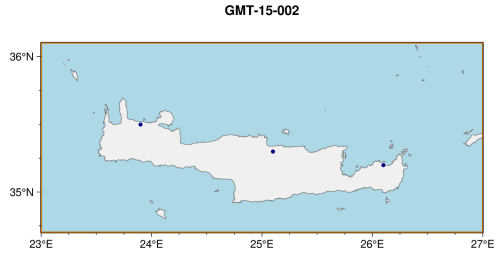
12 maps

Highlight and enlarge geographic windows; vary inset placement, size, detail and projection; add connectors, successive zoom levels and scale bars.



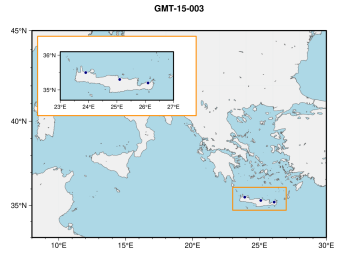
GMT-15-001

Mark the area to zoom into



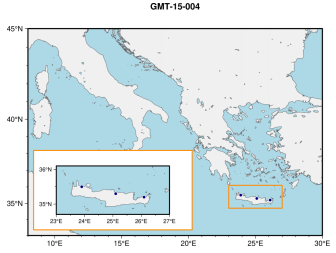
GMT-15-002

Zoom by narrowing the geographic region



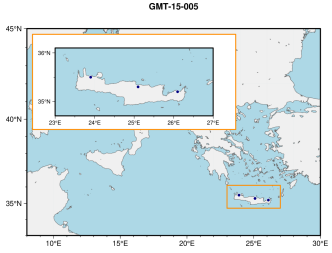
GMT-15-003

Keep the overview and add a zoom-in inset



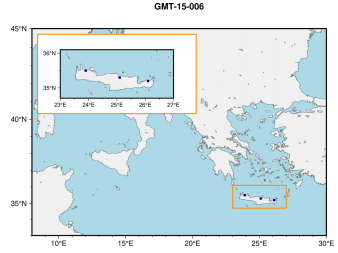
GMT-15-004

Move the enlarged inset to bottom-left



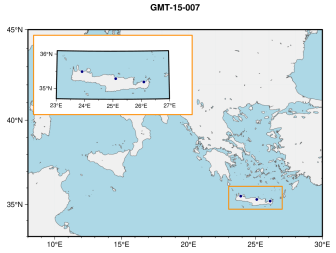
GMT-15-005

Allocate a larger inset panel



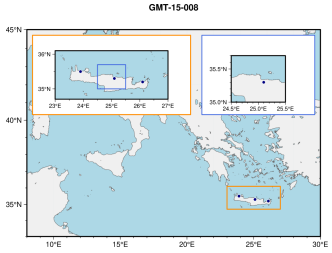
GMT-15-006

Use finer geography in the close-up



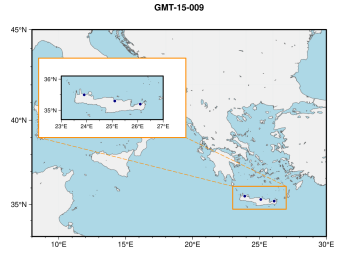
GMT-15-007

Choose an independent inset projection



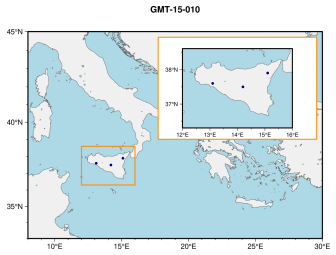
GMT-15-008

Show two successive zoom levels



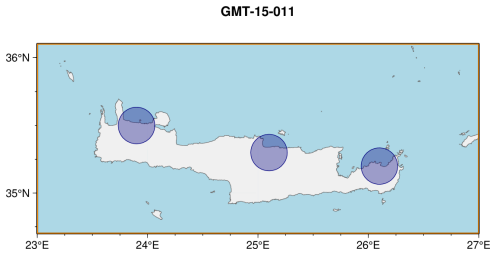
GMT-15-009

Connect the selection to its inset



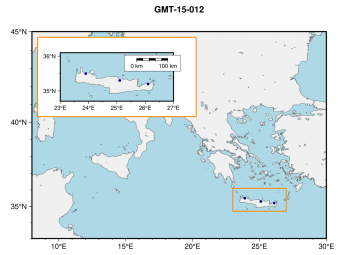
GMT-15-010

Reuse the zoom layout for Sicily



GMT-15-011

Use geographic distances for circle sizes



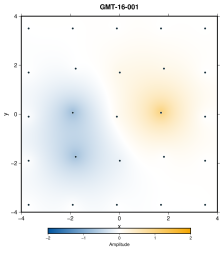
GMT-15-012

Explain the close-up scale inside its panel

Scattered samples become a grid

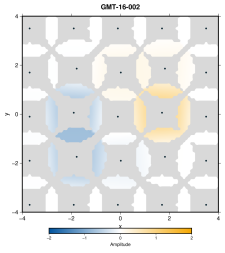
3 maps

Compare three gridding methods with the same local synthetic samples and colour limits.



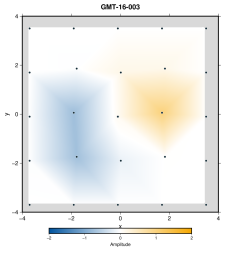
GMT-16-001

Interpolate scattered samples with tension



GMT-16-002

Keep gaps where local coverage is insufficient



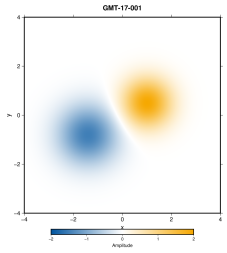
GMT-16-003

Interpolate within Delaunay triangles

Calculate with grids and extract a transect

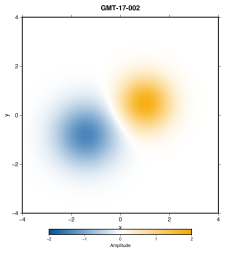
5 maps

Filter, subtract, differentiate and sample an explicit signed analytic field.



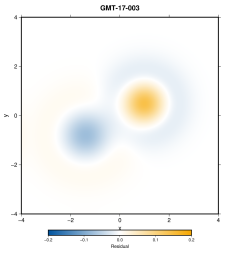
GMT-17-001

Build a signed analytic field



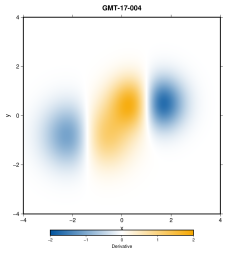
GMT-17-002

Filter the field without changing its grid



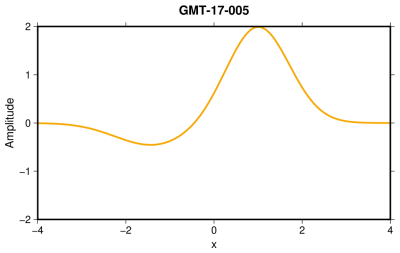
GMT-17-003

Subtract the smooth field to show a residual



GMT-17-004

Differentiate in the x direction



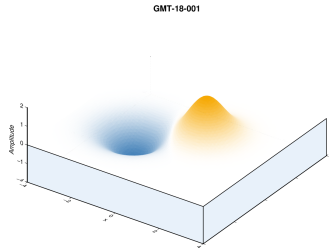
GMT-17-005

Extract a transect from the grid

Perspective surfaces and vector fields

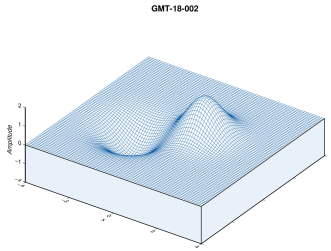
3 maps

Change representation with a surface, mesh and two-component arrows.



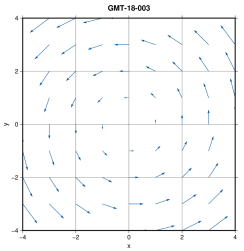
GMT-18-001

View the signed field as a 3D surface



GMT-18-002

Reveal the grid with a perspective mesh



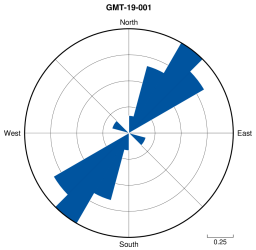
GMT-18-003

Draw a vector field from two grids

Directions and scalar distributions

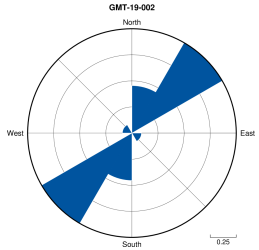
4 maps

Compare angular bin width, counts and frequency percent.



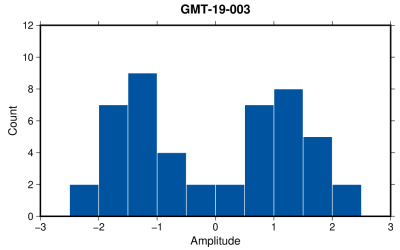
GMT-19-001

Summarize directions in a rose diagram



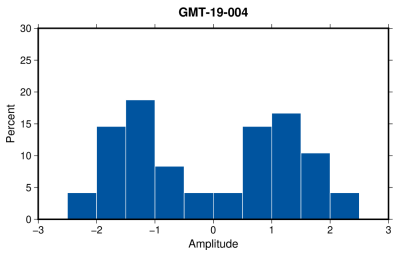
GMT-19-002

Change only the angular bin width



GMT-19-003

Count scalar values in fixed bins



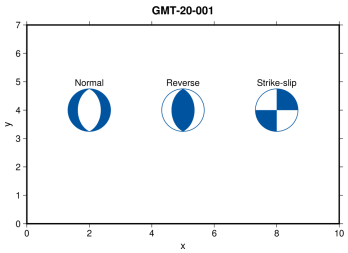
GMT-19-004

Express the same bins as frequency percent

Geophysical symbols and uncertainty

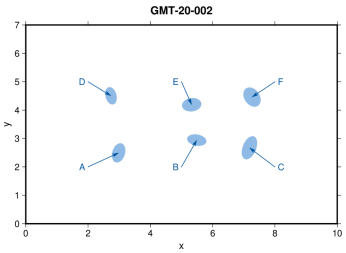
3 maps

Read invented focal mechanisms and compare two joint confidence levels.



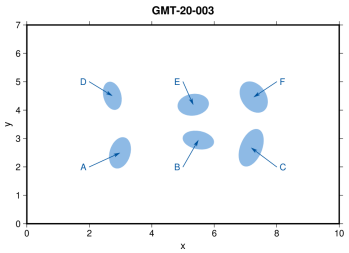
GMT-20-001

Read strike, dip and rake as focal mechanisms



GMT-20-002

Plot horizontal motion with 68 percent ellipses



GMT-20-003

Increase confidence without changing motion

READING THE TOUR

Three ways to see a change

Complete script

Read every GMT command and its local input, including the region and projection.

Actual map

Choose a map in the gallery and compare the rendered figure with its source.

One change

Follow a named baseline, download the runnable script and export PNG or vector PDF.

Read from the beginning or jump to a stable example ID. Each example includes its complete input, captured result and command-by-command parameter tables. The tables explain the values in that script, including the shared session settings; omitted region/projection options reuse the current map state. Copy link preserves the address of the guide you are reading, including its current domain and path.

Map conventions and sources

This tour uses the GMT command-line interface in modern mode, driven by Bash. GMT 6 and Ghostscript are needed to regenerate maps. Ordinary HTML/PDF builds use the prepared figures, and the HTML embeds its map images for offline reading.

For geographic maps, coordinates are longitude, then latitude, in decimal degrees. -R specifies west/east/south/north. Each script explicitly starts a clean session, sets its frame and font sizes, disables automatic data downloads and exports both an opaque PNG and a vector PDF. A frame title records the stable example ID. Chapters 16-20 use explicitly labelled Cartesian data axes or polar direction/radius axes instead of geographic coordinates; their parameter tables state the units. Each figure is independent; the snippets do not rely on an accumulating interactive GMT session.

All station tables, routes, study-area polygons, values and analytic grids are synthetic teaching inputs. Coastlines, rivers and contextual borders come from the locally installed GSHHG database. They retain their own notices in the GSHHG notice and accompanying license texts; the tour does not relicense those geographic data. The coastline resolution is selected explicitly. Geographic boundaries reflect that dataset, not a claim about historical extent or current jurisdiction.

European country and river examples distinguish the installed GSHHG/WDBII layers from DCW country polygons. German federal-state linework is real BKG geography, not synthetic input. The bundled VG250 land-area snapshot is dated 1 January 2026 and has reference scale 1:250,000. It was converted from EPSG:25832 to longitude/latitude, without line simplification. Label positions are authored separately. Data: © BKG 2026 dl-de/by-2-0, original data sources. See the retained source and modification notice and the dataset provenance. Each BKG example offers a script + data ZIP so reproduction needs no network access.

Start with GMT modern sessions, coast, plot, text, grdmath, grdimage, colorbar and inset in the official GMT reference.

Chapters 16-20 extend ideas reviewed in the GMT capability atlas (commit 26039d49). The scripts here have their own inline synthetic inputs, independent sessions, full parameter tables and stable tour IDs. Projection and inset ideas already covered in earlier chapters are retained there. The atlas's x-derivative study is described here as a directional derivative, rather than steepest slope.

Smoother lines: choose the right control

The word *smooth* can refer to several independent choices. Start with the kind of problem visible in the figure, then compare one change at a time.

What looks rough?	Control to inspect	Complete example
Sparse shoreline geometry in a close-up	coast -Di, -Dh or -Df	GMT-09-003
Heavy pointed ends or joins	PS_LINE_CAP and PS_LINE_JOIN	GMT-10-003
An intentionally schematic route	plot -W...+s or sample1d	GMT-11-002
A blocky scalar grid	Grid spacing, grdimage -E and image interpolation	GMT-13-002
Angular extracted contours	grdcontour -S	GMT-13-006
Stair-steps in a PNG edge	Qg/Qt anti-aliasing, H supersampling and E DPI	GMT-14-003

More detailed geographic data, round stroke joins and a higher-quality PNG solve different problems. Rounding a stroke does not move its source vertices. Fitting a spline can change the path between positions, and a smoothing spline can also miss the input positions. Use those curve-fitting examples for the invented route shown here; do not treat the fitted curve as an observed coast, surveyed boundary or measured track. Natural coastlines can be irregular even at full resolution.

The regular exports now use 200 dpi, H2 supersampling and explicit graphics/text anti-aliasing, with round caps and joins. The stroke and raster-quality chapters deliberately override those settings for comparisons. The vector PDF preserves vector paths for coastline and line layers; a grid image embedded in a PDF still has raster sampling. Use the full-size downloads to compare fine detail. In the grid comparisons, grdimage -E200 controls resampling of the map image; the E option supplied to gmt begin controls the final raster export. They act at different stages.

Further references: shoreline resolutions, stroke and frame settings, line plotting, interpolation and smoothing, grid resampling, contour smoothing and raster conversion.

Your first map

GMT-01-001

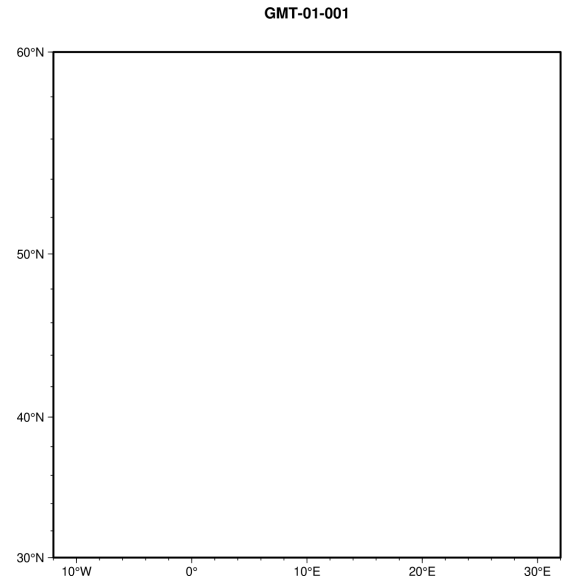
Draw a geographic frame

Start here: -R gives west/east/south/north in degrees. -JM13c selects a Mercator map 13 cm wide; -Baf adds automatic annotations and ticks. Longitude comes before latitude. A geographic frame is already a complete figure.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-01-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt basemap -R-12/32/30/60 -JM13c -Baf
gmt basemap -B+t"GMT-01-001"
gmt end
```

Actual output



GMT-01-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-01-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-01-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-01-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-01-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-01-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-01-001 · 3 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-01-001 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-01-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-01-001 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-01-002

Add a coastline

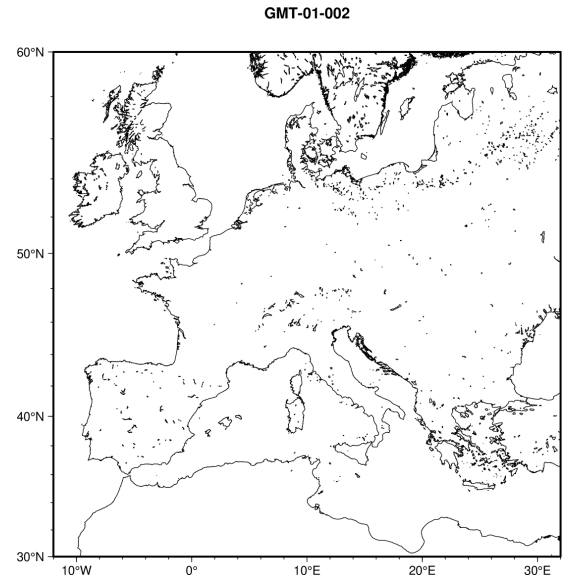
Change: replace basemap with coast and add -Dh and -W0.4p. The high-resolution local GSHHG coastline outlines land; the region, Mercator projection and frame stay the same. A pen width in points controls the line.

Compare with GMT-01-001 · Draw a geographic frame.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-01-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-12/32/30/60 -JM13c -Dh -W0.4p -Baf
gmt basemap -B+t"GMT-01-002"
gmt end
```

Actual output



GMT-01-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-01-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-01-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-01-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-01-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-01-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-01-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-01-002 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-01-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-01-002 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-01-003

Distinguish land and water

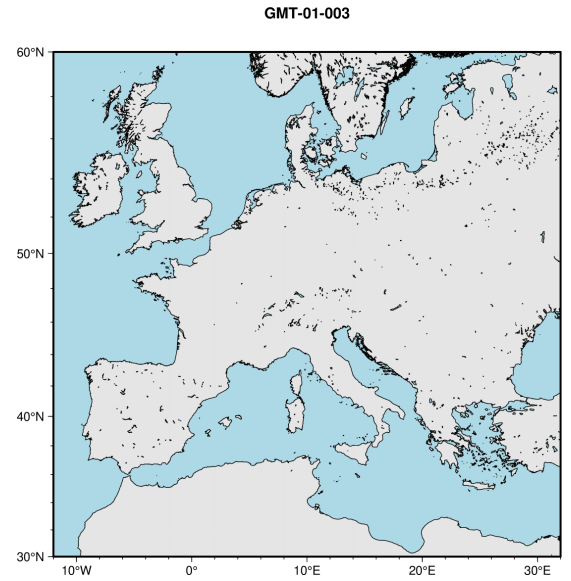
Change: add -Ggray90 for land and -Slightblue for water. coast uses separate fills, so the map becomes easier to read without changing its geometry. This map uses the locally installed coastline database.

Compare with GMT-01-002 · Add a coastline.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-01-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-12/32/30/60 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt basemap -B+t"GMT-01-003"
gmt end
```

Actual output



GMT-01-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-01-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-01-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-01-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-01-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-01-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-01-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-01-003 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-01-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-01-003 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-01-004

Choose annotation and tick intervals

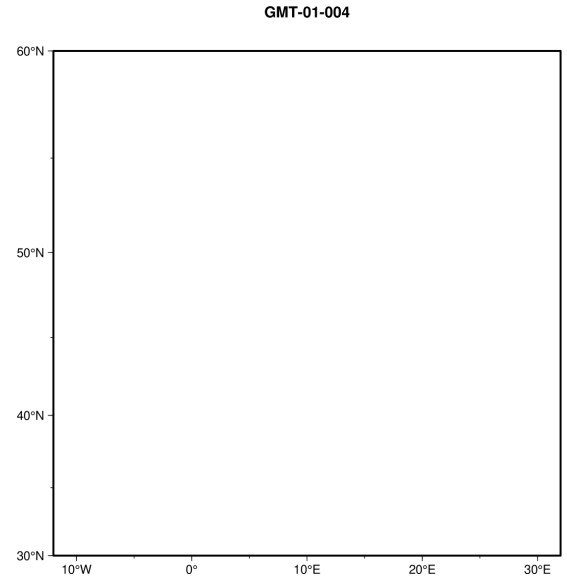
Set longitude and latitude labels every 10 degrees and minor ticks every 5 degrees. Each axis has an explicit -B setting.

Compare with GMT-01-001 · Draw a geographic frame.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-01-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt basemap -R-12/32/30/60 -JM13c -Bxa10f5 -Bya10f5
gmt basemap -B+t"GMT-01-004"
gmt end
```

Actual output



GMT-01-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-01-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-01-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-01-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-01-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-01-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-01-004 · 3 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Bxa10f5`	Label the longitude (x) axis every 10 degrees. Add ticks every 5 degrees (f).
`-Bya10f5`	Label the latitude (y) axis every 10 degrees. Add ticks every 5 degrees (f).

GMT-01-004 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-01-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-01-004 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-01-005

Add a regular geographic grid

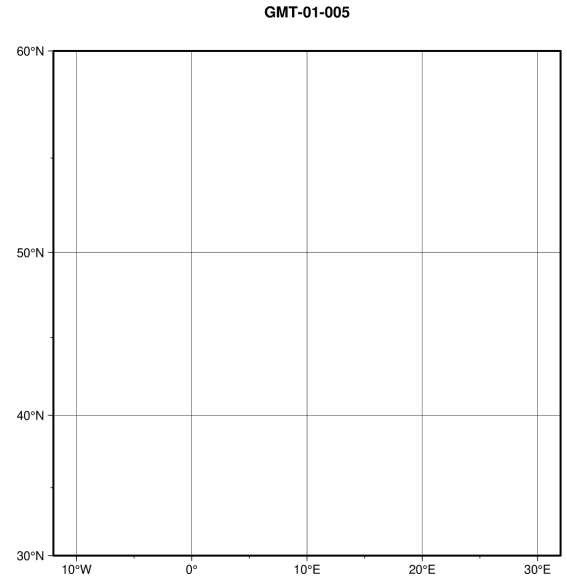
Append g10 on both axes to draw grid lines every 10 degrees while retaining the same labels and ticks.

Compare with GMT-01-004 · Choose annotation and tick intervals.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-01-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt basemap -R-12/32/30/60 -JM13c -Bxa10f5g10 -Bya10f5g10
gmt basemap -B+t"GMT-01-005"
gmt end
```

Actual output



GMT-01-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-01-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-01-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-01-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-01-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-01-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-01-005 · 3 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Bxa10f5g10`	Label the longitude (x) axis every 10 degrees. Add ticks every 5 degrees (f). Add grid lines every 10 degrees (g).
`-Bya10f5g10`	Label the latitude (y) axis every 10 degrees. Add ticks every 5 degrees (f). Add grid lines every 10 degrees (g).

GMT-01-005 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-01-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-01-005 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-01-006

Annotate only two sides

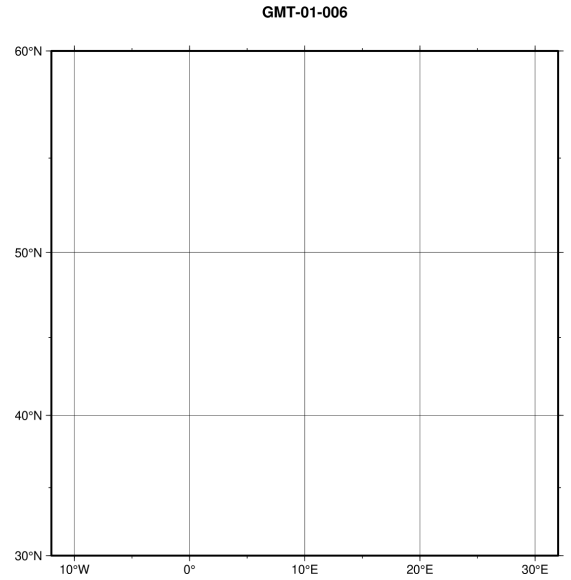
Keep the grid but use -BWSen to label only the west and south axes. Uppercase side letters request annotations; lowercase side letters keep the frame and ticks.

Compare with GMT-01-005 · Add a regular geographic grid.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-01-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt basemap -R-12/32/30/60 -JM13c -Bxa10f5g10 -Bya10f5g10 -BWSen
gmt basemap -B+t"GMT-01-006"
gmt end
```

Actual output



GMT-01-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-01-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-01-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-01-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-01-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-01-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-01-006 · 3 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Bxa10f5g10`	Label the longitude (x) axis every 10 degrees. Add ticks every 5 degrees (f). Add grid lines every 10 degrees (g).
`-Bya10f5g10`	Label the latitude (y) axis every 10 degrees. Add ticks every 5 degrees (f). Add grid lines every 10 degrees (g).
`-BWSen`	Annotate the west (W) and south (S) axes; draw east (e) and north (n) edges with ticks but no annotations.

GMT-01-006 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-01-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-01-006 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-01-007

Use a fancy map border

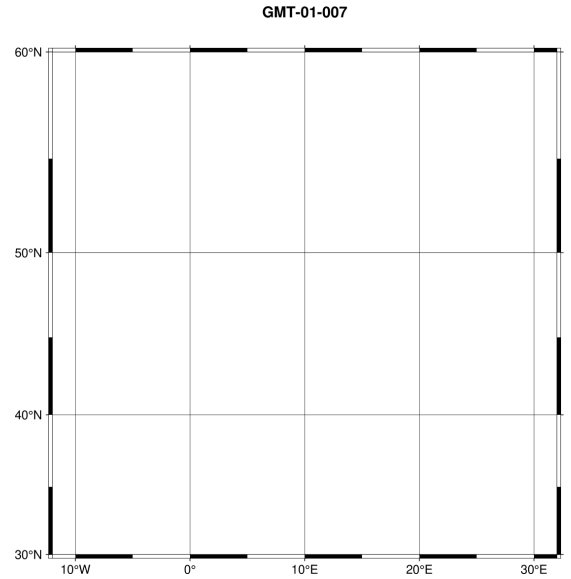
Set MAP_FRAME_TYPE to fancy. Compare the alternating border with the plain frame around the same region.

Compare with GMT-01-006 · Annotate only two sides.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-01-007 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE fancy PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt basemap -R-12/32/30/60 -JM13c -Bxa10f5g10 -Bya10f5g10 -BWSen
gmt basemap -B+t"GMT-01-007"
gmt end
```

Actual output



GMT-01-007 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-01-007

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-01-007 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-01-007 png,pdf`	Start an independent modern session; the output stem figures/GMT-01-007 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-01-007 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE fancy`	Draw the alternating fancy map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-01-007 · 3 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Bxa10f5g10`	Label the longitude (x) axis every 10 degrees. Add ticks every 5 degrees (f). Add grid lines every 10 degrees (g).
`-Bya10f5g10`	Label the latitude (y) axis every 10 degrees. Add ticks every 5 degrees (f). Add grid lines every 10 degrees (g).
`-BWSen`	Annotate the west (W) and south (S) axes; draw east (e) and north (n) edges with ticks but no annotations.

GMT-01-007 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-01-007`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-01-007 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-01-008

Style the graticule independently

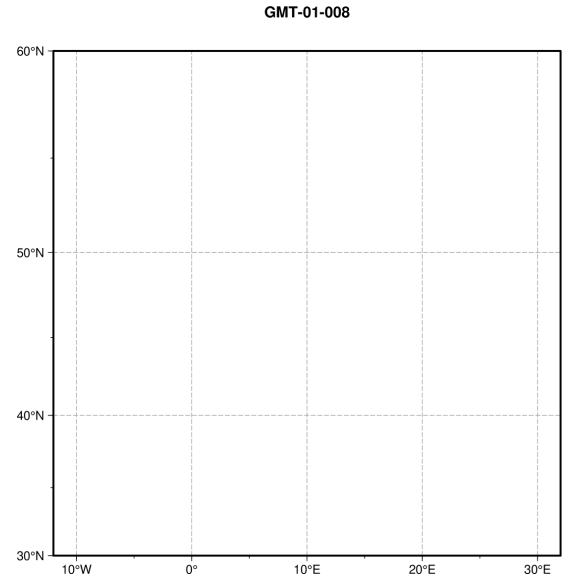
Give the graticule a dashed gray pen while keeping the same geographic grid intervals. The grid pen is independent of the map frame and coastline pen.

Compare with GMT-01-005 · Add a regular geographic grid.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-01-008 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt set MAP_GRID_PEN_PRIMARY 0.4p,gray60,-
gmt basemap -R-12/32/30/60 -JM13c -Bxa10f5g10 -Bya10f5g10
gmt basemap -B+t"GMT-01-008"
gmt end
```

Actual output



GMT-01-008 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-01-008

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-01-008 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-01-008 png,pdf`	Start an independent modern session; the output stem figures/GMT-01-008 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-01-008 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-01-008 · 3 · gmt set · GMT reference

Argument(s)	Meaning in this example
`MAP_GRID_PEN_PRIMARY 0.4p,gray60,-`	Draw primary graticule lines with a 0.4-point gray60 stroke with a dashed pattern.

GMT-01-008 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Bxa10f5g10`	Label the longitude (x) axis every 10 degrees. Add ticks every 5 degrees (f). Add grid lines every 10 degrees (g).
`-Bya10f5g10`	Label the latitude (y) axis every 10 degrees. Add ticks every 5 degrees (f). Add grid lines every 10 degrees (g).

GMT-01-008 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-01-008`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-01-008 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-01-009

Choose a smaller geographic extent

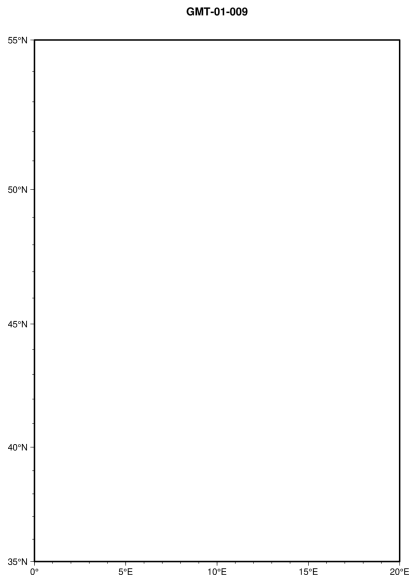
Change only -R to crop the empty frame to 0/20/35/55 degrees. The same 13 cm width now covers a smaller region. Chapter 15 combines this idea with overview maps.

Compare with GMT-01-001 · Draw a geographic frame.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-01-009 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt basemap -R0/20/35/55 -JM13c -Baf
gmt basemap -B+t"GMT-01-009"
gmt end
```

Actual output



GMT-01-009 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-01-009

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-01-009 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-01-009 png,pdf`	Start an independent modern session; the output stem figures/GMT-01-009 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-01-009 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-01-009 · 3 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-R0/20/35/55`	Geographic bounds west/east/south/north = 0/20/35/55 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-01-009 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-01-009`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-01-009 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Choose a projection

GMT-02-001

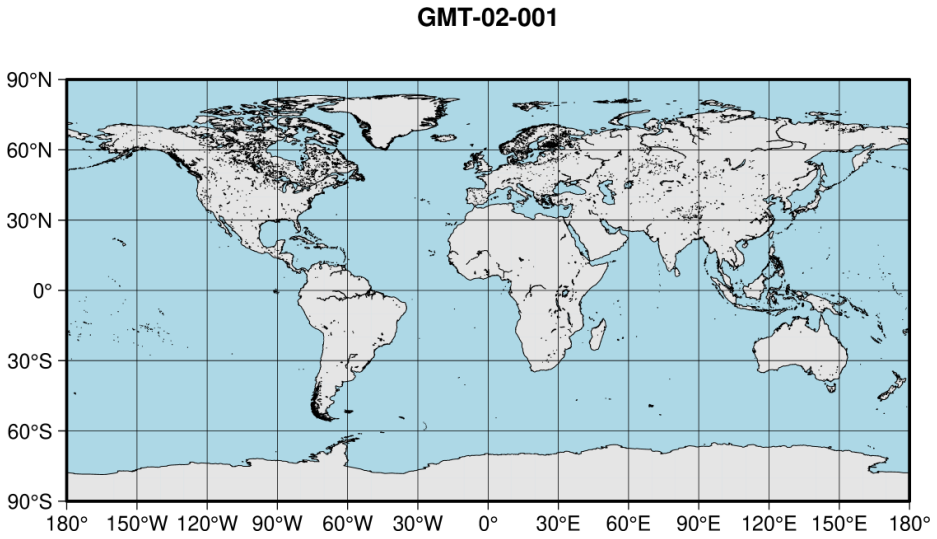
A rectangular world map

Use -Rg for the whole globe and -JQ0/13c for an equidistant cylindrical map centred on longitude zero. -B30g30 sets a 30-degree annotated graticule. Distances and areas are not preserved everywhere; choose a projection for the purpose of a map.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-02-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -Rg -JQ0/13c -Dl -Ggray90 -Slightblue -W0.3p -B30g30
gmt basemap -B+t"GMT-02-001"
gmt end
```

Actual output



GMT-02-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-02-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-02-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-02-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-02-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-02-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-02-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JQ0/13c`	Equidistant cylindrical projection, central meridian 0 degrees, map width 13 cm.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-B30g30`	On both geographic axes, label every 30 degrees and draw grid lines every 30 degrees.

GMT-02-001 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-02-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-02-001 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-02-002

Preserve area with Mollweide

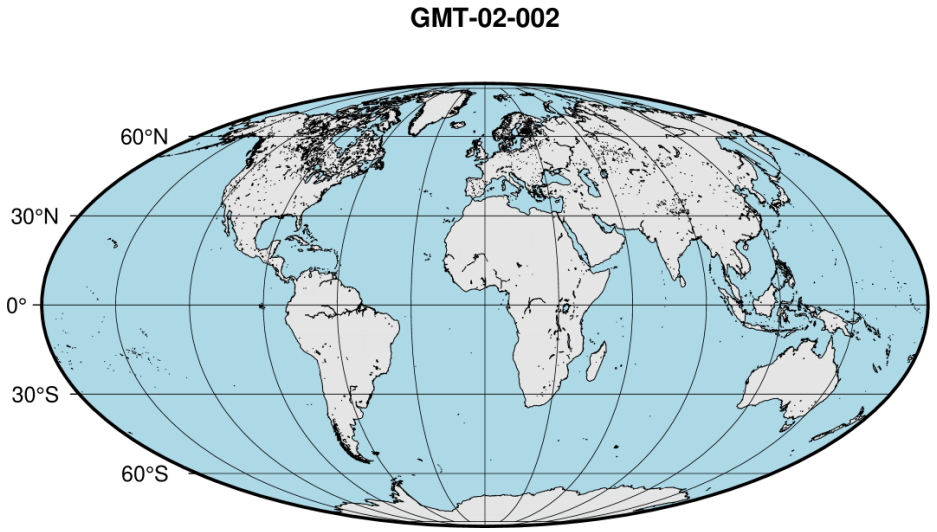
Change only the projection to -JW0/13c. Mollweide is equal-area, so relative areas are preserved while shapes change. Compare the same coastline and graticule with the rectangular world map.

Compare with GMT-02-001 · A rectangular world map.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-02-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -Rg -JW0/13c -Dl -Ggray90 -Slightblue -W0.3p -B30g30
gmt basemap -B+t"GMT-02-002"
gmt end
```

Actual output



GMT-02-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-02-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-02-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-02-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-02-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-02-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-02-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JW0/13c`	Mollweide equal-area projection, central meridian 0 degrees, map width 13 cm.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-B30g30`	On both geographic axes, label every 30 degrees and draw grid lines every 30 degrees.

GMT-02-002 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-02-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-02-002 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-02-003

Look at a hemisphere

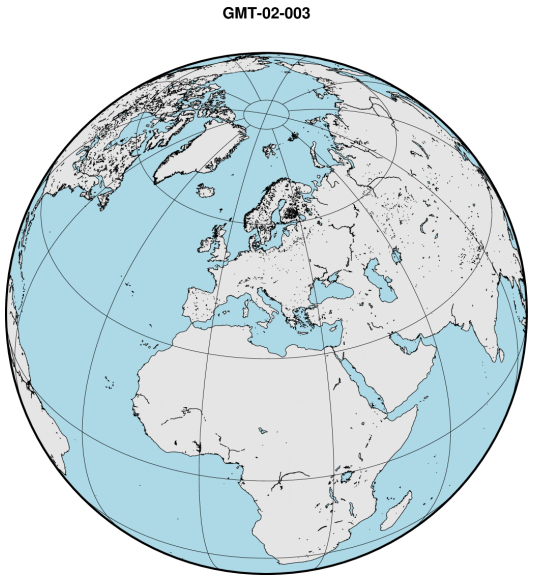
Change the projection to -JG15/40/13c: an orthographic view centred on 15 degrees east and 40 degrees north. The visible hemisphere looks like a globe viewed from far away; features near the limb are foreshortened.

Compare with GMT-02-001 · A rectangular world map.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-02-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -Rg -JG15/40/13c -Dl -Ggray90 -Slightblue -W0.3p -B30g30
gmt basemap -B+t"GMT-02-003"
gmt end
```

Actual output



GMT-02-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-02-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-02-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-02-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-02-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-02-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-02-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JG15/40/13c`	Orthographic globe view, centred at longitude 15, latitude 40 degrees; map width 13 cm.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-B30g30`	On both geographic axes, label every 30 degrees and draw grid lines every 30 degrees.

GMT-02-003 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-02-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-02-003 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-02-004

Compare the Robinson world projection

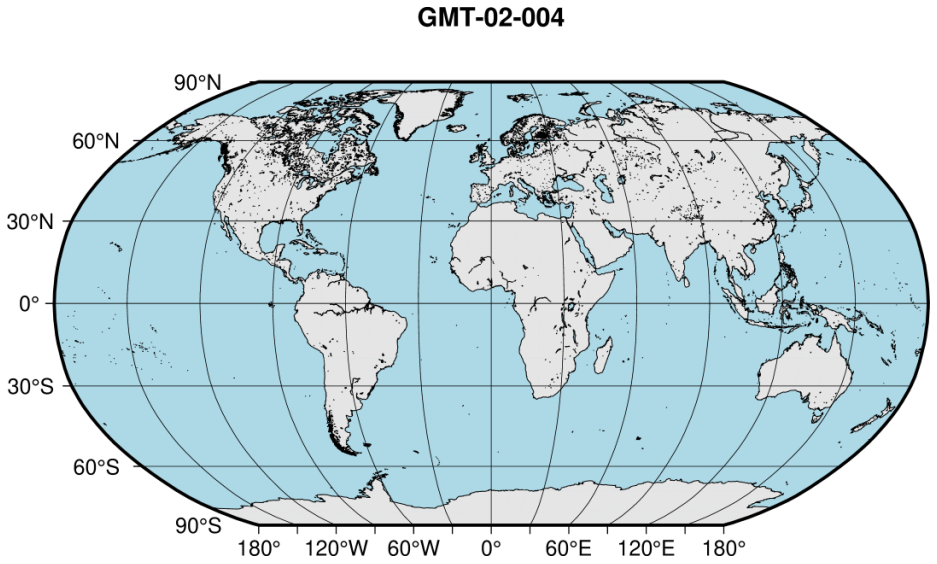
Use Robinson as a compromise world projection. Inspect its curved outer meridians and compare with the rectangular world map.

Compare with GMT-02-001 · A rectangular world map.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-02-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -Rg -JN0/13c -Dl -Ggray90 -Slightblue -W0.3p -B30g30
gmt basemap -B+t"GMT-02-004"
gmt end
```

Actual output



GMT-02-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-02-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-02-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-02-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-02-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-02-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-02-004 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JN0/13c`	Robinson projection, central meridian 0 degrees, map width 13 cm. This compromise projection preserves neither area nor angles exactly.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-B30g30`	On both geographic axes, label every 30 degrees and draw grid lines every 30 degrees.

GMT-02-004 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-02-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-02-004 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-02-005

Compare the Hammer equal-area world

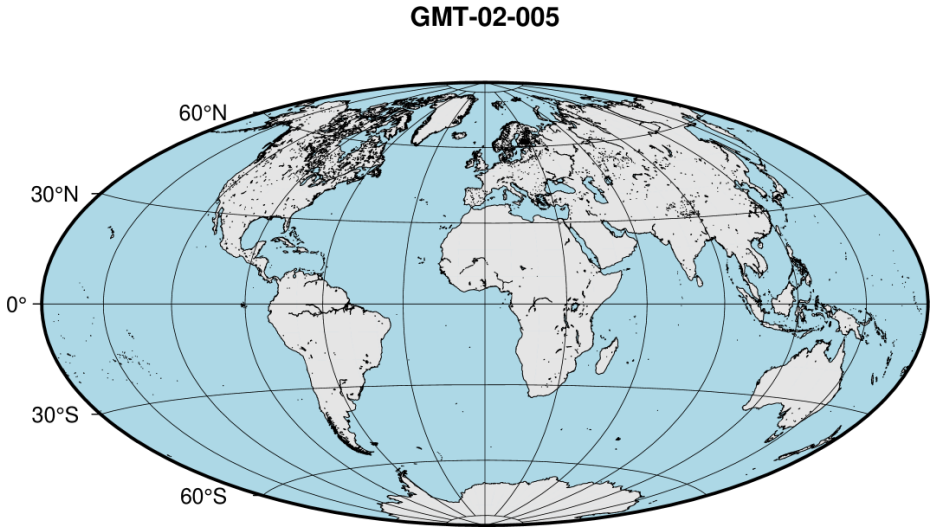
Hammer preserves area and has a different graticule and oval outline from Mollweide. Projection choice changes how the same geography is arranged.

Compare with GMT-02-002 · Preserve area with Mollweide.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-02-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -Rg -JH0/13c -Dl -Ggray90 -Slightblue -W0.3p -B30g30
gmt basemap -B+t"GMT-02-005"
gmt end
```

Actual output



GMT-02-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-02-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-02-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-02-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-02-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-02-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-02-005 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JH0/13c`	Hammer equal-area projection, central meridian 0 degrees and map width 13 cm; compare its outline with Mollweide.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-B30g30`	On both geographic axes, label every 30 degrees and draw grid lines every 30 degrees.

GMT-02-005 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-02-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-02-005 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-02-006

Limit a Mercator world map before the poles

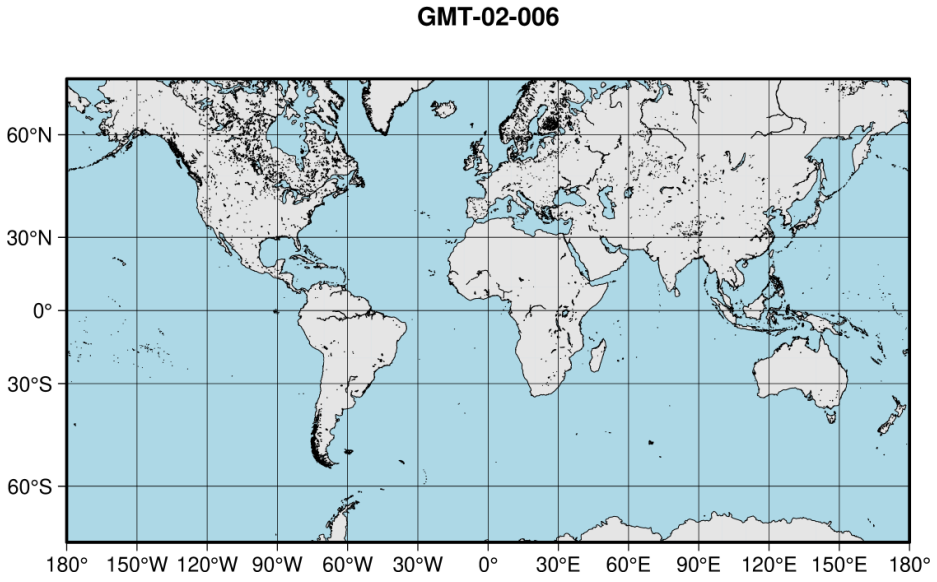
Use Mercator over latitudes -70 to 70 degrees. Mercator cannot display the geographic poles at finite map height; inspect the enlarged high-latitude shapes.

Compare with GMT-02-001 · A rectangular world map.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-02-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-180/180/-70/70 -JM13c -Dl -Ggray90 -Slightblue -W0.3p -B30g30
gmt basemap -B+t"GMT-02-006"
gmt end
```

Actual output



GMT-02-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-02-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-02-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-02-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-02-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-02-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-02-006 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-180/180/-70/70`	Geographic bounds west/east/south/north = -180/180/-70/70 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-B30g30`	On both geographic axes, label every 30 degrees and draw grid lines every 30 degrees.

GMT-02-006 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-02-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-02-006 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-02-007

Re-centre the rectangular world on the Pacific

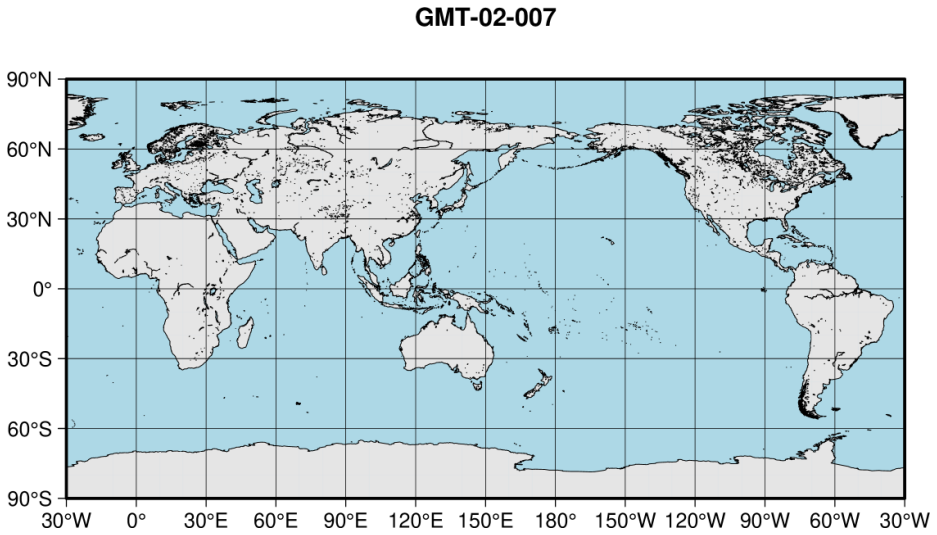
Move the central meridian from 0 to 150 degrees. The whole globe remains in view while the map cut moves away from the Pacific centre.

Compare with GMT-02-001 · A rectangular world map.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-02-007 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -Rg -JQ150/13c -Dl -Ggray90 -Slightblue -W0.3p -B30g30
gmt basemap -B+t"GMT-02-007"
gmt end
```

Actual output



GMT-02-007 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-02-007

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-02-007 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-02-007 png,pdf`	Start an independent modern session; the output stem figures/GMT-02-007 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-02-007 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-02-007 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JQ150/13c`	Equidistant cylindrical projection, central meridian 150 degrees, map width 13 cm.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-B30g30`	On both geographic axes, label every 30 degrees and draw grid lines every 30 degrees.

GMT-02-007 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-02-007`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-02-007 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-02-008

Choose another visible hemisphere

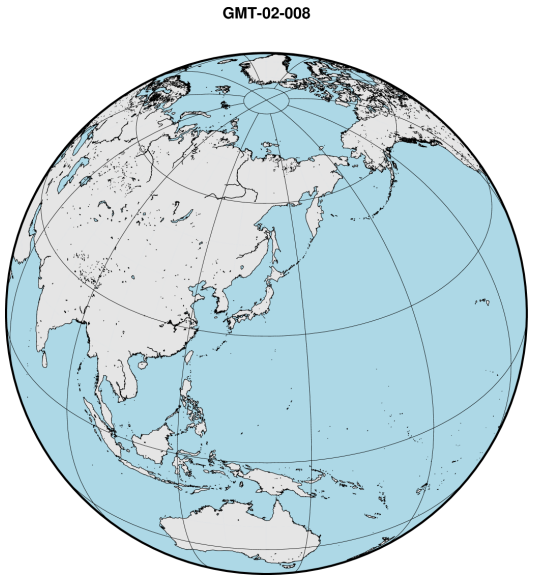
An orthographic view centred at 140 east and 35 north shows a different hemisphere. Compare the globe view centred on Europe and the Mediterranean.

Compare with GMT-02-003 · Look at a hemisphere.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-02-008 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -Rg -JG140/35/13c -Dl -Ggray90 -Slightblue -W0.3p -B30g30
gmt basemap -B+t"GMT-02-008"
gmt end
```

Actual output



GMT-02-008 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-02-008

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-02-008 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-02-008 png,pdf`	Start an independent modern session; the output stem figures/GMT-02-008 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-02-008 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-02-008 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JG140/35/13c`	Orthographic globe view, centred at longitude 140, latitude 35 degrees; map width 13 cm.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-B30g30`	On both geographic axes, label every 30 degrees and draw grid lines every 30 degrees.

GMT-02-008 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-02-008`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-02-008 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-02-009

Set a cylindrical standard parallel

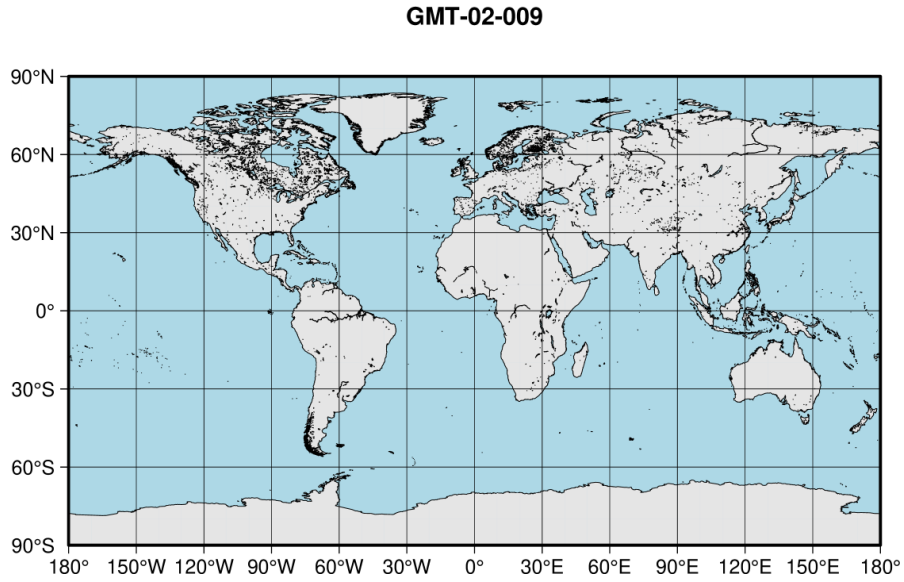
Add latitude 30 as the standard parallel in -JQ0/30/13c. At the same physical width, the relative horizontal and vertical scales change.

Compare with GMT-02-001 · A rectangular world map.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-02-009 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -Rg -JQ0/30/13c -Dl -Ggray90 -Slightblue -W0.3p -B30g30
gmt basemap -B+t"GMT-02-009"
gmt end
```

Actual output



GMT-02-009 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-02-009

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-02-009 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-02-009 png,pdf`	Start an independent modern session; the output stem figures/GMT-02-009 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-02-009 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-02-009 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JQ0/30/13c`	Equidistant cylindrical projection centred at longitude 0, with standard parallel 30 degrees and width 13 cm. The standard parallel changes the horizontal scale relative to the vertical scale.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-B30g30`	On both geographic axes, label every 30 degrees and draw grid lines every 30 degrees.

GMT-02-009 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-02-009`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-02-009 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Coastlines and geographic context

Higher detail has two controls: -Dh/-Df selects finer source geometry; -I selects which river classes are drawn. A thinner pen and a higher raster DPI change the appearance, not the geographic data. Examples 007-010 compare these choices in Europe. -N1 draws national borders; -N2 only supplies state boundaries within the Americas. European country selections can use DCW (-E), while the German Länder examples use the bundled BKG VG250 layer. DCW is independent of GSHHG, so -D does not refine its country polygons.

GMT-03-001

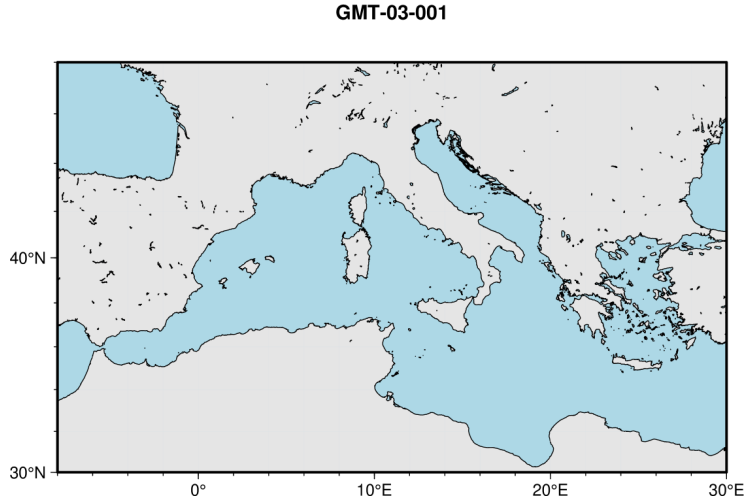
Increase coastline detail

Use -Dh for high-resolution coastlines, rivers and borders, and narrow the view to the Mediterranean. Detail should suit the map scale. The tour explicitly selects a local resolution so the result does not depend on automatic resolution choices.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm FONT_ANNOT_PRIMARY
9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt basemap -B+t"GMT-03-001"
gmt end
```

Actual output



GMT-03-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-03-001 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-001 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-002

Add geographic boundaries

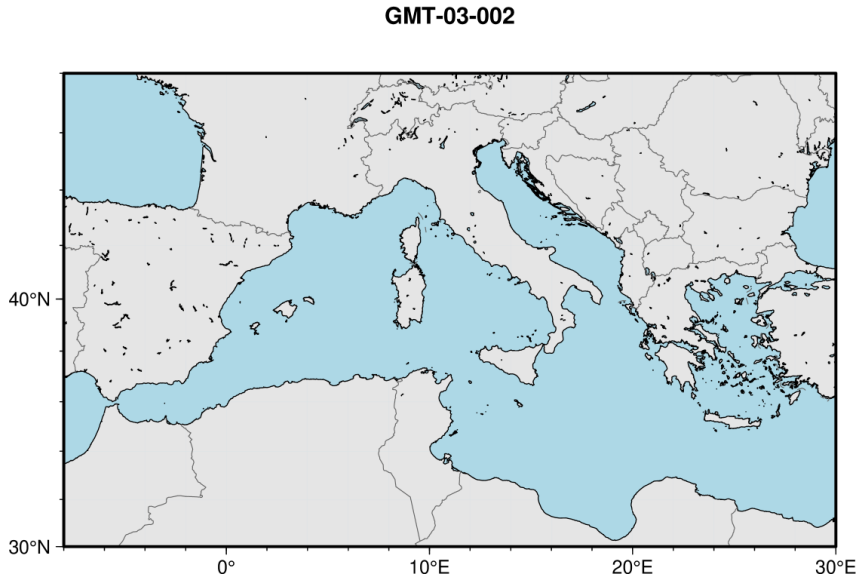
Change: add -N1/0.35p,gray40 to draw national boundaries from the installed geographic database. The width and colour belong to the boundary pen. These contextual boundaries follow that database, whose age and conventions matter for real research.

Compare with GMT-03-001 · Increase coastline detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf -N1/0.35p,gray40
gmt basemap -B+t"GMT-03-002"
gmt end
```

Actual output



GMT-03-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.
`-N1/0.35p,gray40`	Draw national boundaries (level 1) with a 0.35-point gray40 stroke.

GMT-03-002 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-002 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-003

Add major rivers and lakes

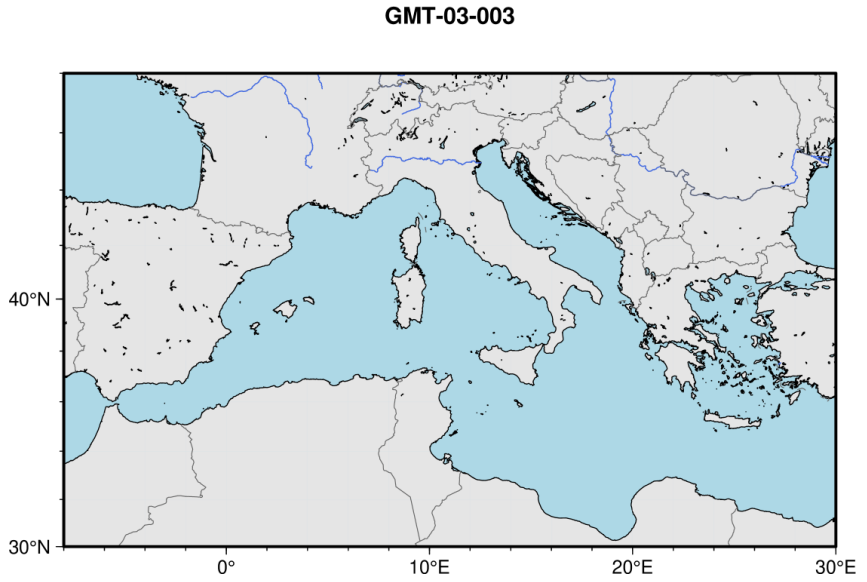
Change: add -I1/0.5p,royalblue for major rivers and -Clightblue for inland water. Rivers and shorelines are separate layers in GSHHG; no remote relief or basemap tiles are used.

Compare with GMT-03-002 · Add geographic boundaries.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf -N1/0.35p,gray40
-I1/0.5p,royalblue -Clightblue
gmt basemap -B+t"GMT-03-003"
gmt end
```

Actual output



GMT-03-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.
`-N1/0.35p,gray40`	Draw national boundaries (level 1) with a 0.35-point gray40 stroke.
`-I1/0.5p,royalblue`	Draw permanent major rivers (class 1) with a 0.5-point royalblue stroke.
`-Clightblue`	Fill lakes and river-lakes with lightblue.

GMT-03-003 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-003 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-004

Filter out small islands and lakes

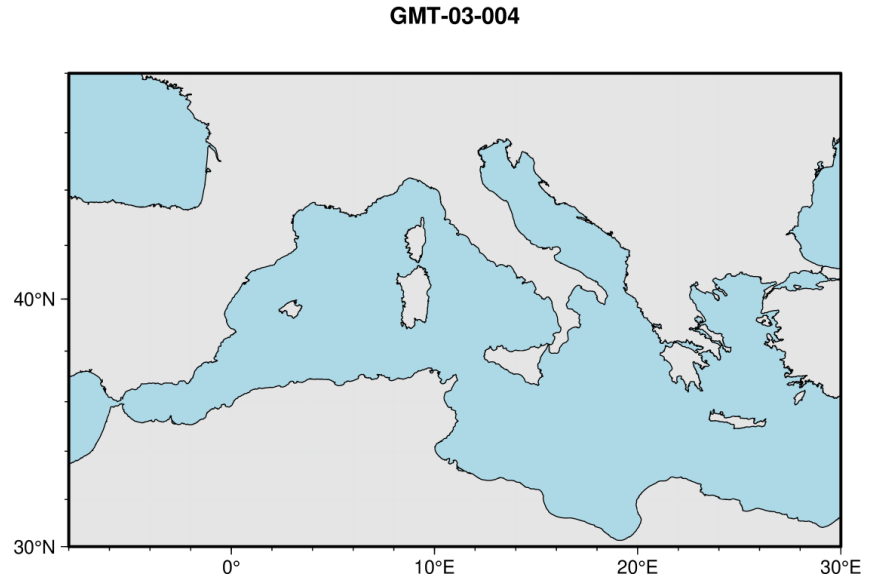
Add -A1000 to omit polygons smaller than 1000 square kilometres. An area filter and the -Dh shoreline resolution control different aspects of the map.

Compare with GMT-03-001 · Increase coastline detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -A1000 -Ggray90 -Slightblue -W0.4p -Baf
gmt basemap -B+t"GMT-03-004"
gmt end
```

Actual output



GMT-03-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-004 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-A1000`	For coast, omit GSHHG polygons smaller than 1000 square kilometres. This area filter removes small features independently of shoreline resolution.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-03-004 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-004 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-005

Show US state boundaries

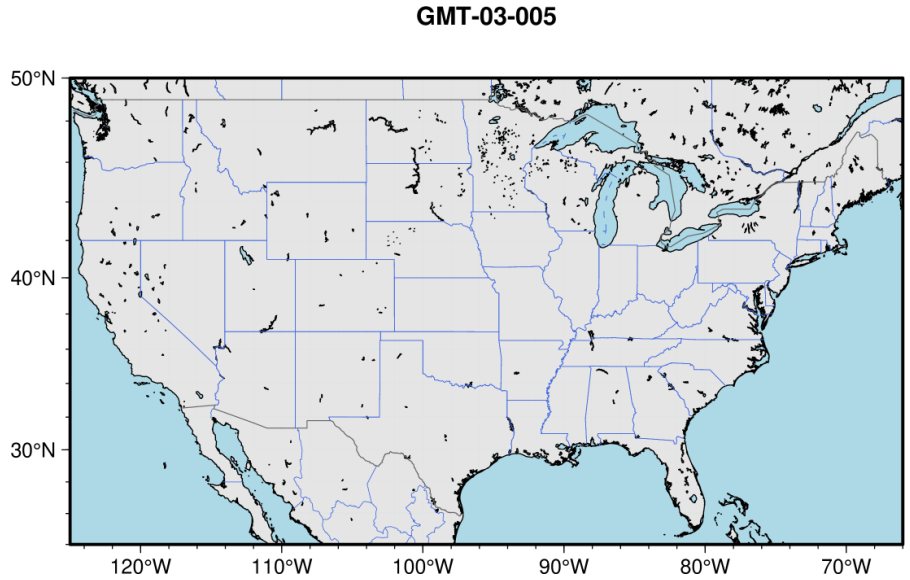
Select the contiguous-US region and draw both national boundaries and state boundaries. The second -N option assigns a separate blue pen to level 2.

Compare with GMT-03-002 · Add geographic boundaries.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-125/-66/24/50 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
-N1/0.35p,gray40 -N2/0.25p,royalblue
gmt basemap -B+t"GMT-03-005"
gmt end
```

Actual output



GMT-03-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-005 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-125/-66/24/50`	Geographic bounds west/east/south/north = -125/-66/24/50 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.
`-N1/0.35p,gray40`	Draw national boundaries (level 1) with a 0.35-point gray40 stroke.
`-N2/0.25p,royalblue`	Draw state boundaries within the Americas (level 2) with a 0.25-point royalblue pen. The US region makes this level visible.

GMT-03-005 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-005 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-006

Include all permanent river classes

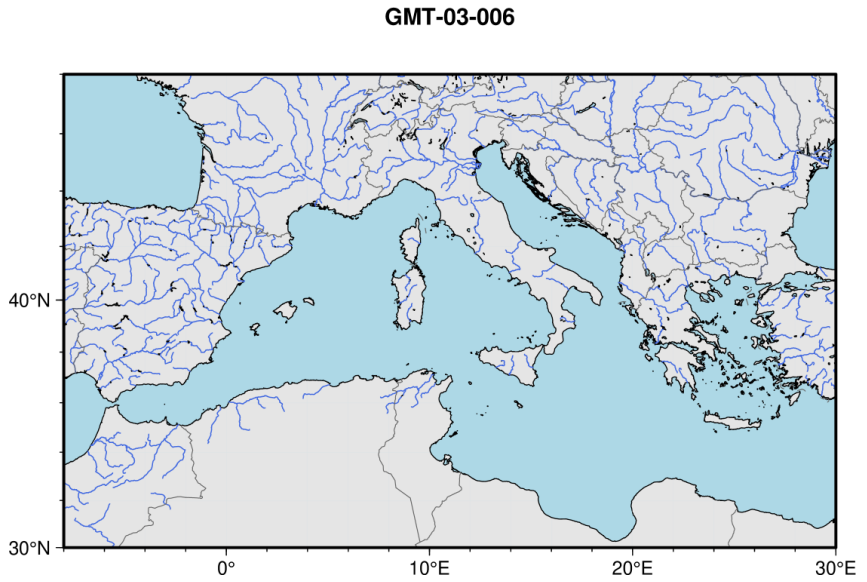
Change the river selector from class 1 to r, the group of permanent rivers including river-lakes. Keep the same pen, lake fill and geographic extent.

Compare with GMT-03-003 · Add major rivers and lakes.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf -N1/0.35p,gray40
-Ir/0.5p,royalblue -Clightblue
gmt basemap -B+t"GMT-03-006"
gmt end
```

Actual output



GMT-03-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-006 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.
`-N1/0.35p,gray40`	Draw national boundaries (level 1) with a 0.35-point gray40 stroke.
`-Ir/0.5p,royalblue`	Draw all permanent river classes 0 to 4, including river-lakes, with a 0.5-point royalblue pen.
`-Clightblue`	Fill lakes and river-lakes with lightblue.

GMT-03-006 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-006 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-007

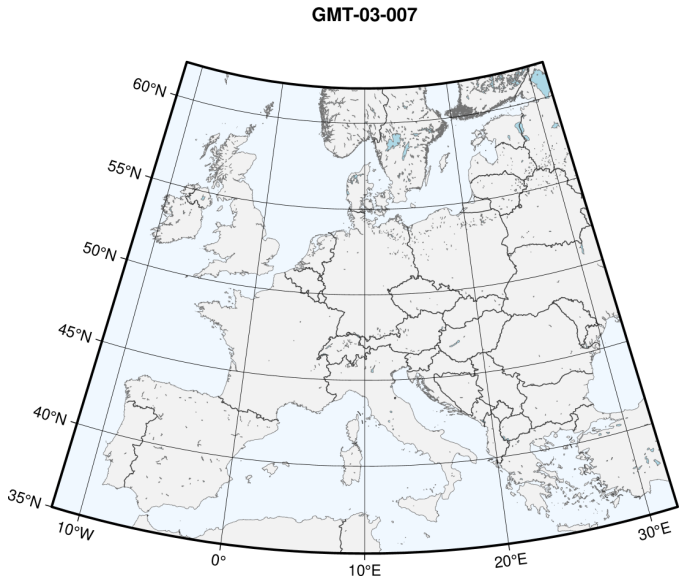
Draw European country borders in high detail

A Lambert conformal conic view shows European countries using high-resolution GSHHG/WDBII geography. National borders (-N1), shorelines (-W) and lake fill (-C) are separate controls. This is the baseline for the full-resolution comparison.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-007 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-12/32/35/62 -JL10/50/40/60/13c -Dh -Ggray95 -Saliceblue -Clightblue
-W0.25p,gray45 -N1/0.5p,gray25 -Bxa10g10 -Bya5g5
gmt basemap -B+t"GMT-03-007"
gmt end
```

Actual output



GMT-03-007 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-007

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-007 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-007 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-007 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-007 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads. These examples use installed GSHHG/DCW and, where declared, bundled BKG input files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-007 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/35/62`	Geographic bounds west/east/south/north = -12/32/35/62 degrees. Negative longitude is west; negative latitude is south.
`-JL10/50/40/60/13c`	Lambert conformal conic: central longitude 10, latitude of origin 50, standard parallels 40 and 60 degrees; width 13 cm.
`-Dh`	Select high-resolution shorelines and the associated river/border geometry from the installed GSHHG/ WDBII files. This changes the source vertices, not PNG DPI; no lower-resolution fallback is requested.
`-Ggray95`	Fill land areas with gray95.
`-Saliceblue`	Fill water areas with aliceblue.
`-Clightblue`	Fill lakes and river-lakes with lightblue.
`-W0.25p,gray45`	Draw 0.25-point gray45 stroke.
`-N1/0.5p,gray25`	Draw national boundaries (level 1) with a 0.5-point gray25 stroke.
`-Bxa10g10`	On the longitude (x) axis, label every 10 degrees; draw grid lines every 10 degrees (g).
`-Bya5g5`	On the latitude (y) axis, label every 5 degrees; draw grid lines every 5 degrees (g).

GMT-03-007 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-007`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-007 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-008

Use full-resolution European boundaries

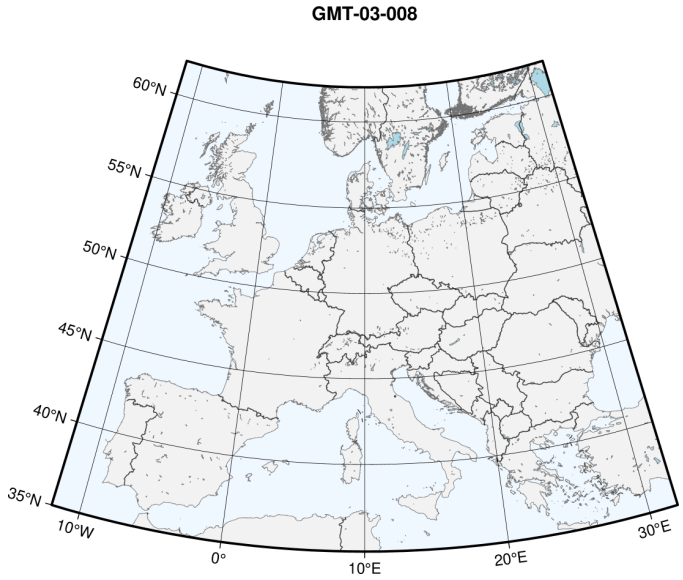
Change only -Dh to -Df in the same European view. Border and coastline paths contain more source vertices; their pen widths and the PNG export settings stay fixed. This demonstrates geometry detail independently of raster quality.

Compare with GMT-03-007 · Draw European country borders in high detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-008 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-12/32/35/62 -JL10/50/40/60/13c -Df -Ggray95 -Saliceblue -Clightblue
-W0.25p,gray45 -N1/0.5p,gray25 -Bxa10g10 -Bya5g5
gmt basemap -B+t"GMT-03-008"
gmt end
```

Actual output



GMT-03-008 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-008

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-008 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-008 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-008 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-008 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads. These examples use installed GSHHG/DCW and, where declared, bundled BKG input files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-008 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/35/62`	Geographic bounds west/east/south/north = -12/32/35/62 degrees. Negative longitude is west; negative latitude is south.
`-JL10/50/40/60/13c`	Lambert conformal conic: central longitude 10, latitude of origin 50, standard parallels 40 and 60 degrees; width 13 cm.
`-Df`	Select full-resolution shorelines and the associated river/border geometry from the installed GSHHG/ WDBII files. This changes the source vertices, not PNG DPI; no lower-resolution fallback is requested.
`-Ggray95`	Fill land areas with gray95.
`-Saliceblue`	Fill water areas with aliceblue.
`-Clightblue`	Fill lakes and river-lakes with lightblue.
`-W0.25p,gray45`	Draw 0.25-point gray45 stroke.
`-N1/0.5p,gray25`	Draw national boundaries (level 1) with a 0.5-point gray25 stroke.
`-Bxa10g10`	On the longitude (x) axis, label every 10 degrees; draw grid lines every 10 degrees (g).
`-Bya5g5`	On the latitude (y) axis, label every 5 degrees; draw grid lines every 5 degrees (g).

GMT-03-008 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-008`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-008 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-009

Give major and minor rivers separate pens

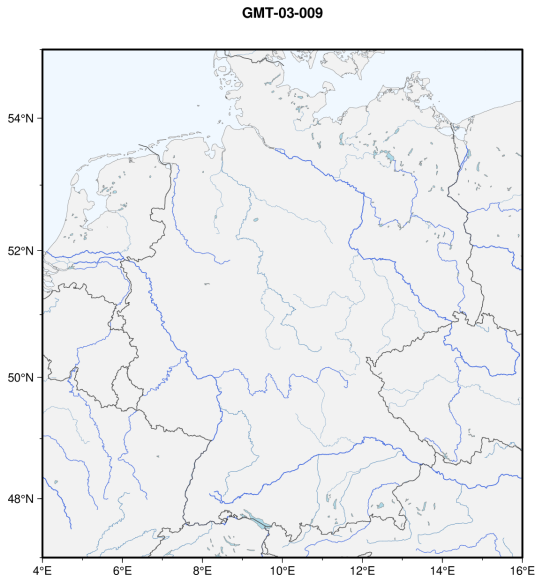
A closer central-European view draws river classes 1-4 at full resolution. Major channels have a stronger pen and smaller rivers a thinner pen. Adding classes increases the number of waterways; -Df separately increases their available geometric detail.

Compare with GMT-03-008 · Use full-resolution European boundaries.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-009 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R4/16/47/55 -JM13c -Df -Ggray95 -Saliceblue -Clightblue -W0.2p,gray45
-N1/0.5p,gray30 -I1/0.55p,royalblue -I2/0.35p,royalblue -I3/0.22p,steelblue
-I4/0.12p,steelblue -Bxa2f1 -Bya2f1
gmt basemap -B+t"GMT-03-009"
gmt end
```

Actual output



GMT-03-009 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-009

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-009 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-009 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-009 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-009 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads. These examples use installed GSHHG/DCW and, where declared, bundled BKG input files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-009 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R4/16/47/55`	Geographic bounds west/east/south/north = 4/16/47/55 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Df`	Select full-resolution shorelines and the associated river/border geometry from the installed GSHHG/ WDBII files. This changes the source vertices, not PNG DPI; no lower-resolution fallback is requested.
`-Ggray95`	Fill land areas with gray95.
`-Saliceblue`	Fill water areas with aliceblue.
`-Clightblue`	Fill lakes and river-lakes with lightblue.
`-W0.2p,gray45`	Draw 0.2-point gray45 stroke.
`-N1/0.5p,gray30`	Draw national boundaries (level 1) with a 0.5-point gray30 stroke.
`-I1/0.55p,royalblue`	Draw permanent major rivers (class 1) with a 0.55-point royalblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-I2/0.35p,royalblue`	Draw additional major rivers (class 2) with a 0.35-point royalblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-I3/0.22p,steelblue`	Draw additional rivers (class 3) with a 0.22-point steelblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-I4/0.12p,steelblue`	Draw minor rivers (class 4) with a 0.12-point steelblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-Bxa2f1`	On the longitude (x) axis, label every 2 degrees; draw ticks every 1 degrees (f).

Argument(s)	Meaning in this example
`-Bya2f1`	On the latitude (y) axis, label every 2 degrees; draw ticks every 1 degrees (f).

GMT-03-009 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-009`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-009 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-010

Add canals without thickening the river network

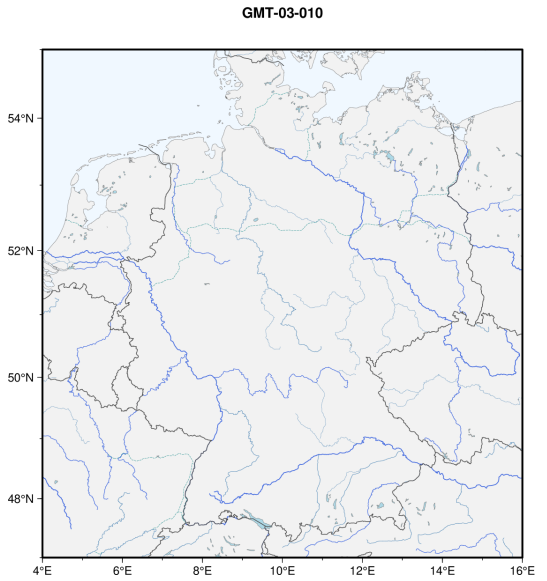
Keep the preceding river hierarchy and add canal classes 8-10 with a thin dashed teal pen. Lake and river-lake areas retain a light-blue fill. The layers come from the installed WDBII/GSHHG snapshot.

Compare with GMT-03-009 · Give major and minor rivers separate pens.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-010 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R4/16/47/55 -JM13c -Df -Ggray95 -Saliceblue -Clightblue -W0.2p,gray45
-N1/0.5p,gray30 -I1/0.55p,royalblue -I2/0.35p,royalblue -I3/0.22p,steelblue
-I4/0.12p,steelblue -Ic/0.18p,0/128/128,- -Bxa2f1 -Bya2f1
gmt basemap -B+t"GMT-03-010"
gmt end
```

Actual output



GMT-03-010 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-010

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-010 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-010 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-010 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-010 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads. These examples use installed GSHHG/DCW and, where declared, bundled BKG input files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-010 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R4/16/47/55`	Geographic bounds west/east/south/north = 4/16/47/55 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Df`	Select full-resolution shorelines and the associated river/border geometry from the installed GSHHG/ WDBII files. This changes the source vertices, not PNG DPI; no lower-resolution fallback is requested.
`-Ggray95`	Fill land areas with gray95.
`-Saliceblue`	Fill water areas with aliceblue.
`-Clightblue`	Fill lakes and river-lakes with lightblue.
`-W0.2p,gray45`	Draw 0.2-point gray45 stroke.
`-N1/0.5p,gray30`	Draw national boundaries (level 1) with a 0.5-point gray30 stroke.
`-I1/0.55p,royalblue`	Draw permanent major rivers (class 1) with a 0.55-point royalblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-I2/0.35p,royalblue`	Draw additional major rivers (class 2) with a 0.35-point royalblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-I3/0.22p,steelblue`	Draw additional rivers (class 3) with a 0.22-point steelblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-I4/0.12p,steelblue`	Draw minor rivers (class 4) with a 0.12-point steelblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.

Argument(s)	Meaning in this example
`-Ic/0.18p,0/128/128,-`	Draw canals (classes 8-10) with a 0.18-point 0/128/128 stroke with a dashed pattern. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-Bxa2f1`	On the longitude (x) axis, label every 2 degrees; draw ticks every 1 degrees (f).
`-Bya2f1`	On the latitude (y) axis, label every 2 degrees; draw ticks every 1 degrees (f).

GMT-03-010 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-010`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-010 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-011

Select European countries by their codes

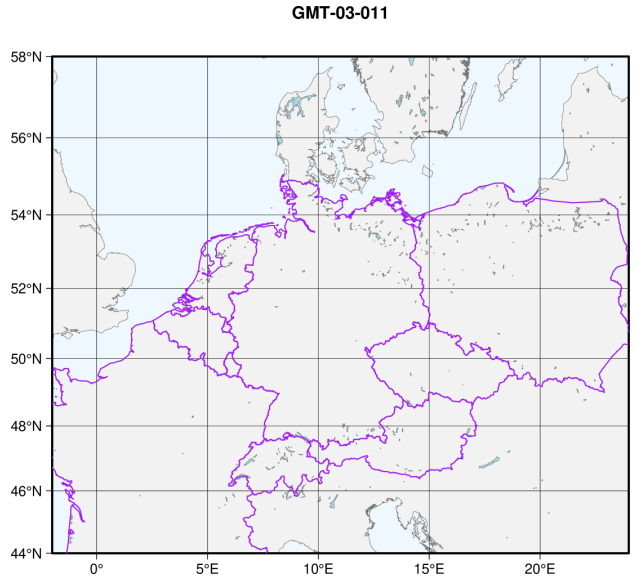
Use DCW country polygons to outline Germany and eight neighbours by ISO country code. Here state means a country. -D does not refine DCW: it is independent of the GSHHG/WDBII layers. For German federal states, use the BKG examples below.

Compare with GMT-03-007 · Draw European country borders in high detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-011 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-2/24/44/58 -JM13c -Df -Ggray95 -Saliceblue -Clightblue -W0.25p,gray45
-Bxa5g5 -Bya2g2
gmt coast -EDE,FR,BE,NL,LU,CH,AT,CZ,PL+p0.7p,purple
gmt basemap -B+t"GMT-03-011"
gmt end
```

Actual output



GMT-03-011 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-03-011

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-011 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-011 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-011 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-011 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads. These examples use installed GSHHG/DCW and, where declared, bundled BKG input files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-011 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-2/24/44/58`	Geographic bounds west/east/south/north = -2/24/44/58 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Df`	Select full-resolution shorelines and the associated river/border geometry from the installed GSHHG/ WDBII files. This changes the source vertices, not PNG DPI; no lower-resolution fallback is requested.
`-Ggray95`	Fill land areas with gray95.
`-Saliceblue`	Fill water areas with aliceblue.
`-Clightblue`	Fill lakes and river-lakes with lightblue.
`-W0.25p,gray45`	Draw 0.25-point gray45 stroke.
`-Bxa5g5`	On the longitude (x) axis, label every 5 degrees; draw grid lines every 5 degrees (g).
`-Bya2g2`	On the latitude (y) axis, label every 2 degrees; draw grid lines every 2 degrees (g).

GMT-03-011 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-EDE,FR,BE,NL,LU,CH,AT,CZ,PL+p0.7p,purple`	Select DCW country outlines for DE Germany, FR France, BE Belgium, NL Netherlands, LU Luxembourg, CH Switzerland, AT Austria, CZ Czechia and PL Poland. +p draws 0.7-point purple outlines. DCW is a separate country-polygon dataset; -D does not refine its vertices.

GMT-03-011 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-011`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-011 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-012

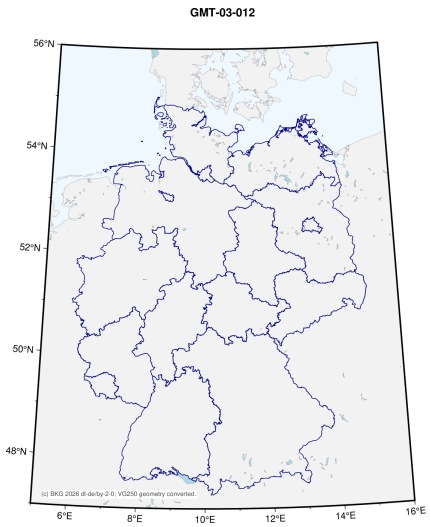
Draw Germany and its sixteen federal states

Draw the actual outlines of all 16 German Länder from the bundled official BKG VG250 land-area layer dated 1 January 2026. The linework retains the source vertices after coordinate conversion. GMT -N2 covers the Americas, so it cannot supply this layer. Unpack the script + data ZIP to reproduce the figure offline.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-012 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
[[ -s examples/data/germany-laender.gmt ]] || { printf "%s\n" "Missing local data;
unpack the script + data ZIP first." >&2; exit 1; }
gmt coast -R5/16/47/56 -JL10/51/47/55/13c -Df -Ggray95 -Saliceblue -Clightblue
-W0.2p,gray60 -Bxa2f1 -Bya2f1
gmt plot examples/data/germany-laender.gmt -W0.55p,navy
printf '5.3 47.15 (c) BKG 2026 dl-de/by-2-0; VG250 geometry converted.\n' | gmt text
-F+f6p,Helvetica,gray30+jBL -Gwhite -C0.04c
gmt basemap -B+t"GMT-03-012"
gmt end
```

Actual output



GMT-03-012 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map · Script + data ZIP

Unpack the script + data ZIP and run from its folder. Local inputs: germany-laender.gmt.

Data: © BKG 2026 dl-de/by-2-0. VG250, 1 January 2026. Changes: land areas selected, coordinates converted, rings exported without simplification. Source and changes.

Parameters explained · GMT-03-012

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-012 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-012 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-012 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-012 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads. These examples use installed GSHHG/DCW and, where declared, bundled BKG input files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-012 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R5/16/47/56`	Geographic bounds west/east/south/north = 5/16/47/56 degrees. Negative longitude is west; negative latitude is south.
`-JL10/51/47/55/13c`	Lambert conformal conic: central longitude 10, latitude of origin 51, standard parallels 47 and 55 degrees; width 13 cm.
`-Df`	Select full-resolution shorelines and the associated river/border geometry from the installed GSHHG/ WDBII files. This changes the source vertices, not PNG DPI; no lower-resolution fallback is requested.
`-Ggray95`	Fill land areas with gray95.
`-Saliceblue`	Fill water areas with aliceblue.
`-Clightblue`	Fill lakes and river-lakes with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Bxa2f1`	On the longitude (x) axis, label every 2 degrees; draw ticks every 1 degrees (f).
`-Bya2f1`	On the latitude (y) axis, label every 2 degrees; draw ticks every 1 degrees (f).

GMT-03-012 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`examples/data/germany-laender.gmt`	Read the bundled BKG VG250 land-area rings for all 16 German Länder (GF=4, 1 January 2026). Each > header starts a ring; coordinates are longitude/latitude after conversion from EPSG:25832. No line smoothing or simplification was applied. Read longitude and latitude from the preceding printf pipeline.
`-W0.55p,navy`	Draw 0.55-point navy stroke.

GMT-03-012 · 5 · gmt text · GMT reference

Argument(s)	Meaning in this example
`-F+f6p,Helvetica,gray30+jBL`	Use 6-point Helvetica in dark gray and bottom-left justification for the visible BKG source and modification credit. Text comes from the preceding printf pipeline.
`-Gwhite`	Put an opaque white background behind each label or source credit so underlying map lines remain legible.
`-C0.04c`	Leave 0.04 cm clearance between text and its white background box.

GMT-03-012 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-012`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-012 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-013

Label the German Länder with their state codes

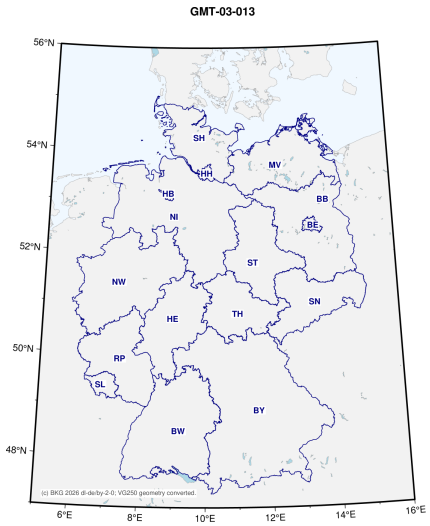
Keep the same federal-state geometry and add the official two-letter LKZ abbreviations. Label anchors are authored for legibility and do not represent measured locations. The bundled data README expands every abbreviation. City states remain visible without long overlapping names.

Compare with GMT-03-012 · Draw Germany and its sixteen federal states.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-013 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
[[ -s examples/data/germany-laender.gmt ]] || { printf "%s\n" "Missing local data;
unpack the script + data ZIP first." >&2; exit 1; }
gmt coast -R5/16/47/56 -JL10/51/47/55/13c -Df -Ggray95 -Saliceblue -Clightblue
-W0.2p,gray60 -Bxa2f1 -Bya2f1
gmt plot examples/data/germany-laender.gmt -W0.55p,navy
gmt text examples/data/germany-labels.txt -F+f8p,Helvetica-Bold,navy+jCM -Gwhite
-C0.04c
printf '5.3 47.15 (c) BKG 2026 dl-de/by-2-0; VG250 geometry converted.\n' | gmt text
-F+f6p,Helvetica,gray30+jBL -Gwhite -C0.04c
gmt basemap -B+t"GMT-03-013"
gmt end
```

Actual output



GMT-03-013 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map · Script + data ZIP

Unpack the script + data ZIP and run from its folder. Local inputs: germany-laender.gmt · germany-labels.txt.

Data: © BKG 2026 dl-de/by-2-0. VG250, 1 January 2026. Changes: land areas selected, coordinates converted, rings exported without simplification. Source and changes.

Parameters explained · GMT-03-013

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-013 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-013 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-013 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-013 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads. These examples use installed GSHHG/DCW and, where declared, bundled BKG input files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-013 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R5/16/47/56`	Geographic bounds west/east/south/north = 5/16/47/56 degrees. Negative longitude is west; negative latitude is south.
`-JL10/51/47/55/13c`	Lambert conformal conic: central longitude 10, latitude of origin 51, standard parallels 47 and 55 degrees; width 13 cm.
`-Df`	Select full-resolution shorelines and the associated river/border geometry from the installed GSHHG/ WDBII files. This changes the source vertices, not PNG DPI; no lower-resolution fallback is requested.
`-Ggray95`	Fill land areas with gray95.
`-Saliceblue`	Fill water areas with aliceblue.
`-Clightblue`	Fill lakes and river-lakes with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Bxa2f1`	On the longitude (x) axis, label every 2 degrees; draw ticks every 1 degrees (f).
`-Bya2f1`	On the latitude (y) axis, label every 2 degrees; draw ticks every 1 degrees (f).

GMT-03-013 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`examples/data/germany-laender.gmt`	Read the bundled BKG VG250 land-area rings for all 16 German Länder (GF=4, 1 January 2026). Each > header starts a ring; coordinates are longitude/latitude after conversion from EPSG:25832. No line smoothing or simplification was applied. Read longitude and latitude from the preceding printf pipeline.
`-W0.55p,navy`	Draw 0.55-point navy stroke.

GMT-03-013 · 5 · gmt text · GMT reference

Argument(s)	Meaning in this example
`examples/data/germany-labels.txt`	Read authored longitude/latitude label anchors and the official two-letter LKZ state abbreviations. These are label placements, not measured station positions; the data README gives the full names.
`-F+f8p,Helvetica-Bold,navy+jCM`	Use 8-point bold Helvetica in navy; centre each two-letter state label on its anchor (+jCM).
`-Gwhite`	Put an opaque white background behind each label or source credit so underlying map lines remain legible.
`-C0.04c`	Leave 0.04 cm clearance between text and its white background box.

GMT-03-013 · 6 · gmt text · GMT reference

Argument(s)	Meaning in this example
`-F+f6p,Helvetica,gray30+jBL`	Use 6-point Helvetica in dark gray and bottom-left justification for the visible BKG source and modification credit. Text comes from the preceding printf pipeline.
`-Gwhite`	Put an opaque white background behind each label or source credit so underlying map lines remain legible.
`-C0.04c`	Leave 0.04 cm clearance between text and its white background box.

GMT-03-013 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-013`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-013 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-03-014

Inspect North Rhine-Westphalia beside its rivers

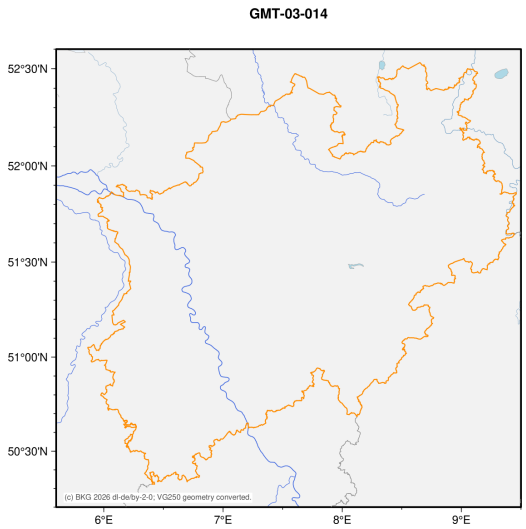
Zoom to North Rhine-Westphalia and outline it in orange against neighbouring German states. Full-resolution WDBII river classes show the available waterway network. The BKG state geometry and the GSHHG/WDBII hydrology are separate datasets; their generalisation and reference dates differ. The BKG line is not replaced by a fitted spline.

Compare with GMT-03-012 · Draw Germany and its sixteen federal states.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-03-014 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
[[ -s examples/data/germany-laender.gmt ]] || { printf "%s\n" "Missing local data;
unpack the script + data ZIP first." >&2; exit 1; }
[[ -s examples/data/nrw.gmt ]] || { printf "%s\n" "Missing local data; unpack the
script + data ZIP first." >&2; exit 1; }
gmt coast -R5.6/9.5/50.2/52.6 -JM13c -Df -Ggray95 -Saliceblue -Clightblue
-W0.2p,gray60 -I1/0.55p,royalblue -I2/0.35p,royalblue -I3/0.22p,steelblue
-I4/0.12p,steelblue -Bxa1f0.5 -Bya0.5f0.1
gmt plot examples/data/germany-laender.gmt -W0.3p,gray50
gmt plot examples/data/nrw.gmt -W0.8p,darkorange
printf '5.67 50.24 (c) BKG 2026 dl-de/by-2-0; VG250 geometry converted.\n' | gmt text
-F+f6p,Helvetica,gray30+jBL -Gwhite -C0.04c
gmt basemap -B+t"GMT-03-014"
gmt end
```

Actual output



GMT-03-014 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map · Script + data ZIP

Unpack the script + data ZIP and run from its folder. Local inputs: germany-laender.gmt · nrw.gmt.

Data: © BKG 2026 dl-de/by-2-0. VG250, 1 January 2026. Changes: land areas selected, coordinates converted, rings exported without simplification. Source and changes.

Parameters explained · GMT-03-014

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-03-014 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-03-014 png,pdf`	Start an independent modern session; the output stem figures/GMT-03-014 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-03-014 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads. These examples use installed GSHHG/DCW and, where declared, bundled BKG input files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-03-014 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R5.6/9.5/50.2/52.6`	Geographic bounds west/east/south/north = 5.6/9.5/50.2/52.6 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Df`	Select full-resolution shorelines and the associated river/border geometry from the installed GSHHG/ WDBII files. This changes the source vertices, not PNG DPI; no lower-resolution fallback is requested.
`-Ggray95`	Fill land areas with gray95.
`-Saliceblue`	Fill water areas with aliceblue.
`-Clightblue`	Fill lakes and river-lakes with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-I1/0.55p,royalblue`	Draw permanent major rivers (class 1) with a 0.55-point royalblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-I2/0.35p,royalblue`	Draw additional major rivers (class 2) with a 0.35-point royalblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-I3/0.22p,steelblue`	Draw additional rivers (class 3) with a 0.22-point steelblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-I4/0.12p,steelblue`	Draw minor rivers (class 4) with a 0.12-point steelblue stroke. Higher class numbers add different features; -Df supplies finer geometry for the selected classes.
`-Bxa1f0.5`	On the longitude (x) axis, label every 1 degrees; draw ticks every 0.5 degrees (f).
`-Bya0.5f0.1`	On the latitude (y) axis, label every 0.5 degrees; draw ticks every 0.1 degrees (f).

GMT-03-014 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`examples/data/germany-laender.gmt`	Read the bundled BKG VG250 land-area rings for all 16 German Länder (GF=4, 1 January 2026). Each > header starts a ring; coordinates are longitude/latitude after conversion from EPSG:25832. No line smoothing or simplification was applied. Read longitude and latitude from the preceding printf pipeline.
`-W0.3p,gray50`	Draw 0.3-point gray50 stroke.

GMT-03-014 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`examples/data/nrw.gmt`	Read the bundled BKG land-area rings for Nordrhein-Westfalen only (SN_L=05); geometry was converted to longitude/latitude without simplification. Read longitude and latitude from the preceding printf pipeline.
`-W0.8p,darkorange`	Draw 0.8-point darkorange stroke.

GMT-03-014 · 6 · gmt text · GMT reference

Argument(s)	Meaning in this example
`-F+f6p,Helvetica,gray30+jBL`	Use 6-point Helvetica in dark gray and bottom-left justification for the visible BKG source and modification credit. Text comes from the preceding printf pipeline.
`-Gwhite`	Put an opaque white background behind each label or source credit so underlying map lines remain legible.
`-C0.04c`	Leave 0.04 cm clearance between text and its white background box.

GMT-03-014 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-03-014`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-03-014 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Put points on a map

GMT-04-001

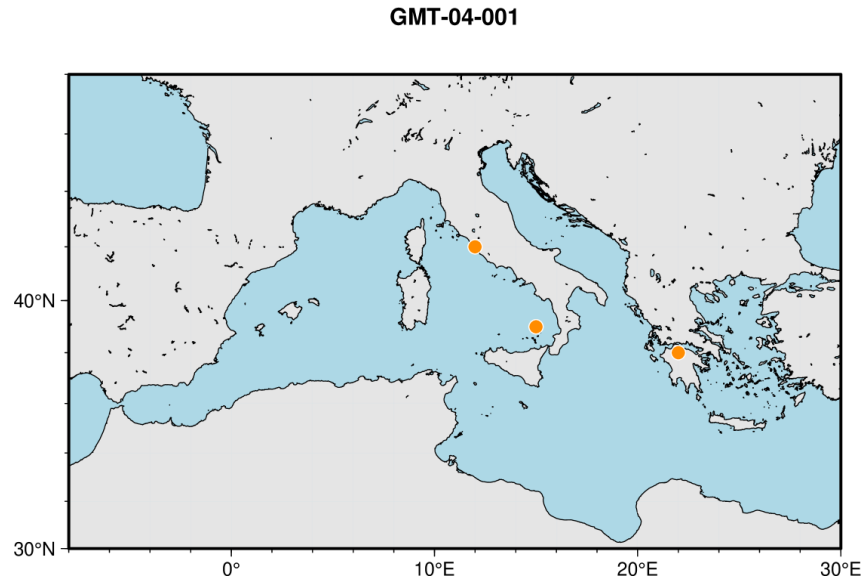
Plot longitude and latitude

The local table contains three illustrative stations. plot reads the first two columns as longitude and latitude; -i0,1 selects them explicitly. -Sc0.24c draws equal-sized circles, -G fills them and -W outlines them. The stations are teaching data, not observations.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-04-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -Sc0.24c -Gdarkorange -W0.5p,white
gmt basemap -B+t"GMT-04-001"
gmt end
```

Actual output



GMT-04-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-04-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-04-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-04-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-04-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-04-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-04-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-04-001 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.24c`	Draw circles with diameter 0.24 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-04-001 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-04-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-04-001 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-04-002

Change the point symbol

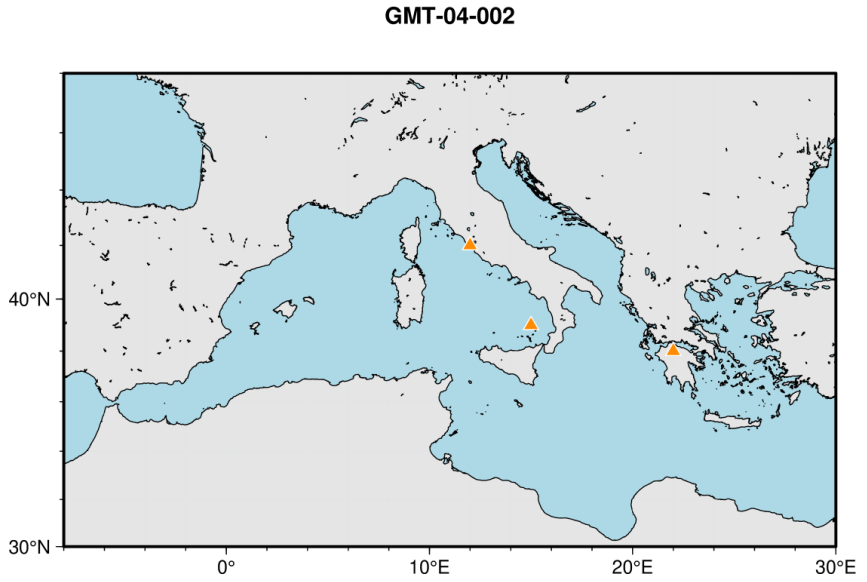
Change -Sc0.24c to -St0.3c for triangles. The same coordinates and colours let you see the effect of the symbol choice. A letter following -S selects a symbol; the following size is a physical drawing size.

Compare with GMT-04-001 · Plot longitude and latitude.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-04-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -St0.3c -Gdarkorange -W0.5p,white
gmt basemap -B+t"GMT-04-002"
gmt end
```

Actual output



GMT-04-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-04-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-04-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-04-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-04-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-04-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-04-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-04-002 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-St0.3c`	Draw triangles with circumscribed-circle diameter 0.3 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-04-002 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-04-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-04-002 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-04-003

Read symbol sizes from a column

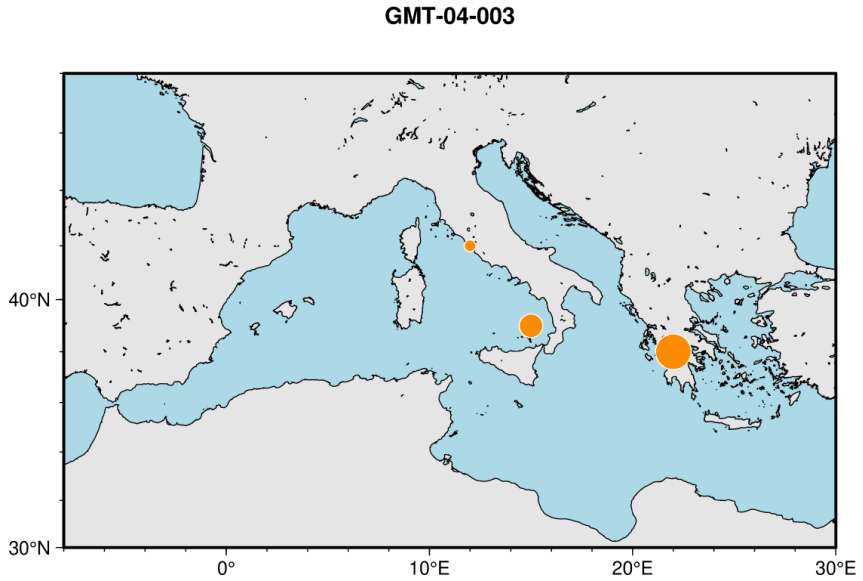
Change: supply a third numeric column and omit the fixed circle size after -Sc. Those values are symbol diameters in centimetres because this script explicitly sets PROJ_LENGTH_UNIT to cm. This example demonstrates size encoding without implying that circle area is proportional to a measurement.

Compare with GMT-04-001 · Plot longitude and latitude.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-04-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sizes.txt <<'DATA'
12 42 0.2
15 39 0.4
22 38 0.6
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sizes.txt -Sc -Gdarkorange -W0.5p,white
gmt basemap -B+t"GMT-04-003"
gmt end
```

Actual output



GMT-04-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-04-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-04-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-04-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-04-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-04-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-04-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-04-003 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sizes.txt`	Read longitude, latitude and circle diameter (0.2, 0.4, 0.6 cm). These are diameters, not area-proportional values.
`-Sc`	Draw circles; read their diameters from column 3 in cm, because PROJ_LENGTH_UNIT is cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-04-003 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-04-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-04-003 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-04-004

Use square point symbols

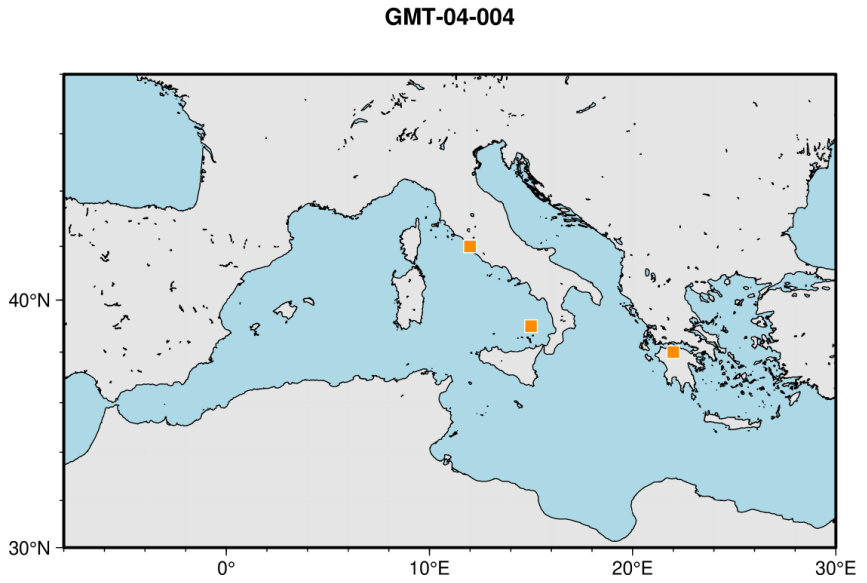
Change the symbol to squares with a circumscribing-circle diameter of 0.3 cm. The coordinates, fill and outline remain the same.

Compare with GMT-04-001 · Plot longitude and latitude.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-04-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -Ss0.3c -Gdarkorange -W0.5p,white
gmt basemap -B+t"GMT-04-004"
gmt end
```

Actual output



GMT-04-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-04-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-04-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-04-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-04-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-04-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-04-004 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-04-004 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Ss0.3c`	Draw squares whose circumscribing-circle diameter is 0.3 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-04-004 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-04-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-04-004 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-04-005

Use diamond point symbols

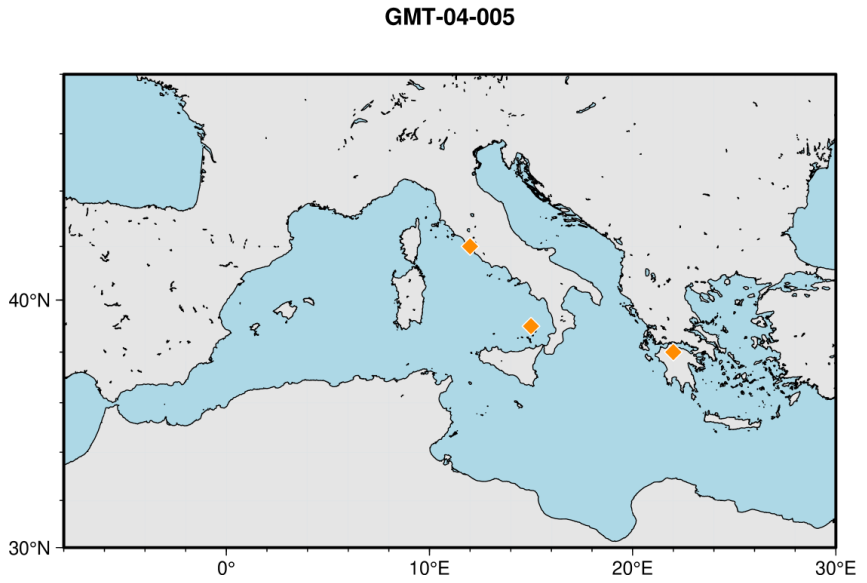
Use diamonds to distinguish a category. The 0.3 cm size describes the circumscribing circle, not the diamond side length.

Compare with GMT-04-004 · Use square point symbols.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-04-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -Sd0.3c -Gdarkorange -W0.5p,white
gmt basemap -B+t"GMT-04-005"
gmt end
```

Actual output



GMT-04-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-04-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-04-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-04-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-04-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-04-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-04-005 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-04-005 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sd0.3c`	Draw diamonds whose circumscribing-circle diameter is 0.3 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-04-005 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-04-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-04-005 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-04-006

Draw hollow station symbols

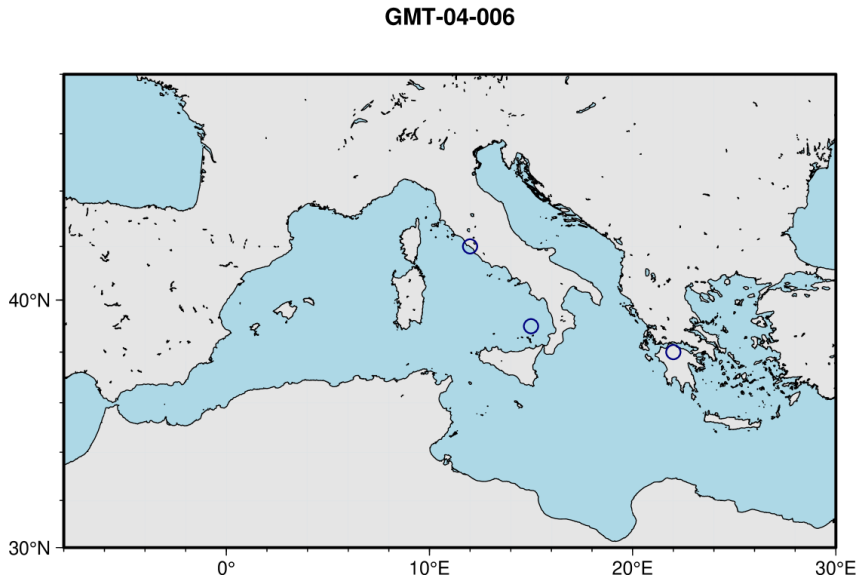
Omit the fill and draw a heavier navy outline. The coastline remains visible through the circle interiors.

Compare with GMT-04-001 · Plot longitude and latitude.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-04-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -Sc0.24c -W0.8p,navy
gmt basemap -B+t"GMT-04-006"
gmt end
```

Actual output



GMT-04-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-04-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-04-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-04-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-04-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-04-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-04-006 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-04-006 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.24c`	Draw circles with diameter 0.24 cm.
`-W0.8p,navy`	Draw 0.8-point navy stroke.

GMT-04-006 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-04-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-04-006 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-04-007

Increase a fixed circle diameter

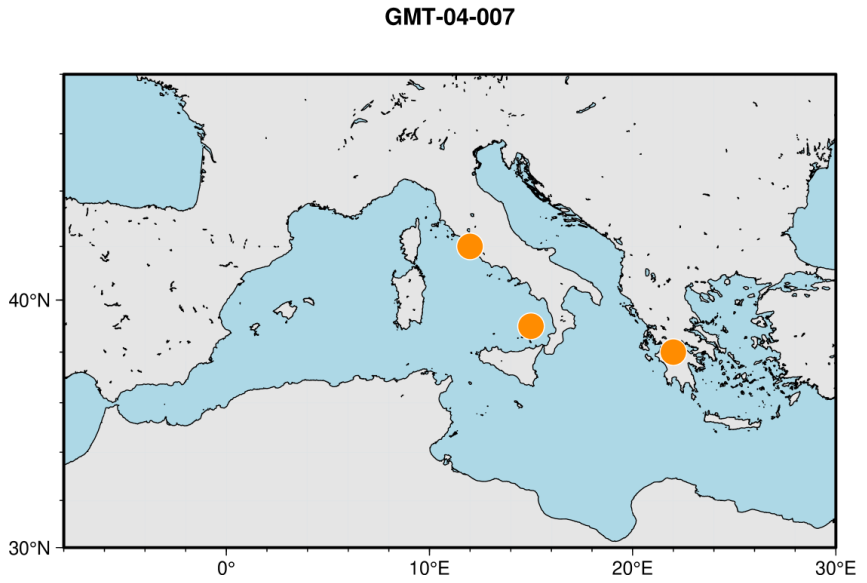
Change the fixed circle diameter from 0.24 to 0.45 cm. All three synthetic stations retain equal size.

Compare with GMT-04-001 · Plot longitude and latitude.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-04-007 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -Sc0.45c -Gdarkorange -W0.5p,white
gmt basemap -B+t"GMT-04-007"
gmt end
```

Actual output



GMT-04-007 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-04-007

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-04-007 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-04-007 png,pdf`	Start an independent modern session; the output stem figures/GMT-04-007 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-04-007 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-04-007 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-04-007 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.45c`	Draw circles with diameter 0.45 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-04-007 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-04-007`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-04-007 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-04-008

Make a symbol fill translucent

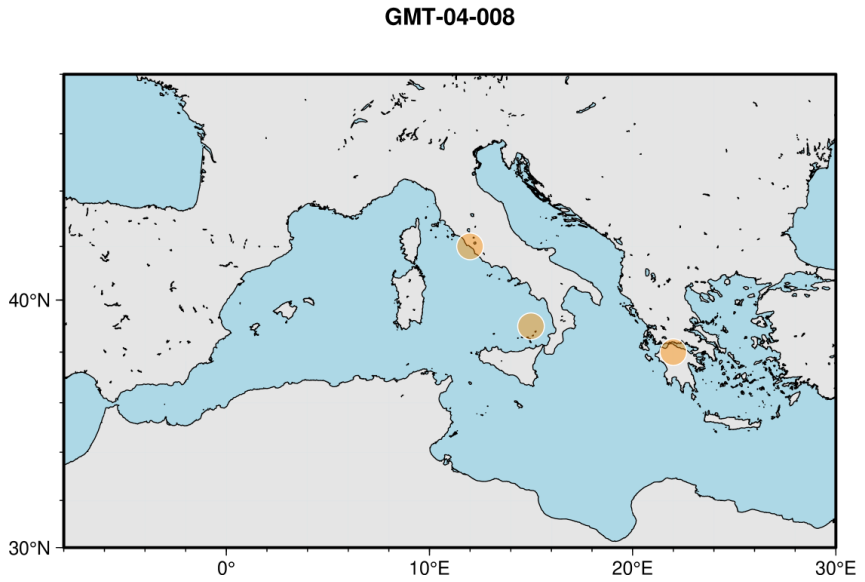
Use 55 percent transparency for the larger orange circles. Their white outlines remain opaque.

Compare with GMT-04-007 · Increase a fixed circle diameter.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-04-008 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -Sc0.45c -Gdarkorange@55 -W0.5p,white
gmt basemap -B+t"GMT-04-008"
gmt end
```

Actual output



GMT-04-008 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-04-008

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-04-008 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-04-008 png,pdf`	Start an independent modern session; the output stem figures/GMT-04-008 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-04-008 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-04-008 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-04-008 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.45c`	Draw circles with diameter 0.45 cm.
`-Gdarkorange@55`	Fill symbols with darkorange at 55 percent transparency (0 is opaque; 100 is invisible).
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-04-008 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-04-008`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-04-008 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-04-009

Distinguish two groups and explain them

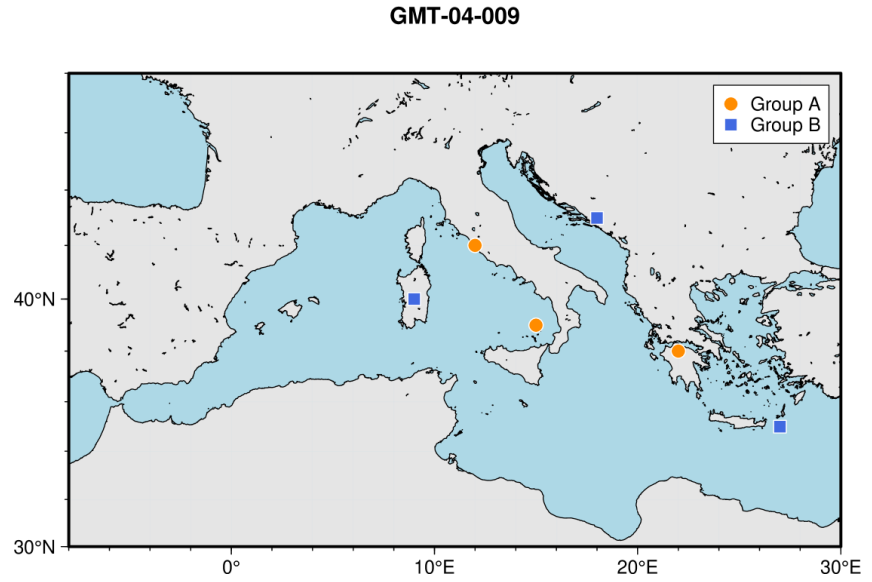
Plot two synthetic groups with separate symbol styles and collect their labels in an automatic legend. Colour and shape give two ways to identify a group.

Compare with GMT-04-001 · Plot longitude and latitude.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-04-009 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
printf '9 40 D\n18 43 E\n27 35 F\n' > other.txt
gmt plot sites.txt -i0,1 -Sc0.24c -Gdarkorange -W0.5p,white -l"Group A"
gmt plot other.txt -i0,1 -Ss0.3c -Groyalblue -W0.5p,white -l"Group B"
gmt legend -DjTR+o0.2c -F+gwhite+p0.4p
gmt basemap -B+t"GMT-04-009"
gmt end
```

Actual output



GMT-04-009 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-04-009

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-04-009 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-04-009 png,pdf`	Start an independent modern session; the output stem figures/GMT-04-009 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-04-009 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-04-009 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-04-009 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.24c`	Draw circles with diameter 0.24 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.
`'-lGroup A'`	Register the plotted symbol style in the automatic legend with label Group A.

GMT-04-009 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`other.txt`	Read a second synthetic group of longitude/latitude/name records; its separate plot command assigns a different symbol style.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Ss0.3c`	Draw squares whose circumscribing-circle diameter is 0.3 cm.
`-Groyalblue`	Fill the symbols with royalblue.
`-W0.5p,white`	Draw 0.5-point white stroke.
`'-lGroup B'`	Register the plotted symbol style in the automatic legend with label Group B.

GMT-04-009 · 6 · gmt legend · GMT reference

Argument(s)	Meaning in this example
`-DjTR+o0.2c`	jTR places the automatically collected symbol legend inside the map at top-right; +o0.2c offsets it inward by 0.2 cm in both directions.
`-F+gwhite+p0.4p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.4-point black (the default) stroke.

GMT-04-009 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-04-009`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-04-009 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Labels, routes and areas

GMT-05-001

Label the stations

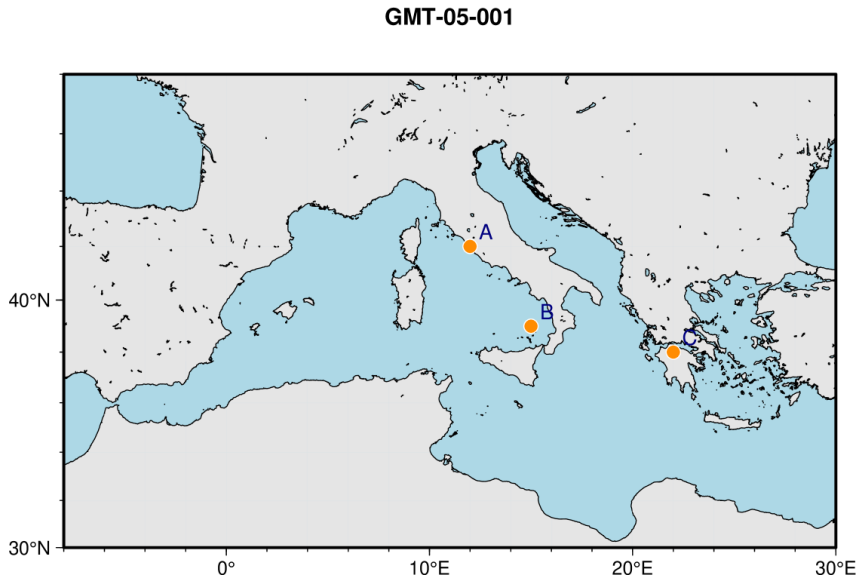
Change: pass the same local table to text. -F sets a 10-point Helvetica font, a navy colour and bottom-left justification; -D offsets each label from its station. The names A, B and C are illustrative.

Compare with GMT-04-001 · Plot longitude and latitude.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-05-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -Sc0.24c -Gdarkorange -W0.5p,white
gmt text sites.txt -F+f10p,Helvetica,navy+jBL -D0.15c/0.12c
gmt basemap -B+t"GMT-05-001"
gmt end
```

Actual output



GMT-05-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-05-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-05-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-05-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-05-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-05-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-05-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-05-001 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.24c`	Draw circles with diameter 0.24 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-05-001 · 5 · gmt text · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-F+f10p,Helvetica,navy+jBL`	+f selects 10-point Helvetica text in navy; +jBL anchors each label at its bottom-left corner. Read the text after longitude and latitude.
`-D0.15c/0.12c`	Offset labels by +0.15 cm horizontally and +0.12 cm vertically from the input coordinates.

GMT-05-001 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-05-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-05-001 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-05-002

Connect a route

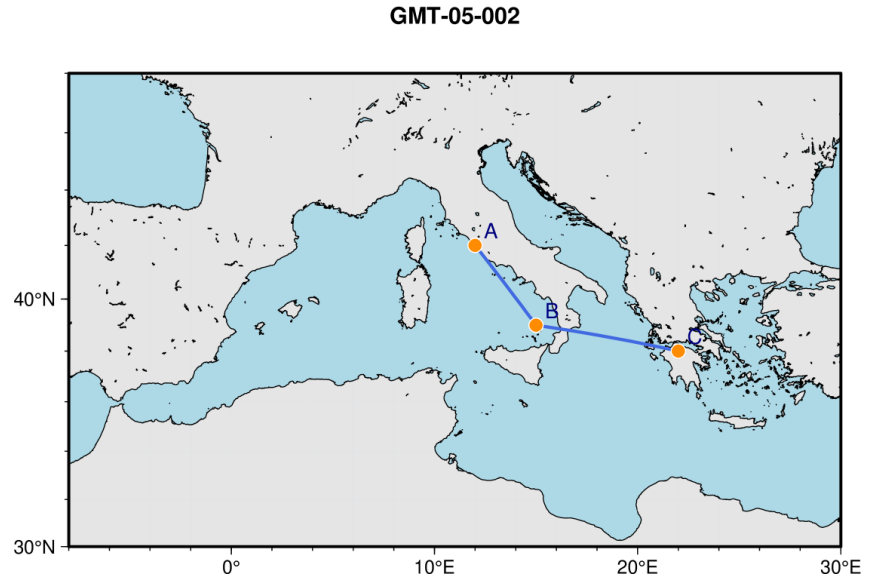
Change: draw the station coordinates as a line before plotting the symbols and labels. -W1.5p,royalblue chooses the route pen. On a geographic projection GMT connects the geographic positions; this illustrative line is not a transport network or a measured track.

Compare with GMT-05-001 · Label the stations.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-05-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -W1.5p,royalblue
gmt plot sites.txt -i0,1 -Sc0.24c -Gdarkorange -W0.5p,white
gmt text sites.txt -F+f10p,Helvetica,navy+jBL -D0.15c/0.12c
gmt basemap -B+t"GMT-05-002"
gmt end
```

Actual output



GMT-05-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-05-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-05-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-05-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-05-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-05-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-05-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-05-002 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-W1.5p,royalblue`	Draw 1.5-point royalblue stroke.

GMT-05-002 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.24c`	Draw circles with diameter 0.24 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-05-002 · 6 · gmt text · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-F+f10p,Helvetica,navy+jBL`	+f selects 10-point Helvetica text in navy; +jBL anchors each label at its bottom-left corner. Read the text after longitude and latitude.
`-D0.15c/0.12c`	Offset labels by +0.15 cm horizontally and +0.12 cm vertically from the input coordinates.

GMT-05-002 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-05-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-05-002 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-05-003

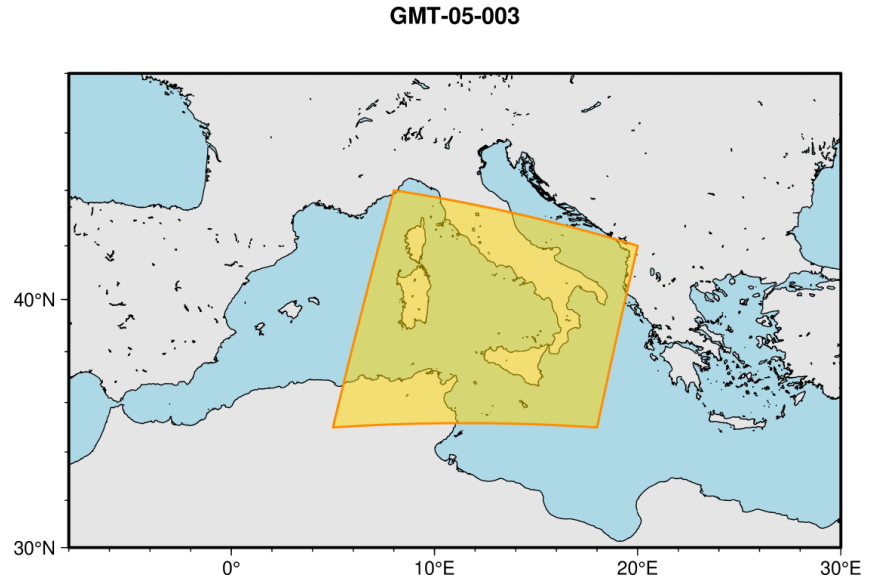
Fill an illustrative area

plot can also draw a closed polygon. -L closes the path, -G gives it a partly transparent fill, and -W draws the edge. The coordinates below are an invented study area; they are not a historical, political or administrative boundary.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-05-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot -L -Ggold@50 -W1p,darkorange <<'DATA'
5 35
18 35
20 42
8 44
DATA
gmt basemap -B+t"GMT-05-003"
gmt end
```

Actual output



GMT-05-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-05-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-05-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-05-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-05-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-05-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-05-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-05-003 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-Ggold@50`	Fill the polygon gold with 50 percent transparency (@50).
`-W1p,darkorange`	Draw 1-point darkorange stroke.
`<< DATA`	Read the following DATA-delimited here document as longitude/latitude polygon vertices; DATA itself is a shell delimiter, not a GMT option.

GMT-05-003 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-05-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-05-003 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-05-004

Anchor labels above and left of their points

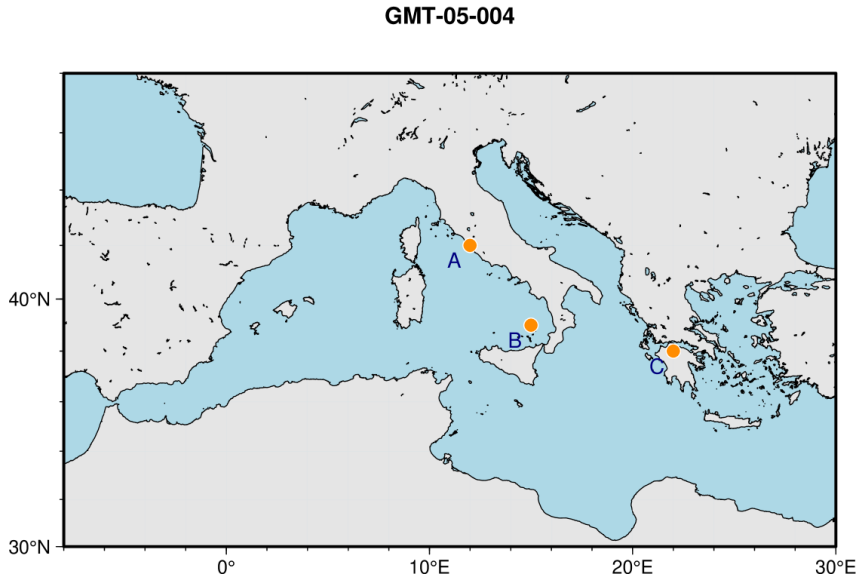
Use top-right text justification and negative offsets. The label moves to the other side of its point while the station coordinates stay fixed.

Compare with GMT-05-001 · Label the stations.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-05-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -Sc0.24c -Gdarkorange -W0.5p,white
gmt text sites.txt -F+f10p,Helvetica,navy+jTR -D-0.15c/-0.12c
gmt basemap -B+t"GMT-05-004"
gmt end
```

Actual output



GMT-05-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-05-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-05-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-05-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-05-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-05-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-05-004 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-05-004 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.24c`	Draw circles with diameter 0.24 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-05-004 · 5 · gmt text · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-F+f10p,Helvetica,navy+jTR`	+f sets 10-point Helvetica text in navy; +jTR anchors the top-right corner of each label to its offset position.
`-D-0.15c/-0.12c`	Offset labels 0.15 cm left and 0.12 cm down from the station coordinates.

GMT-05-004 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-05-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-05-004 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-05-005

Give labels a readable background

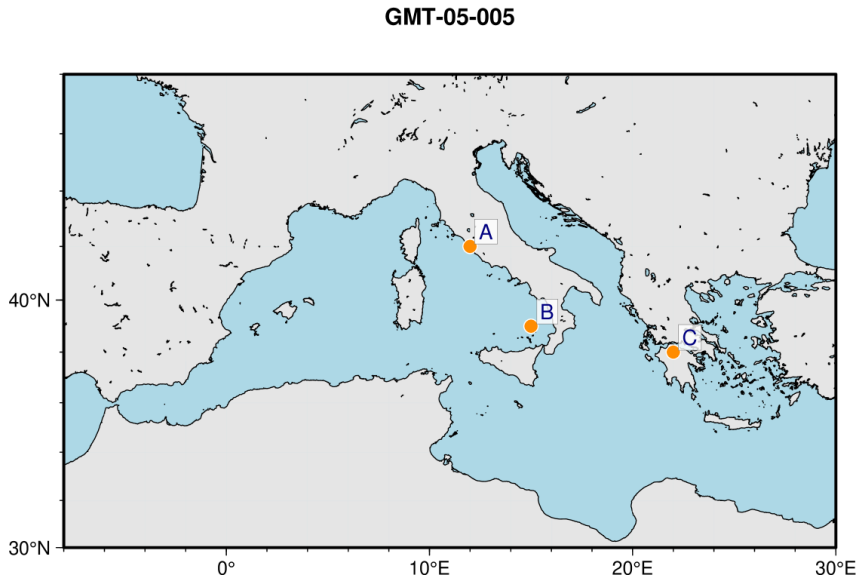
Put a lightly translucent white box behind each label. Clearance and a thin border separate the name from nearby map detail.

Compare with GMT-05-001 · Label the stations.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-05-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -Sc0.24c -Gdarkorange -W0.5p,white
gmt text sites.txt -F+f10p,Helvetica,navy+jBL -D0.15c/0.12c -Gwhite@20 -C0.08c
-W0.2p,gray50
gmt basemap -B+t"GMT-05-005"
gmt end
```

Actual output



GMT-05-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-05-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-05-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-05-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-05-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-05-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-05-005 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-05-005 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.24c`	Draw circles with diameter 0.24 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-05-005 · 5 · gmt text · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-F+f10p,Helvetica,navy+jBL`	+f selects 10-point Helvetica text in navy; +jBL anchors each label at its bottom-left corner. Read the text after longitude and latitude.
`-D0.15c/0.12c`	Offset labels by +0.15 cm horizontally and +0.12 cm vertically from the input coordinates.
`-Gwhite@20`	For text, fill each label background white with 20 percent transparency; the label font remains navy.
`-C0.08c`	For text, leave 0.08 cm of clearance between each label and its background box.
`-W0.2p,gray50`	Draw 0.2-point gray50 stroke.

GMT-05-005 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-05-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-05-005 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-05-006

Draw an unfilled study-area outline

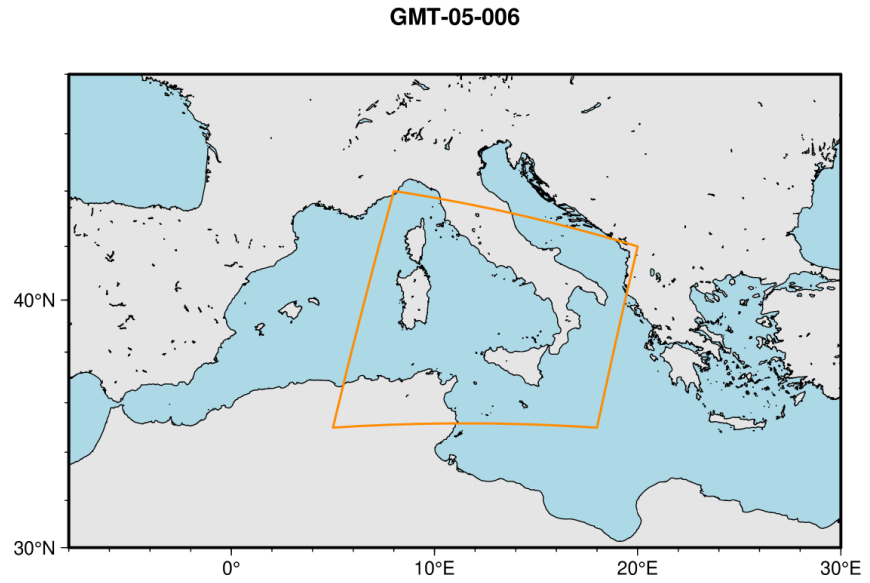
Remove the polygon fill while retaining its closed outline. The geography underneath the invented study area remains unobscured.

Compare with GMT-05-003 · Fill an illustrative area.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-05-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot -L -W1p,darkorange <<'DATA'
5 35
18 35
20 42
8 44
DATA
gmt basemap -B+t"GMT-05-006"
gmt end
```

Actual output



GMT-05-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-05-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-05-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-05-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-05-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-05-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-05-006 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-05-006 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1p,darkorange`	Draw 1-point darkorange stroke.
`<< DATA`	Read the following DATA-delimited here document as longitude/latitude polygon vertices; DATA itself is a shell delimiter, not a GMT option.

GMT-05-006 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-05-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-05-006 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Values, colour scales and legends

GMT-06-001

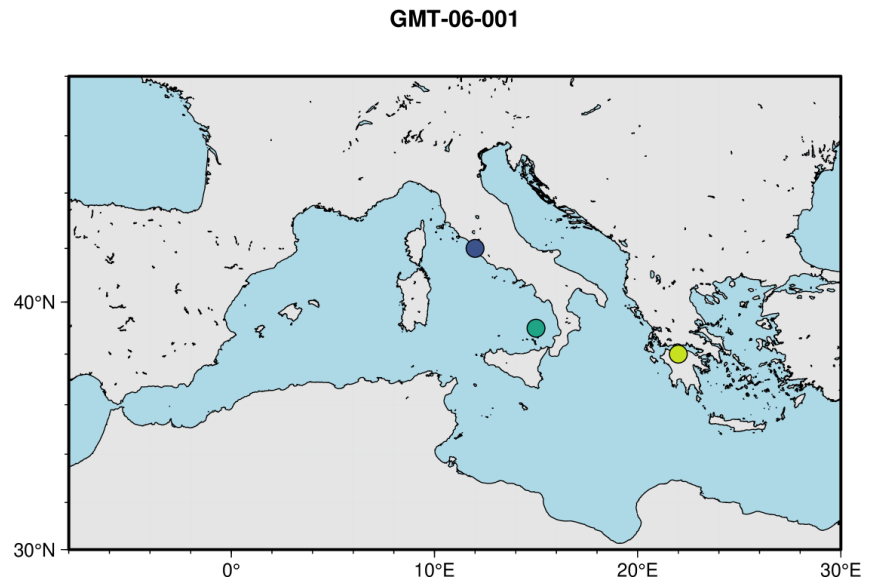
Colour points by value

The third column now holds an illustrative numeric value. makecpt builds a viridis palette from zero to sixty in steps of ten; -H writes it to a named local file. plot -Cvalues.cpt maps each value to that palette while keeping circle size fixed. A palette encodes values, so the next example adds the scale needed to interpret them.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-06-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
cat > values.txt <<'DATA'
12 42 10
15 39 30
22 38 50
DATA
gmt makecpt -Cviridis -T0/60/10 -H > values.cpt
gmt plot values.txt -Sc0.3c -Cvalues.cpt -W0.5p,black
gmt basemap -B+t"GMT-06-001"
gmt end
```

Actual output



GMT-06-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-06-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-06-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-06-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-06-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-06-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-06-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-06-001 · 4 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`-Cviridis`	Use the built-in viridis colour palette as the source colour sequence.
`-T0/60/10`	Construct palette intervals from 0 to 60 in steps of 10 illustrative data units.
`-H`	Also write the palette to standard output in modern mode, so the shell can save values.cpt.
`> values.cpt`	Shell redirection: save standard output in values.cpt.

GMT-06-001 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`values.txt`	Read longitude, latitude and illustrative scalar value; the third column selects the palette colour.
`-Sc0.3c`	Draw circles with diameter 0.3 cm.
`-Cvalues.cpt`	Map the third input column to colours using the explicit palette file values.cpt; the fixed symbol diameter is separate.
`-W0.5p,black`	Draw 0.5-point black stroke.

GMT-06-001 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-06-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-06-001 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-06-002

Explain the colour scale

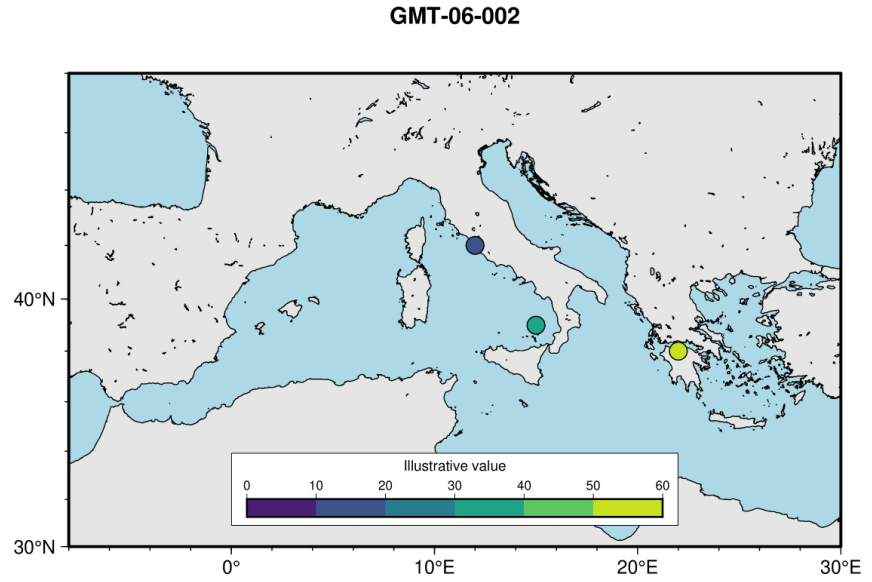
Change: add colorbar. -DjBC anchors it inside the map at bottom centre, +w sets its dimensions and +h makes it horizontal. The annotations and label state the numeric range; the table values have no physical unit in this teaching example.

Compare with GMT-06-001 · Colour points by value.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-06-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
cat > values.txt <<'DATA'
12 42 10
15 39 30
22 38 50
DATA
gmt makecpt -Cviridis -T0/60/10 -H > values.cpt
gmt plot values.txt -Sc0.3c -Cvalues.cpt -W0.5p,black
gmt colorbar -Cvalues.cpt -DjBC+o0c/0.5c+w7c/0.3c+h -Bxa10+l"Illustrative value"
-F+gwhite+p0.3p
gmt basemap -B+t"GMT-06-002"
gmt end
```

Actual output



GMT-06-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-06-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-06-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-06-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-06-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-06-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-06-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-06-002 · 4 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`-Cviridis`	Use the built-in viridis colour palette as the source colour sequence.
`-T0/60/10`	Construct palette intervals from 0 to 60 in steps of 10 illustrative data units.
`-H`	Also write the palette to standard output in modern mode, so the shell can save values.cpt.
`> values.cpt`	Shell redirection: save standard output in values.cpt.

GMT-06-002 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`values.txt`	Read longitude, latitude and illustrative scalar value; the third column selects the palette colour.
`-Sc0.3c`	Draw circles with diameter 0.3 cm.
`-Cvalues.cpt`	Map the third input column to colours using the explicit palette file values.cpt; the fixed symbol diameter is separate.
`-W0.5p,black`	Draw 0.5-point black stroke.

GMT-06-002 · 6 · gmt colorbar · GMT reference

Argument(s)	Meaning in this example
`-Cvalues.cpt`	Read the same explicit palette file as the coloured point symbols.
`-DjBC+o0c/0.5c+w7c/0.3c+h`	jBC anchors inside the map at bottom-centre; +o shifts it 0 cm horizontally and 0.5 cm vertically; +w makes it 7 cm long and 0.3 cm thick; +h makes it horizontal.
`'-Bxa10+lIllustrative value'`	Colour-bar x axis: annotate every 10 data units (a10); +l sets the label to Illustrative value.
`-F+gwhite+p0.3p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.3-point black (the default) stroke.

GMT-06-002 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-06-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-06-002 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-06-003

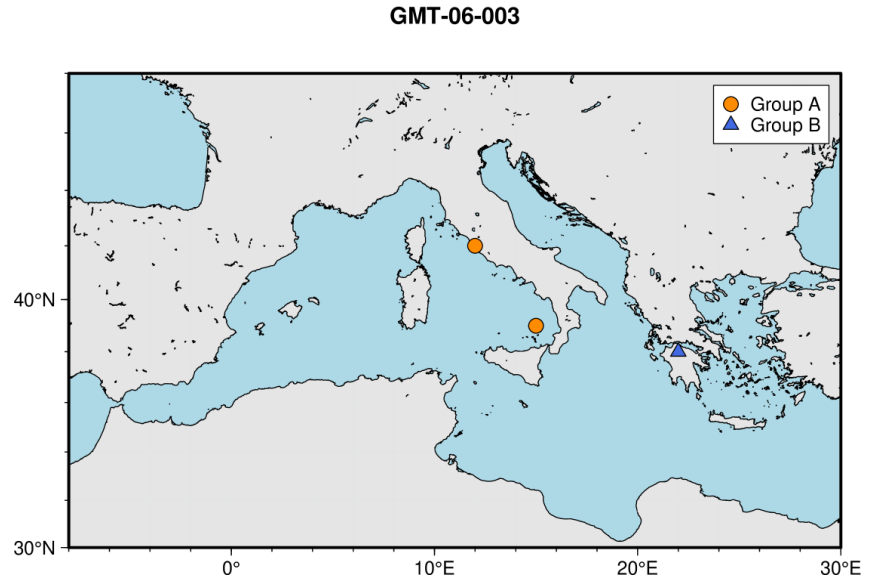
Explain categories with a legend

For categories, choose distinct symbols and provide explicit labels with -l. legend collects those entries. -DjTR places it inside the top-right corner and -F draws a white box with a thin border. Categories A and B have no measured magnitude.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-06-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
printf '12 42\n15 39\n' | gmt plot -Sc0.25c -Gdarkorange -W0.4p -l'Group A'
printf '22 38\n' | gmt plot -St0.3c -Groyalblue -W0.4p -l'Group B'
gmt legend -DjTR+o0.2c -F+gwhite+p0.4p
gmt basemap -B+t"GMT-06-003"
gmt end
```

Actual output



GMT-06-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-06-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-06-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-06-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-06-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-06-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-06-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-06-003 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`-Sc0.25c`	Draw circles with diameter 0.25 cm. Read longitude and latitude from the preceding printf pipeline.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`'-lGroup A'`	Register the plotted symbol style in the automatic legend with label Group A.

GMT-06-003 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`-St0.3c`	Draw triangles with circumscribed-circle diameter 0.3 cm. Read longitude and latitude from the preceding printf pipeline.
`-Groyalblue`	Fill the symbols with royalblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`'-lGroup B'`	Register the plotted symbol style in the automatic legend with label Group B.

GMT-06-003 · 6 · gmt legend · GMT reference

Argument(s)	Meaning in this example
`-DjTR+o0.2c`	jTR places the automatically collected symbol legend inside the map at top-right; +o0.2c offsets it inward by 0.2 cm in both directions.
`-F+gwhite+p0.4p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.4-point black (the default) stroke.

GMT-06-003 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-06-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-06-003 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Grids and shaded relief

GMT-07-001

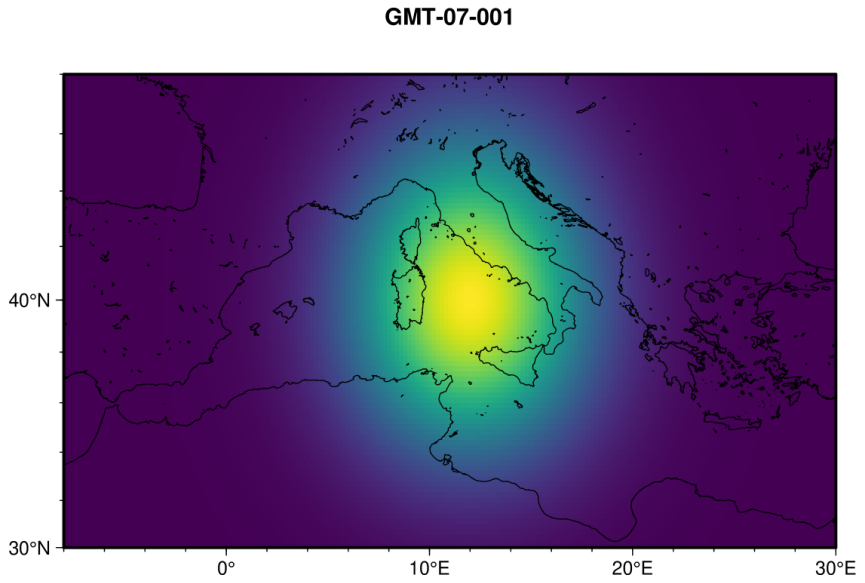
Create and colour a synthetic grid

grdmath creates a smooth Gaussian hill on a 0.2-degree grid. Its reverse-Polish expression squares offsets from longitude 12 and latitude 40, adds them, applies a negative exponential and scales the amplitude. grdimage colours that local grid. The surface is synthetic, not an elevation model of the Mediterranean.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-07-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt grdmath -R-8/30/30/48 -I0.2 X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP
1000 MUL = hill.nc
gmt grdimage hill.nc -JM13c -Cviridis -Baf
gmt coast -Dh -W0.4p
gmt basemap -B+t"GMT-07-001"
gmt end
```

Actual output



GMT-07-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-07-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-07-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-07-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-07-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-07-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-07-001 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-I0.2`	Grid-node spacing 0.2 degrees in both longitude and latitude; evaluate the formula at these nodes.
`X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP 1000 MUL = hill.nc`	Evaluate 1000 * exp(-0.03 * ((longitude - 12)^2 + (latitude - 40)^2)). X and Y are node coordinates; SUB subtracts, DUP duplicates, MUL multiplies, ADD adds and EXP exponentiates. = hill.nc writes the result. Values are synthetic amplitude units.

GMT-07-001 · 4 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Cviridis`	Colour the synthetic grid with viridis, automatically scaled to the grid-value range.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-07-001 · 5 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.4p`	Draw 0.4-point black (the default) stroke.

GMT-07-001 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-07-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-07-001 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-07-002

Illuminate the synthetic surface

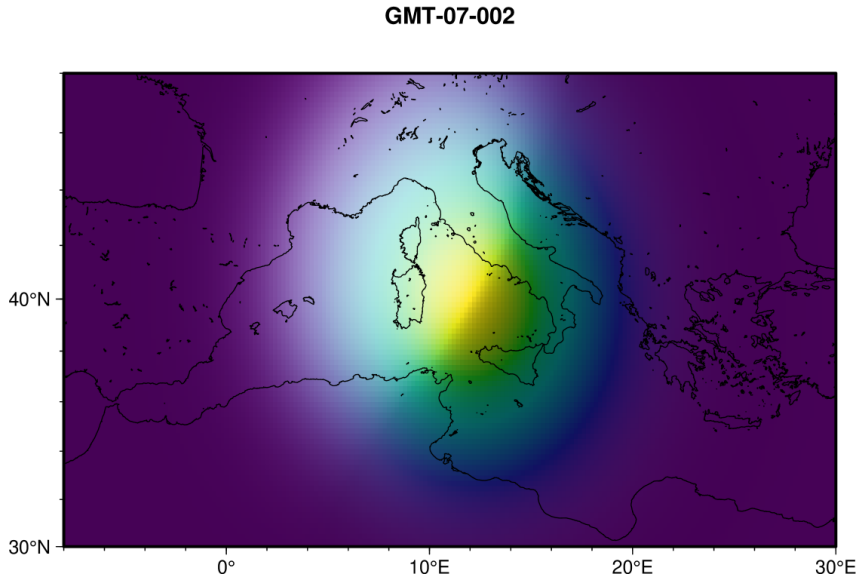
Change: add -I+d to grdimage to derive illumination using GMT defaults. Compare the shaded hill with the unshaded amplitude map. Illumination adds a visual cue to slope; it does not turn the synthetic field into real terrain.

Compare with GMT-07-001 · Create and colour a synthetic grid.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-07-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt grdmath -R-8/30/30/48 -I0.2 X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP
1000 MUL = hill.nc
gmt grdimage hill.nc -JM13c -Cviridis -I+d -Baf
gmt coast -Dh -W0.4p
gmt basemap -B+t"GMT-07-002"
gmt end
```

Actual output



GMT-07-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-07-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-07-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-07-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-07-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-07-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-07-002 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-I0.2`	Grid-node spacing 0.2 degrees in both longitude and latitude; evaluate the formula at these nodes.
`X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP 1000 MUL = hill.nc`	Evaluate 1000 * exp(-0.03 * ((longitude - 12)^2 + (latitude - 40)^2)). X and Y are node coordinates; SUB subtracts, DUP duplicates, MUL multiplies, ADD adds and EXP exponentiates. = hill.nc writes the result. Values are synthetic amplitude units.

GMT-07-002 · 4 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Cviridis`	Colour the synthetic grid with viridis, automatically scaled to the grid-value range.
`-I+d`	Derive illumination from this grid using GMT default gradient settings; this changes shading, not grid values.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-07-002 · 5 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.4p`	Draw 0.4-point black (the default) stroke.

GMT-07-002 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-07-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-07-002 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-07-003

Overlay labelled contours

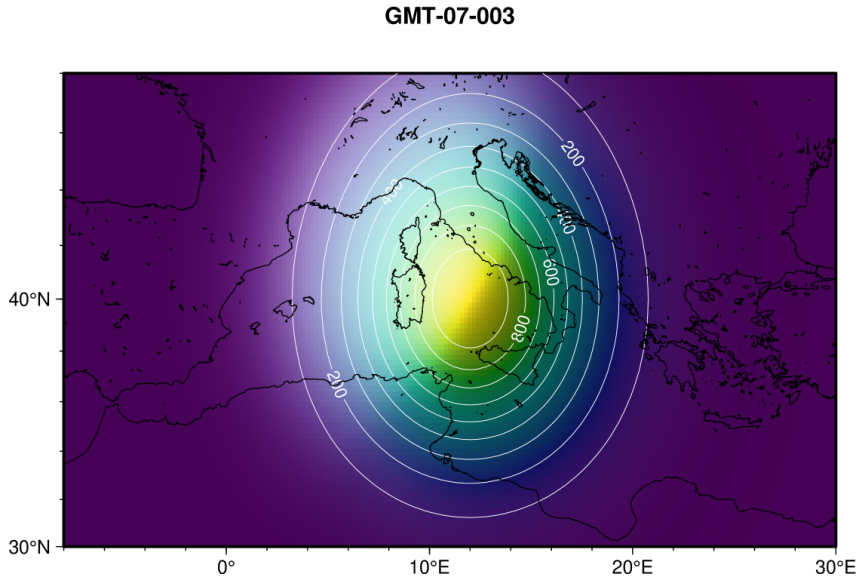
Change: overlay grdcontour on the shaded grid. -C100 draws contours every hundred amplitude units and -A200 annotates every two hundred. The contour pen is white for contrast; +f sets the annotation font. These values belong to the same synthetic grid.

Compare with GMT-07-002 · Illuminate the synthetic surface.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-07-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt grdmath -R-8/30/30/48 -I0.2 X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP
1000 MUL = hill.nc
gmt grdimage hill.nc -JM13c -Cviridis -I+d -Baf
gmt grdcontour hill.nc -C100 -A200+f8p -W0.3p,white
gmt coast -Dh -W0.4p
gmt basemap -B+t"GMT-07-003"
gmt end
```

Actual output



GMT-07-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-07-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-07-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-07-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-07-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-07-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-07-003 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-I0.2`	Grid-node spacing 0.2 degrees in both longitude and latitude; evaluate the formula at these nodes.
`X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP 1000 MUL = hill.nc`	Evaluate 1000 * exp(-0.03 * ((longitude - 12)^2 + (latitude - 40)^2)). X and Y are node coordinates; SUB subtracts, DUP duplicates, MUL multiplies, ADD adds and EXP exponentiates. = hill.nc writes the result. Values are synthetic amplitude units.

GMT-07-003 · 4 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Cviridis`	Colour the synthetic grid with viridis, automatically scaled to the grid-value range.
`-I+d`	Derive illumination from this grid using GMT default gradient settings; this changes shading, not grid values.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-07-003 · 5 · gmt grdcontour · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-C100`	Draw contour levels every 100 synthetic amplitude units.
`-A200+f8p`	Annotate every 200 amplitude units; +f8p uses 8-point contour labels.
`-W0.3p,white`	Draw 0.3-point white stroke.

GMT-07-003 · 6 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.4p`	Draw 0.4-point black (the default) stroke.

GMT-07-003 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-07-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-07-003 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Map furniture and a finished layout

GMT-08-001

Add a geographic scale bar

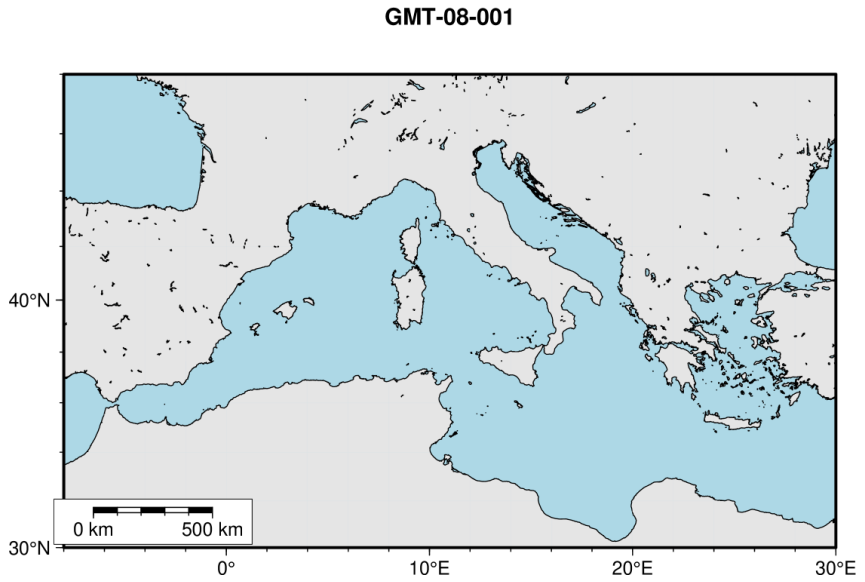
Change: add a 500-kilometre scale bar at bottom left. +c40 defines its reference latitude, +w500k gives the length and units, and +f selects the decorated form. A scale bar is locally representative; projection scale varies across this Mercator map.

Compare with GMT-03-001 · Increase coastline detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-08-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt basemap -LjBL+c40+w500k+o0.5c/0.5c+f+u -F+gwhite+p0.3p
gmt basemap -B+t"GMT-08-001"
gmt end
```

Actual output



GMT-08-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-08-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-08-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-08-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-08-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-08-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-08-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-08-001 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-LjBL+c40+w500k+o0.5c/0.5c+f+u`	jBL anchors inside at bottom-left; +c40 computes scale at latitude 40 degrees; +w500k sets a 500 km length; +o offsets by 0.5 cm in both directions; +f selects a fancy segmented bar; +u appends the units to annotations.
`-F+gwhite+p0.3p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.3-point black (the default) stroke.

GMT-08-001 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-08-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-08-001 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-08-002

Add a locator inset

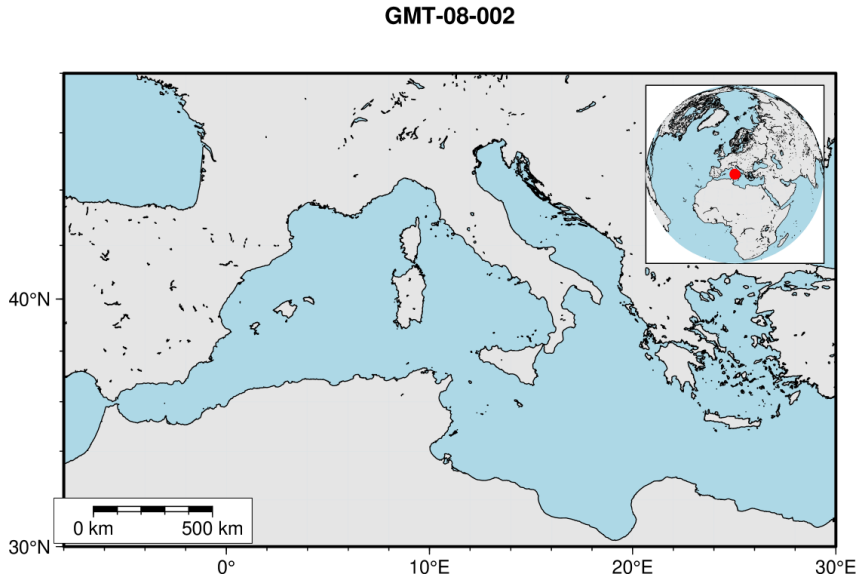
Change: open a small inset at top right. It has its own global region and orthographic projection, with a red locator point near the main region. inset end restores the main map context before the example title is added.

Compare with GMT-08-001 · Add a geographic scale bar.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-08-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt basemap -LjBL+c40+w500k+o0.5c/0.5c+f+u -F+gwhite+p0.3p
gmt inset begin -DjTR+w3c+o0.2c -F+gwhite+p0.5p
gmt coast -Rg -JG12/40/3c -Dl -Ggray90 -Slightblue -W0.2p
printf '12 40\n' | gmt plot -Sc0.18c -Gred
gmt inset end
gmt basemap -B+t"GMT-08-002"
gmt end
```

Actual output



GMT-08-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-08-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-08-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-08-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-08-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-08-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-08-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-08-002 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-LjBL+c40+w500k+o0.5c/0.5c+f+u`	jBL anchors inside at bottom-left; +c40 computes scale at latitude 40 degrees; +w500k sets a 500 km length; +o offsets by 0.5 cm in both directions; +f selects a fancy segmented bar; +u appends the units to annotations.
`-F+gwhite+p0.3p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.3-point black (the default) stroke.

GMT-08-002 · 5 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTR+w3c+o0.2c`	jTR anchors an inset inside the map at top-right; +w3c makes it 3 cm wide; +o0.2c offsets it inward 0.2 cm in both directions.
`-F+gwhite+p0.5p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.5-point black (the default) stroke.

GMT-08-002 · 6 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JG12/40/3c`	Orthographic globe view, centred at longitude 12, latitude 40 degrees; map width 3 cm.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p`	Draw 0.2-point black (the default) stroke.

GMT-08-002 · 7 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`-Sc0.18c`	Draw circles with diameter 0.18 cm. Read longitude and latitude from the preceding printf pipeline.
`-Gred`	Fill the symbols with red.

GMT-08-002 · 8 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-08-002 · 9 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-08-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-08-002 · 10 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-08-003

Assemble a finished map

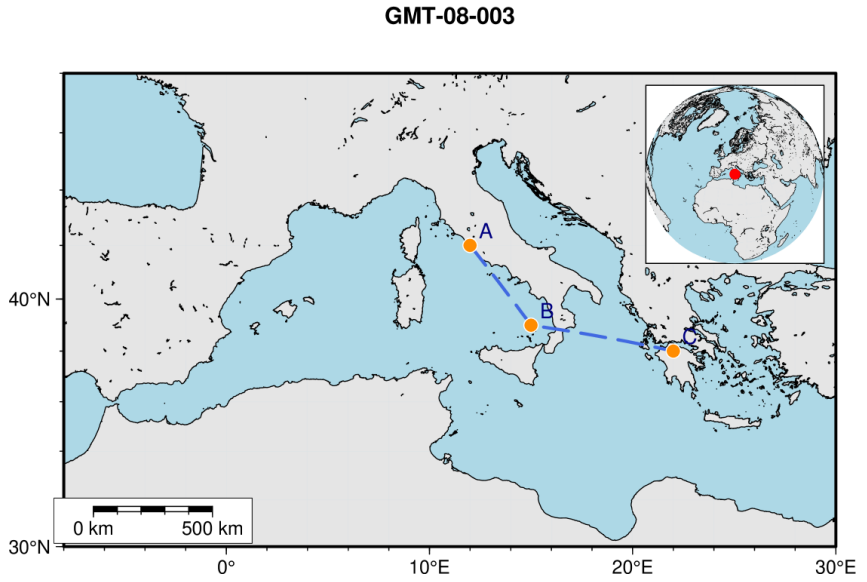
Combine the established layers: local coastline, illustrative route, stations, offset labels, scale bar and locator globe. Draw the route before the station symbols so the points remain visible. Every command and input is included; this map can be regenerated independently of earlier examples.

Compare with GMT-08-002 · Add a locator inset.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-08-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt coast -R-8/30/30/48 -JM13c -Dh -Ggray90 -Slightblue -W0.4p -Baf
gmt plot sites.txt -i0,1 -W1.5p,royalblue,-
gmt plot sites.txt -i0,1 -Sc0.24c -Gdarkorange -W0.5p,white
gmt text sites.txt -F+f10p,Helvetica,navy+jBL -D0.15c/0.12c
gmt basemap -LjBL+c40+w500k+o0.5c/0.5c+f+u -F+gwhite+p0.3p
gmt inset begin -DjTR+w3c+o0.2c -F+gwhite+p0.5p
gmt coast -Rg -JG12/40/3c -Dl -Ggray90 -Slightblue -W0.2p
printf '12 40\n' | gmt plot -Sc0.18c -Gred
gmt inset end
gmt basemap -B+t"GMT-08-003"
gmt end
```

Actual output



GMT-08-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-08-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-08-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-08-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-08-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-08-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-08-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.4p`	Draw 0.4-point black (the default) stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-08-003 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-W1.5p,royalblue,-`	Draw 1.5-point royalblue stroke with a dashed pattern.

GMT-08-003 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.24c`	Draw circles with diameter 0.24 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-08-003 · 6 · gmt text · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-F+f10p,Helvetica,navy+jBL`	+f selects 10-point Helvetica text in navy; +jBL anchors each label at its bottom-left corner. Read the text after longitude and latitude.
`-D0.15c/0.12c`	Offset labels by +0.15 cm horizontally and +0.12 cm vertically from the input coordinates.

GMT-08-003 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-LjBL+c40+w500k+o0.5c/0.5c+f+u`	jBL anchors inside at bottom-left; +c40 computes scale at latitude 40 degrees; +w500k sets a 500 km length; +o offsets by 0.5 cm in both directions; +f selects a fancy segmented bar; +u appends the units to annotations.
`-F+gwhite+p0.3p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.3-point black (the default) stroke.

GMT-08-003 · 8 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTR+w3c+o0.2c`	jTR anchors an inset inside the map at top-right; +w3c makes it 3 cm wide; +o0.2c offsets it inward 0.2 cm in both directions.
`-F+gwhite+p0.5p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.5-point black (the default) stroke.

GMT-08-003 · 9 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JG12/40/3c`	Orthographic globe view, centred at longitude 12, latitude 40 degrees; map width 3 cm.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p`	Draw 0.2-point black (the default) stroke.

GMT-08-003 · 10 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`-Sc0.18c`	Draw circles with diameter 0.18 cm. Read longitude and latitude from the preceding printf pipeline.
`-Gred`	Fill the symbols with red.

GMT-08-003 · 11 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-08-003 · 12 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-08-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-08-003 · 13 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Coastline resolution at close range

GMT-09-001

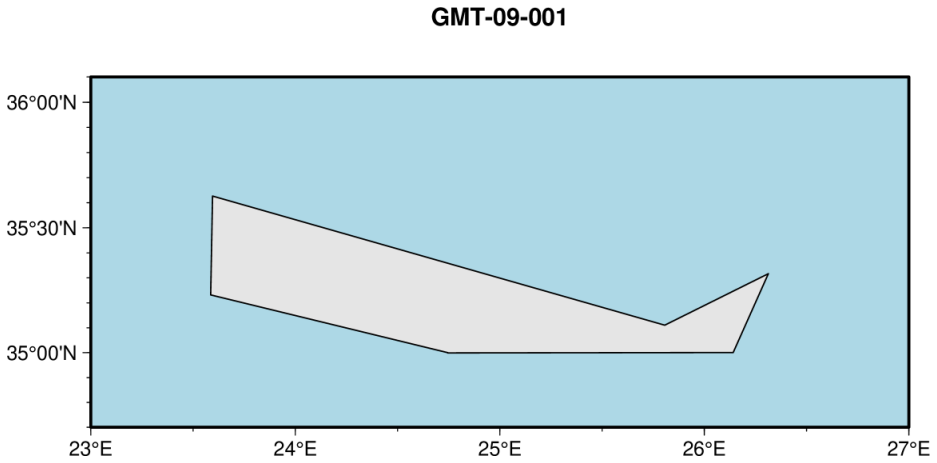
Crete with crude shoreline detail

This deliberately coarse close-up is the baseline. -Dc selects the most simplified installed GSHHG shoreline. At this scale the angular outline reflects sparse geographic vertices; extra PNG pixels cannot restore the omitted shoreline detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-09-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R23/27/34.7/36.1 -JM13c -Dc -Ggray90 -Slightblue -W0.6p -Bxa1f0.5
-Bya0.5f0.1
gmt basemap -B+t"GMT-09-001"
gmt end
```

Actual output



GMT-09-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-09-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-09-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-09-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-09-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-09-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-09-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dc`	Select crude-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.6p`	Draw 0.6-point black (the default) stroke.
`-Bxa1f0.5`	On the longitude (x) axis, label every 1 degrees; draw ticks every 0.5 degrees (f).
`-Bya0.5f0.1`	On the latitude (y) axis, label every 0.5 degrees; draw ticks every 0.1 degrees (f).

GMT-09-001 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-09-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-09-001 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-09-002

Crete with low shoreline detail

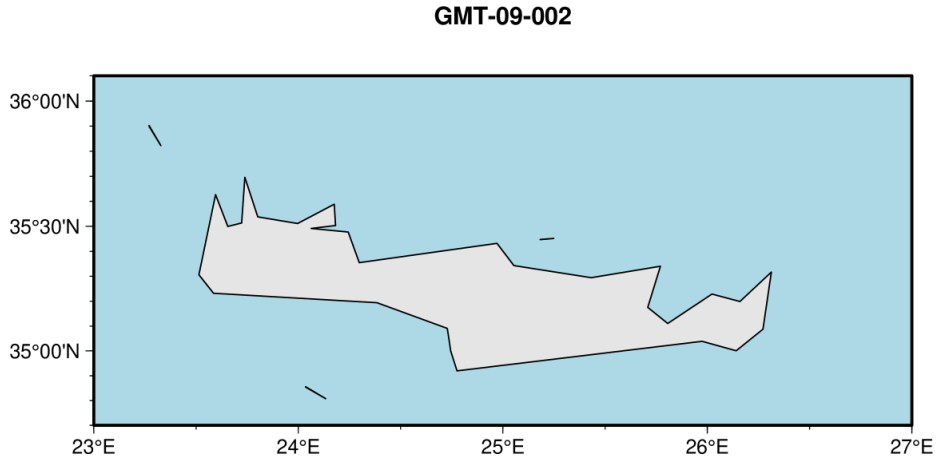
Change only -Dc to -Dl. The low-resolution shoreline keeps more geographic detail. Compare the island outline with the crude baseline using the full-size map or PDF, rather than judging only the gallery thumbnail.

Compare with GMT-09-001 · Crete with crude shoreline detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-09-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R23/27/34.7/36.1 -JM13c -Dl -Ggray90 -Slightblue -W0.6p -Bxa1f0.5
-Bya0.5f0.1
gmt basemap -B+t"GMT-09-002"
gmt end
```

Actual output



GMT-09-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-09-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-09-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-09-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-09-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-09-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-09-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dl`	Select low-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.6p`	Draw 0.6-point black (the default) stroke.
`-Bxa1f0.5`	On the longitude (x) axis, label every 1 degrees; draw ticks every 0.5 degrees (f).
`-Bya0.5f0.1`	On the latitude (y) axis, label every 0.5 degrees; draw ticks every 0.1 degrees (f).

GMT-09-002 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-09-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-09-002 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-09-003

Crete with intermediate shoreline detail

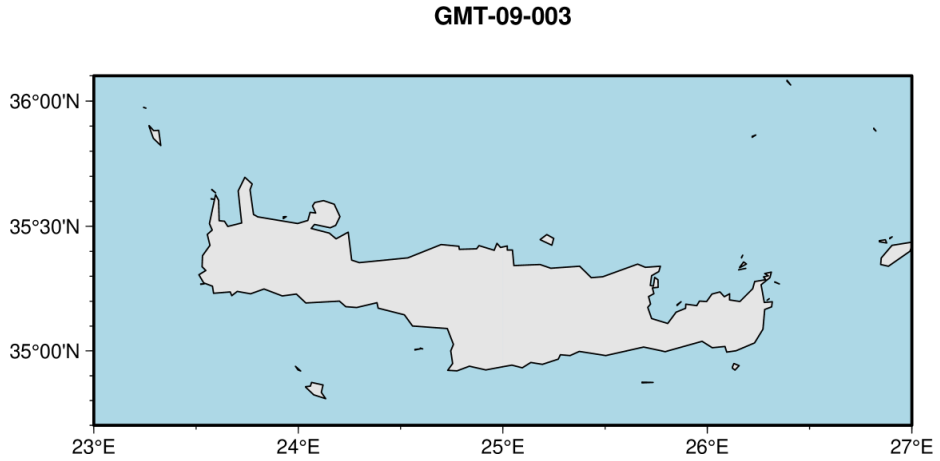
Change -Dl to -Di. Intermediate resolution adds smaller bends and features. Choose a level appropriate to the map extent and physical output size; more detail is useful only while the map can display it.

Compare with GMT-09-002 · Crete with low shoreline detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-09-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R23/27/34.7/36.1 -JM13c -Di -Ggray90 -Slightblue -W0.6p -Bxa1f0.5
-Bya0.5f0.1
gmt basemap -B+t"GMT-09-003"
gmt end
```

Actual output



GMT-09-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-09-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-09-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-09-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-09-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-09-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-09-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.6p`	Draw 0.6-point black (the default) stroke.
`-Bxa1f0.5`	On the longitude (x) axis, label every 1 degrees; draw ticks every 0.5 degrees (f).
`-Bya0.5f0.1`	On the latitude (y) axis, label every 0.5 degrees; draw ticks every 0.1 degrees (f).

GMT-09-003 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-09-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-09-003 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-09-004

Crete with high shoreline detail

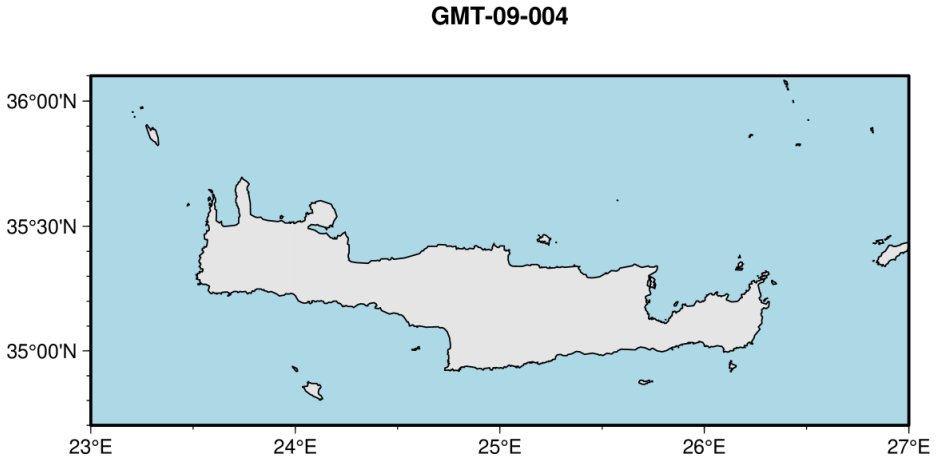
Change -Di to -Dh. High resolution retains finer shoreline geometry. It can improve a close-up while adding clutter at continental scale. The requested local dataset must be installed; this example does not silently fall back to a coarser shoreline.

Compare with GMT-09-003 · Crete with intermediate shoreline detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-09-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R23/27/34.7/36.1 -JM13c -Dh -Ggray90 -Slightblue -W0.6p -Bxa1f0.5
-Bya0.5f0.1
gmt basemap -B+t"GMT-09-004"
gmt end
```

Actual output



GMT-09-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-09-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-09-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-09-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-09-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-09-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-09-004 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.6p`	Draw 0.6-point black (the default) stroke.
`-Bxa1f0.5`	On the longitude (x) axis, label every 1 degrees; draw ticks every 0.5 degrees (f).
`-Bya0.5f0.1`	On the latitude (y) axis, label every 0.5 degrees; draw ticks every 0.1 degrees (f).

GMT-09-004 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-09-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-09-004 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-09-005

Crete with full shoreline detail

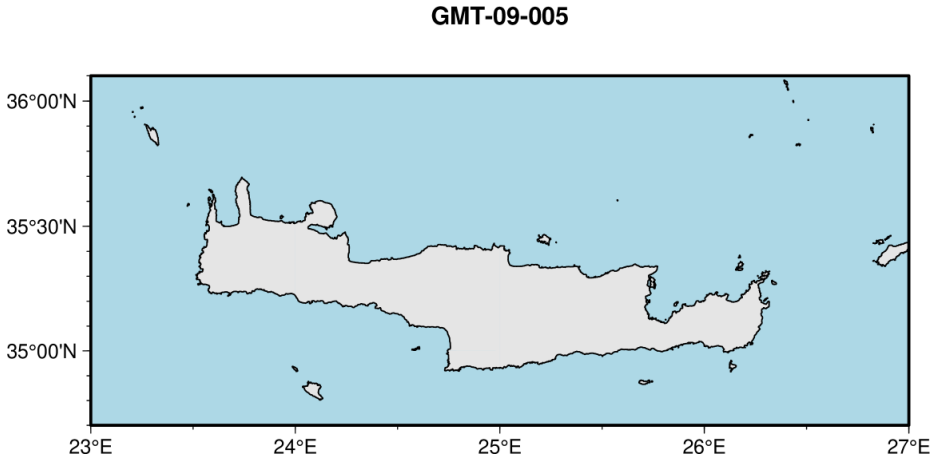
Change -Dh to -Df. Full resolution uses the most detailed installed shoreline. Natural shores can remain irregular because they contain real geographic structure. This increases geometric detail; it does not fit an invented smooth curve to the coast.

Compare with GMT-09-004 · Crete with high shoreline detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-09-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R23/27/34.7/36.1 -JM13c -Df -Ggray90 -Slightblue -W0.6p -Bxa1f0.5
-Bya0.5f0.1
gmt basemap -B+t"GMT-09-005"
gmt end
```

Actual output



GMT-09-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-09-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-09-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-09-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-09-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-09-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-09-005 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Df`	Select full-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.6p`	Draw 0.6-point black (the default) stroke.
`-Bxa1f0.5`	On the longitude (x) axis, label every 1 degrees; draw ticks every 0.5 degrees (f).
`-Bya0.5f0.1`	On the latitude (y) axis, label every 0.5 degrees; draw ticks every 0.1 degrees (f).

GMT-09-005 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-09-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-09-005 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-09-006

Refine the full-resolution shoreline pen

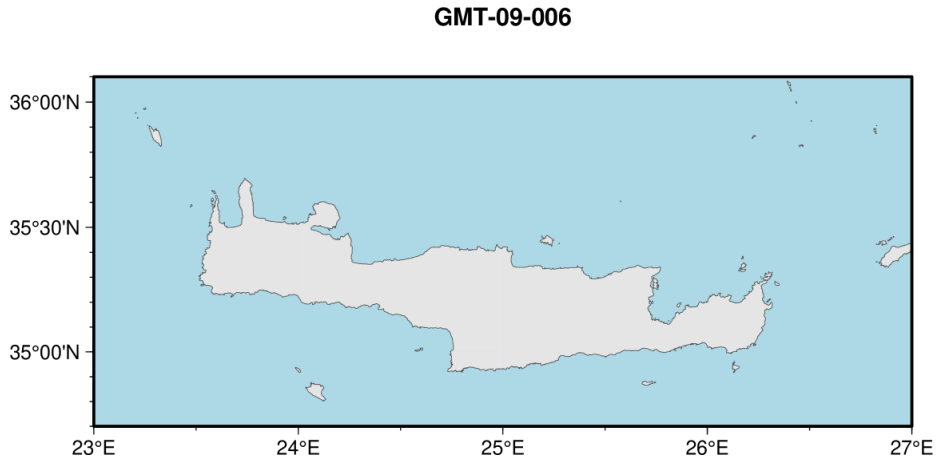
Change the full-resolution pen from a 0.6-point black line to a 0.25-point gray30 line. Round joins and the narrower stroke keep tight bends from merging into a heavy band. The geographic vertices remain identical to the preceding example; use the vector PDF to inspect them when zooming.

Compare with GMT-09-005 · Crete with full shoreline detail.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-09-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R23/27/34.7/36.1 -JM13c -Df -Ggray90 -Slightblue -W0.25p,gray30 -Bxa1f0.5
-Bya0.5f0.1
gmt basemap -B+t"GMT-09-006"
gmt end
```

Actual output



GMT-09-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-09-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-09-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-09-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-09-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-09-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-09-006 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Df`	Select full-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.25p,gray30`	Draw 0.25-point gray30 stroke.
`-Bxa1f0.5`	On the longitude (x) axis, label every 1 degrees; draw ticks every 0.5 degrees (f).
`-Bya0.5f0.1`	On the latitude (y) axis, label every 0.5 degrees; draw ticks every 0.1 degrees (f).

GMT-09-006 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-09-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-09-006 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Line ends, corners and border styling

GMT-10-001

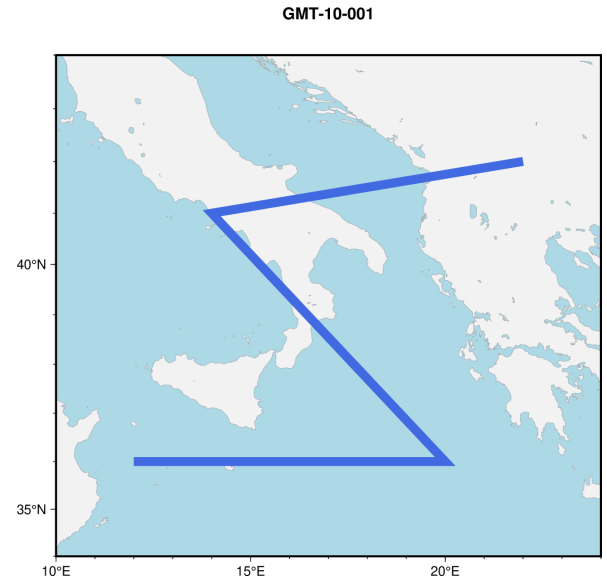
Flat ends and miter joins

Baseline: PS_LINE_CAP butt gives flat ends and PS_LINE_JOIN miter gives sharp joins. A thick synthetic line makes these choices visible. -A connects the projected vertices directly.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-10-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt set PS_LINE_CAP butt PS_LINE_JOIN miter
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt coast -R10/24/34/44 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot line.txt -A -W6p,royalblue
gmt basemap -B+t"GMT-10-001"
gmt end
```

Actual output



GMT-10-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-10-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-10-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-10-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-10-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-10-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-10-001 · 3 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP butt`	Stop strokes squarely at their endpoint, without projecting beyond it.
`PS_LINE_JOIN miter`	Extend adjoining stroke edges to a pointed join (subject to the miter limit).

GMT-10-001 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R10/24/34/44`	Geographic bounds west/east/south/north = 10/24/34/44 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-10-001 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W6p,royalblue`	Draw 6-point royalblue stroke.

GMT-10-001 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-10-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-10-001 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-10-002

Round the line ends

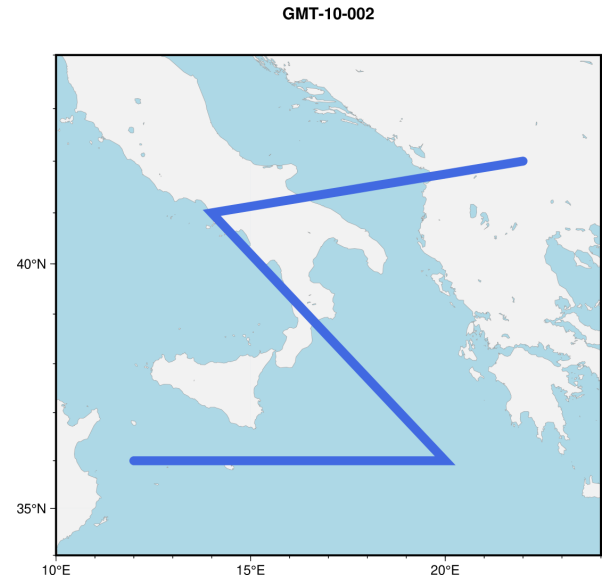
Change PS_LINE_CAP to round. Semicircular stroke ends extend beyond the endpoint; the coordinates stay fixed. Joins remain mitered for comparison.

Compare with GMT-10-001 · Flat ends and miter joins.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-10-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt set PS_LINE_CAP round PS_LINE_JOIN miter
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt coast -R10/24/34/44 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot line.txt -A -W6p,royalblue
gmt basemap -B+t"GMT-10-002"
gmt end
```

Actual output



GMT-10-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-10-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-10-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-10-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-10-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-10-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-10-002 · 3 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN miter`	Extend adjoining stroke edges to a pointed join (subject to the miter limit).

GMT-10-002 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R10/24/34/44`	Geographic bounds west/east/south/north = 10/24/34/44 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-10-002 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W6p,royalblue`	Draw 6-point royalblue stroke.

GMT-10-002 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-10-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-10-002 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-10-003

Round the corners of the stroke

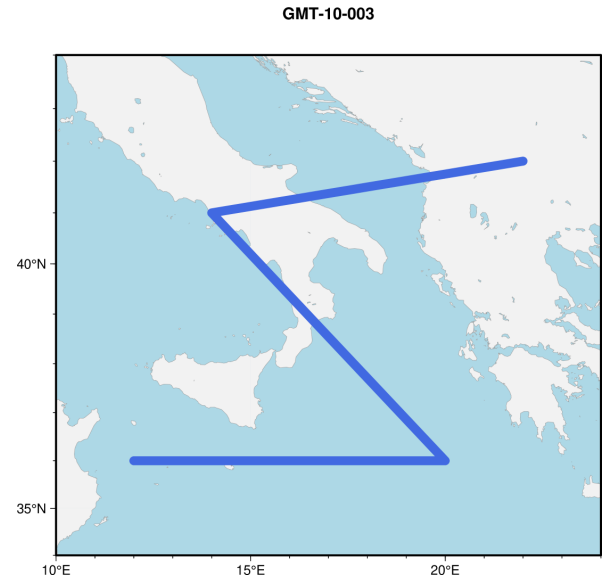
Change PS_LINE_JOIN to round. It rounds the outside of each stroke corner without moving vertices or fitting a new route. The thick line exposes the difference.

Compare with GMT-10-002 · Round the line ends.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-10-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt set PS_LINE_CAP round PS_LINE_JOIN round
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt coast -R10/24/34/44 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot line.txt -A -W6p,royalblue
gmt basemap -B+t"GMT-10-003"
gmt end
```

Actual output



GMT-10-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-10-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-10-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-10-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-10-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-10-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-10-003 · 3 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-10-003 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R10/24/34/44`	Geographic bounds west/east/south/north = 10/24/34/44 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-10-003 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W6p,royalblue`	Draw 6-point royalblue stroke.

GMT-10-003 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-10-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-10-003 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-10-004

Bevel a sharp corner

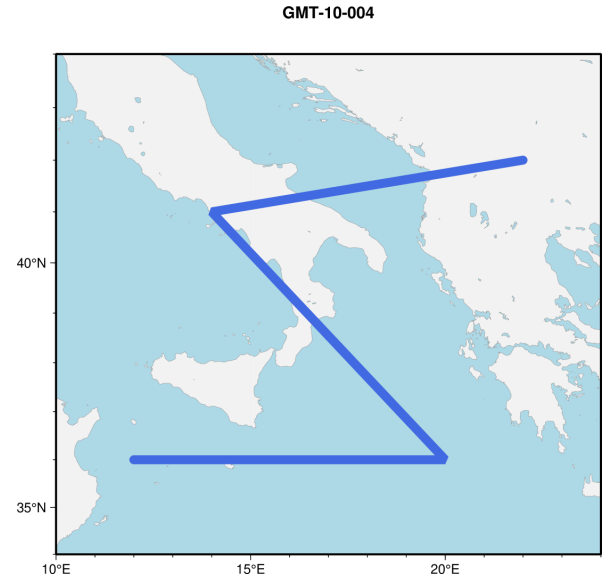
Change the join to bevel. The cut-off corner differs from both a miter spike and a round join. Stroke style is independent of geographic detail.

Compare with GMT-10-002 · Round the line ends.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-10-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt set PS_LINE_CAP round PS_LINE_JOIN bevel
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt coast -R10/24/34/44 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot line.txt -A -W6p,royalblue
gmt basemap -B+t"GMT-10-004"
gmt end
```

Actual output



GMT-10-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-10-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-10-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-10-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-10-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-10-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-10-004 · 3 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN bevel`	Cut off the join with a straight bevel.

GMT-10-004 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R10/24/34/44`	Geographic bounds west/east/south/north = 10/24/34/44 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-10-004 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W6p,royalblue`	Draw 6-point royalblue stroke.

GMT-10-004 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-10-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-10-004 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-10-005

Use a lighter dashed boundary

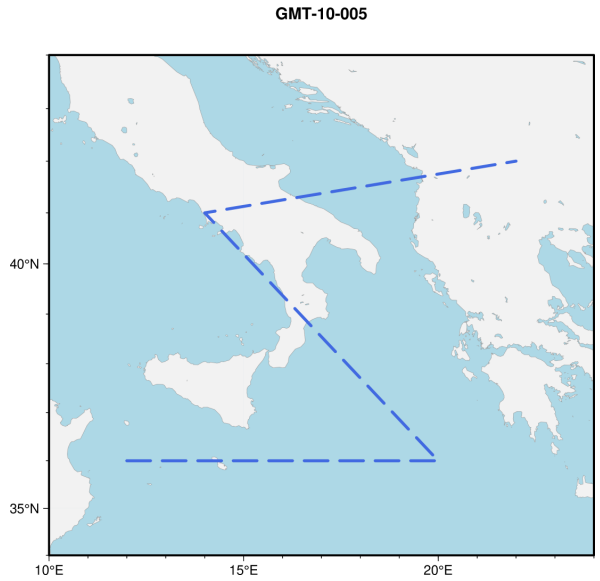
The dashed 2-point pen reduces the visual weight of this illustrative boundary. Round caps soften dash ends. Keep dashes and gaps legible at the intended print size.

Compare with GMT-10-003 · Round the corners of the stroke.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-10-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt set PS_LINE_CAP round PS_LINE_JOIN round
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt coast -R10/24/34/44 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot line.txt -A -W2p,royalblue,-
gmt basemap -B+t"GMT-10-005"
gmt end
```

Actual output



GMT-10-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-10-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-10-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-10-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-10-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-10-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-10-005 · 3 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-10-005 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R10/24/34/44`	Geographic bounds west/east/south/north = 10/24/34/44 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-10-005 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W2p,royalblue,-`	Draw 2-point royalblue stroke with a dashed pattern.

GMT-10-005 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-10-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-10-005 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-10-006

Separate a route from its background

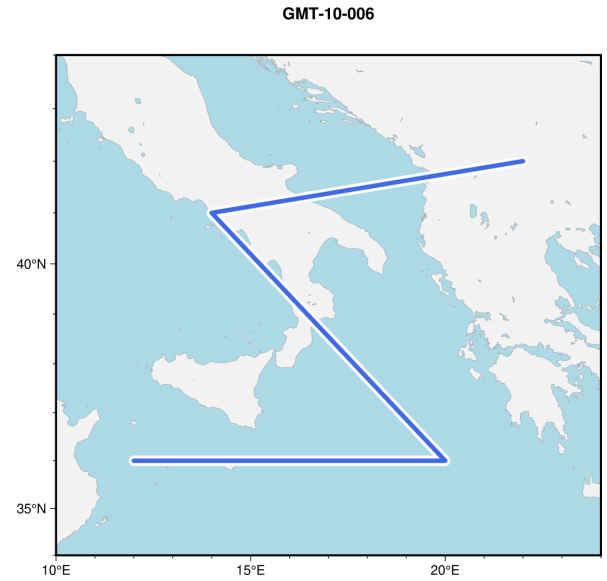
Draw the same line twice: a wider white casing under a narrower blue stroke. This separates the illustrative route from coastlines beneath it without changing the route coordinates.

Compare with GMT-10-003 · Round the corners of the stroke.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-10-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt set PS_LINE_CAP round PS_LINE_JOIN round
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt coast -R10/24/34/44 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot line.txt -A -W7p,white
gmt plot line.txt -A -W3p,royalblue
gmt basemap -B+t"GMT-10-006"
gmt end
```

Actual output



GMT-10-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-10-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-10-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-10-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-10-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-10-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-10-006 · 3 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-10-006 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R10/24/34/44`	Geographic bounds west/east/south/north = 10/24/34/44 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-10-006 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W7p,white`	Draw 7-point white stroke.

GMT-10-006 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W3p,royalblue`	Draw 3-point royalblue stroke.

GMT-10-006 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-10-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-10-006 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Curves, interpolation and smoothing

GMT-11-001

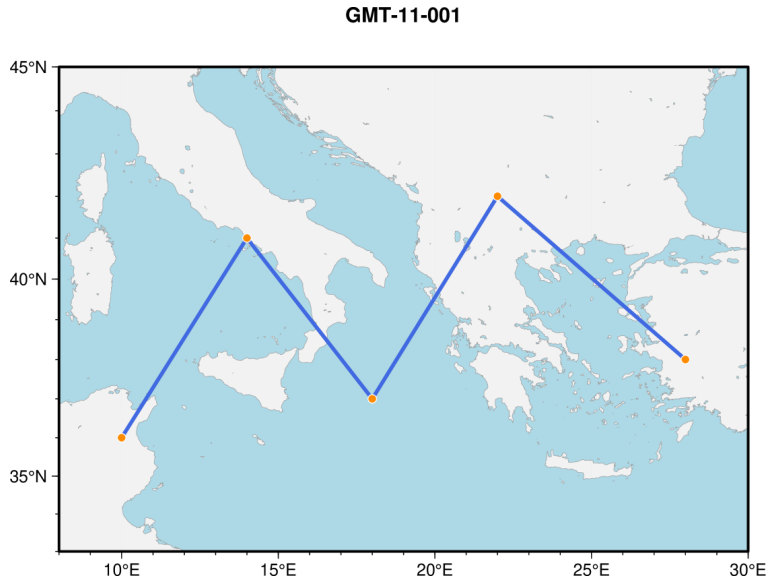
Connect a sparse illustrative route

The first column is an increasing parameter, followed by longitude and latitude. plot -i1,2 selects the coordinates; -A draws straight projected segments. Orange points mark the supplied vertices. This invented route supports interpolation experiments; it is not an observed track.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-11-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > track.txt <<'DATA'
0 10 36
1 14 41
2 18 37
3 22 42
4 28 38
DATA
gmt coast -R8/30/33/45 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot track.txt -i1,2 -A -W2p,royalblue
gmt plot track.txt -i1,2 -Sc0.16c -Gdarkorange -W0.4p,white
gmt basemap -B+t"GMT-11-001"
gmt end
```

Actual output



GMT-11-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-11-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-11-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-11-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-11-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-11-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-11-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-11-001 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W2p,royalblue`	Draw 2-point royalblue stroke.

GMT-11-001 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-Sc0.16c`	Draw circles with diameter 0.16 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-11-001 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-11-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-11-001 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-11-002

Draw a Bezier curve through the route

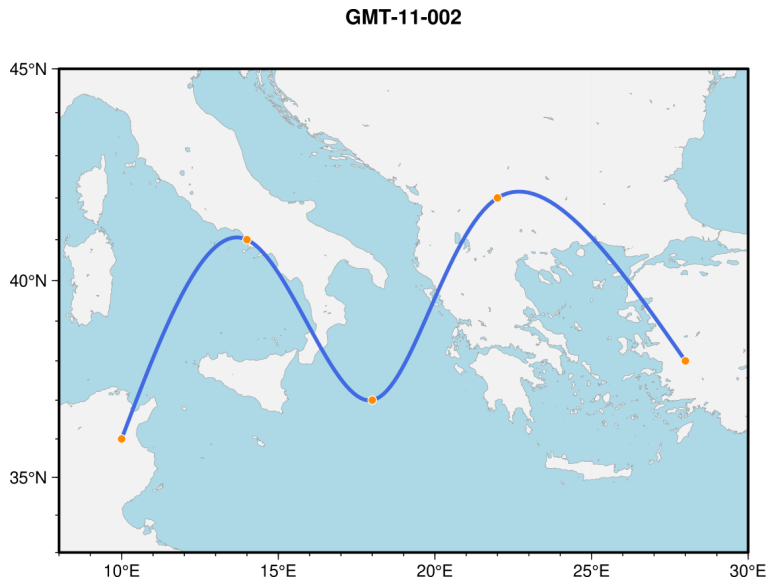
Change the pen to -W2p,royalblue+s to draw a Bezier spline. The route acquires a curved path between the supplied positions. Use this for an illustrative connection when that shape is intended; it does not provide additional observations or an authoritative boundary.

Compare with GMT-11-001 · Connect a sparse illustrative route.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-11-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > track.txt <<'DATA'
0 10 36
1 14 41
2 18 37
3 22 42
4 28 38
DATA
gmt coast -R8/30/33/45 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot track.txt -i1,2 -A -W2p,royalblue+s
gmt plot track.txt -i1,2 -Sc0.16c -Gdarkorange -W0.4p,white
gmt basemap -B+t"GMT-11-002"
gmt end
```

Actual output



GMT-11-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-11-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-11-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-11-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-11-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-11-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-11-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-11-002 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W2p,royalblue+s`	Draw 2-point royalblue stroke; +s draws a Bezier spline through the line vertices.

GMT-11-002 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-Sc0.16c`	Draw circles with diameter 0.16 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-11-002 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-11-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-11-002 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-11-003

Add linearly interpolated positions

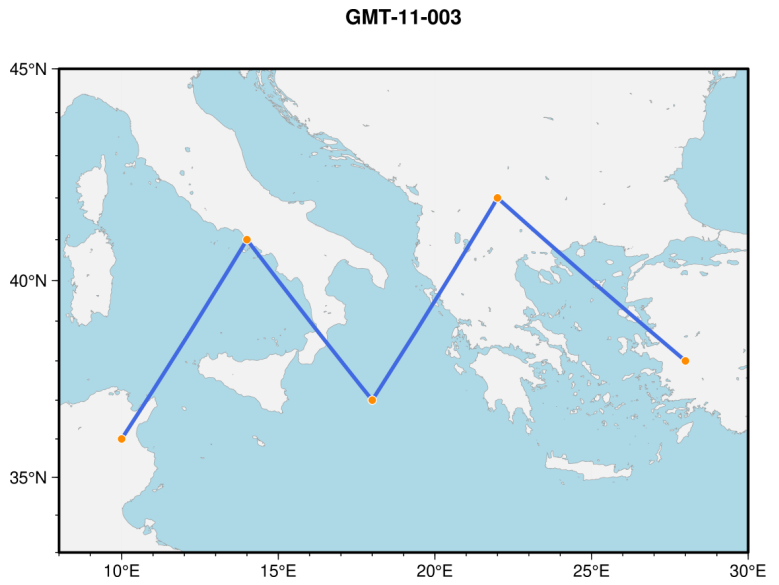
-Fl samples each coordinate linearly against the first column at increments of 0.05. More vertices describe that chosen interpolation; they are not more measurements. A Mercator projection can bend the display of a line interpolated in longitude and latitude.

Compare with GMT-11-001 · Connect a sparse illustrative route.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-11-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > track.txt <<'DATA'
0 10 36
1 14 41
2 18 37
3 22 42
4 28 38
DATA
gmt sample1d track.txt -T0/4/0.05 -Fl > curve.txt
gmt coast -R8/30/33/45 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot curve.txt -i1,2 -A -W2p,royalblue
gmt plot track.txt -i1,2 -Sc0.16c -Gdarkorange -W0.4p,white
gmt basemap -B+t"GMT-11-003"
gmt end
```

Actual output



GMT-11-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-11-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-11-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-11-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-11-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-11-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-11-003 · 3 · gmt sample1d · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-T0/4/0.05`	Resample the first column (track parameter, not geographic distance) from 0 to 4 in steps of 0.05; interpolate longitude and latitude as dependent columns.
`-Fl`	Piecewise linear interpolation; the path passes through the input positions and retains corners.
`> curve.txt`	Shell redirection: save standard output in curve.txt.

GMT-11-003 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-11-003 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`curve.txt`	Read the resampled table: track parameter, interpolated longitude and interpolated latitude.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W2p,royalblue`	Draw 2-point royalblue stroke.

GMT-11-003 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-Sc0.16c`	Draw circles with diameter 0.16 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-11-003 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-11-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-11-003 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-11-004

Interpolate with an Akima spline

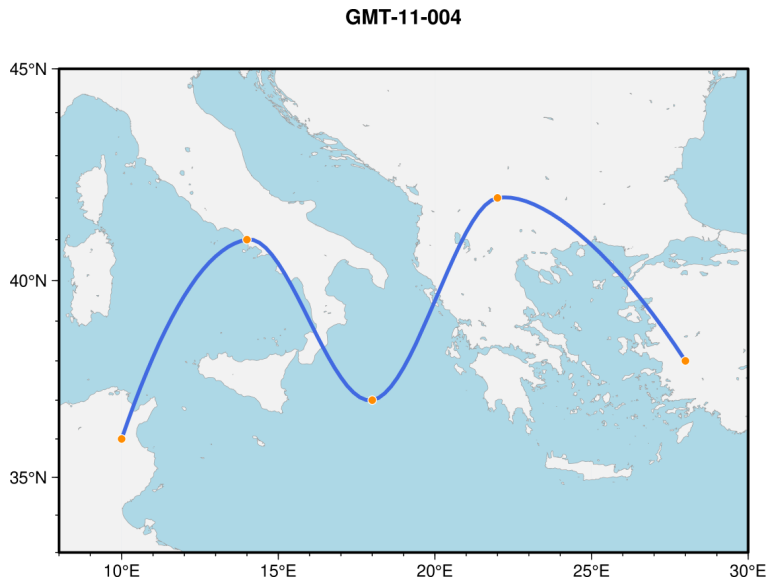
Change -Fl to -Fa to interpolate the longitude and latitude columns with Akima splines. The source vertices remain visible in orange. Examine the intervening path and any overshoot before interpreting an interpolated route.

Compare with GMT-11-003 · Add linearly interpolated positions.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-11-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > track.txt <<'DATA'
0 10 36
1 14 41
2 18 37
3 22 42
4 28 38
DATA
gmt sample1d track.txt -T0/4/0.05 -Fa > curve.txt
gmt coast -R8/30/33/45 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot curve.txt -i1,2 -A -W2p,royalblue
gmt plot track.txt -i1,2 -Sc0.16c -Gdarkorange -W0.4p,white
gmt basemap -B+t"GMT-11-004"
gmt end
```

Actual output



GMT-11-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-11-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-11-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-11-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-11-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-11-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-11-004 · 3 · gmt sample1d · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-T0/4/0.05`	Resample the first column (track parameter, not geographic distance) from 0 to 4 in steps of 0.05; interpolate longitude and latitude as dependent columns.
`-Fa`	Akima interpolation: a local spline passing through the input positions.
`> curve.txt`	Shell redirection: save standard output in curve.txt.

GMT-11-004 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-11-004 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`curve.txt`	Read the resampled table: track parameter, interpolated longitude and interpolated latitude.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W2p,royalblue`	Draw 2-point royalblue stroke.

GMT-11-004 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-Sc0.16c`	Draw circles with diameter 0.16 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-11-004 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-11-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-11-004 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-11-005

Compare a natural cubic spline

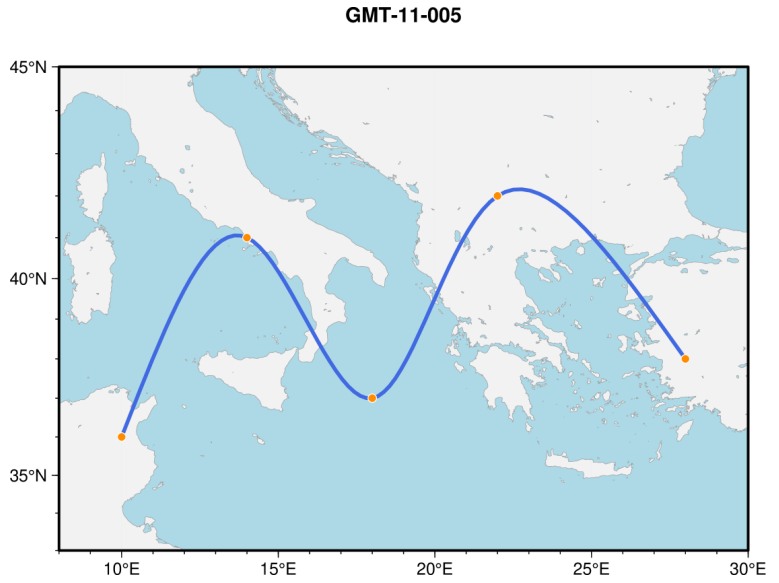
Change the interpolation choice to -Fc. A natural cubic spline produces another smooth route through the input positions. A visually smooth result still depends on this interpolation model, especially where stations are sparse.

Compare with GMT-11-003 · Add linearly interpolated positions.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-11-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > track.txt <<'DATA'
0 10 36
1 14 41
2 18 37
3 22 42
4 28 38
DATA
gmt sample1d track.txt -T0/4/0.05 -Fc > curve.txt
gmt coast -R8/30/33/45 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot curve.txt -i1,2 -A -W2p,royalblue
gmt plot track.txt -i1,2 -Sc0.16c -Gdarkorange -W0.4p,white
gmt basemap -B+t"GMT-11-005"
gmt end
```

Actual output



GMT-11-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-11-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-11-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-11-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-11-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-11-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-11-005 · 3 · gmt sample1d · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-T0/4/0.05`	Resample the first column (track parameter, not geographic distance) from 0 to 4 in steps of 0.05; interpolate longitude and latitude as dependent columns.
`-Fc`	Natural cubic-spline interpolation through the input positions; curvature can produce overshoot.
`> curve.txt`	Shell redirection: save standard output in curve.txt.

GMT-11-005 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-11-005 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`curve.txt`	Read the resampled table: track parameter, interpolated longitude and interpolated latitude.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W2p,royalblue`	Draw 2-point royalblue stroke.

GMT-11-005 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-Sc0.16c`	Draw circles with diameter 0.16 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-11-005 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-11-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-11-005 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-11-006

Fit a smoothing spline

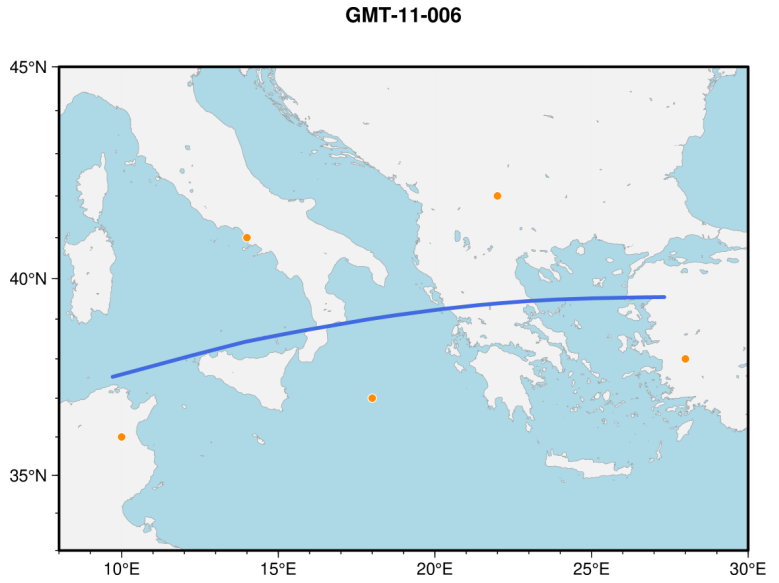
-Fs0.05 trades fit against curvature. Unlike exact interpolation, the smoothed curve need not pass through the orange source positions. The fit parameter is specific to the coordinate and parameter scales here; it is not a universal smoothing setting.

Compare with GMT-11-005 · Compare a natural cubic spline.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-11-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > track.txt <<'DATA'
0 10 36
1 14 41
2 18 37
3 22 42
4 28 38
DATA
gmt sample1d track.txt -T0/4/0.05 -Fs0.05 > curve.txt
gmt coast -R8/30/33/45 -JM13c -Di -Ggray95 -Slightblue -W0.2p,gray60 -Baf
gmt plot curve.txt -i1,2 -A -W2p,royalblue
gmt plot track.txt -i1,2 -Sc0.16c -Gdarkorange -W0.4p,white
gmt basemap -B+t"GMT-11-006"
gmt end
```

Actual output



GMT-11-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-11-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-11-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-11-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-11-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-11-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-11-006 · 3 · gmt sample1d · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-T0/4/0.05`	Resample the first column (track parameter, not geographic distance) from 0 to 4 in steps of 0.05; interpolate longitude and latitude as dependent columns.
`-Fs0.05`	Fit a smoothing cubic spline with fit parameter 0.05, trading residual error against curvature; it need not pass through the input positions.
`> curve.txt`	Shell redirection: save standard output in curve.txt.

GMT-11-006 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p,gray60`	Draw 0.2-point gray60 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-11-006 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`curve.txt`	Read the resampled table: track parameter, interpolated longitude and interpolated latitude.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W2p,royalblue`	Draw 2-point royalblue stroke.

GMT-11-006 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the local table: track parameter (0 to 4), longitude and latitude. These five positions define the schematic route.
`-i1,2`	Read zero-based columns 1 and 2 as longitude and latitude; skip column 0, the track parameter.
`-Sc0.16c`	Draw circles with diameter 0.16 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-11-006 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-11-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-11-006 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Regional projections and difficult extents

GMT-12-001

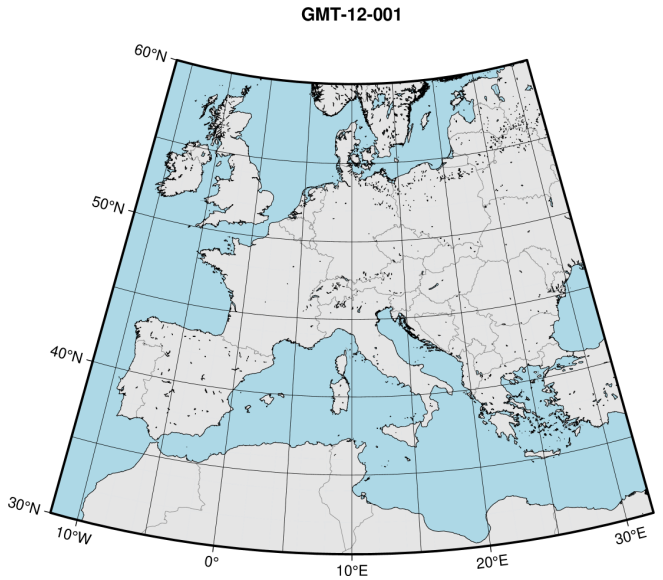
Use Lambert conformal conic for a region

-JL10/45/35/55/13c sets the central meridian and latitude, two standard parallels and map width. A conformal conic projection is a useful choice for some regional maps; inspect its scale away from the standard parallels.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-12-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-12/32/30/60 -JL10/45/35/55/13c -Dh -Ggray90 -Slightblue -W0.3p
-N1/0.25p,gray50 -B10g5
gmt basemap -B+t"GMT-12-001"
gmt end
```

Actual output



GMT-12-001 · Rendered by GMT

GMT · exit 0

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Parameters explained · GMT-12-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-12-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-12-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-12-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-12-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-12-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JL10/45/35/55/13c`	Lambert conformal conic: central longitude 10, latitude of origin 45, standard parallels 35 and 55 degrees; width 13 cm.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-N1/0.25p,gray50`	Draw national boundaries (level 1) with a 0.25-point gray50 stroke.
`-B10g5`	On both geographic axes, label every 10 degrees and draw grid lines every 5 degrees.

GMT-12-001 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-12-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-12-001 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-12-002

Compare Albers equal-area conic

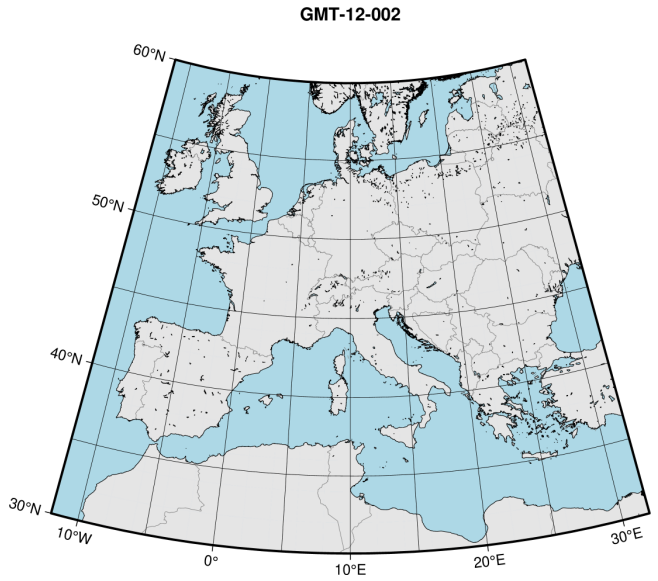
Change the projection to -JB with the same centre and standard parallels. Albers preserves area while changing shapes. The regional extent, coast data and graticule stay fixed for comparison.

Compare with GMT-12-001 · Use Lambert conformal conic for a region.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-12-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-12/32/30/60 -JB10/45/35/55/13c -Dh -Ggray90 -Slightblue -W0.3p
-N1/0.25p,gray50 -B10g5
gmt basemap -B+t"GMT-12-002"
gmt end
```

Actual output



GMT-12-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-12-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-12-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-12-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-12-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-12-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-12-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-12/32/30/60`	Geographic bounds west/east/south/north = -12/32/30/60 degrees. Negative longitude is west; negative latitude is south.
`-JB10/45/35/55/13c`	Albers equal-area conic: central longitude 10, latitude of origin 45, standard parallels 35 and 55 degrees; width 13 cm.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-N1/0.25p,gray50`	Draw national boundaries (level 1) with a 0.25-point gray50 stroke.
`-B10g5`	On both geographic axes, label every 10 degrees and draw grid lines every 5 degrees.

GMT-12-002 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-12-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-12-002 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-12-003

Centre a Lambert azimuthal equal-area map

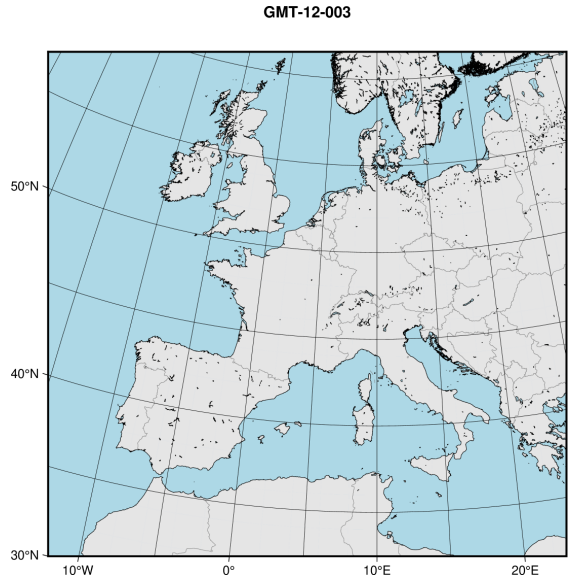
-JA10/45/13c places a Lambert azimuthal equal-area projection at 10 degrees east and 45 degrees north. -R-12/30/32/60+r supplies the lower-left and upper-right corners for a rectangular regional view. Equal-area projections can support area comparisons, but they do not preserve every distance or angle.

Compare with GMT-12-002 · Compare Albers equal-area conic.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-12-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-12/30/32/60+r -JA10/45/13c -Dh -Ggray90 -Slightblue -W0.3p
-N1/0.25p,gray50 -B10g5
gmt basemap -B+t"GMT-12-003"
gmt end
```

Actual output



GMT-12-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-12-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-12-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-12-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-12-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-12-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-12-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-12/30/32/60+r`	+r reads opposite corners: lower-left longitude/ latitude -12/30, upper-right 32/60 degrees; use a rectangular regional frame.
`-JA10/45/13c`	Lambert azimuthal equal-area projection, centred at longitude 10, latitude 45 degrees; map width 13 cm.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-N1/0.25p,gray50`	Draw national boundaries (level 1) with a 0.25-point gray50 stroke.
`-B10g5`	On both geographic axes, label every 10 degrees and draw grid lines every 5 degrees.

GMT-12-003 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-12-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-12-003 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-12-004

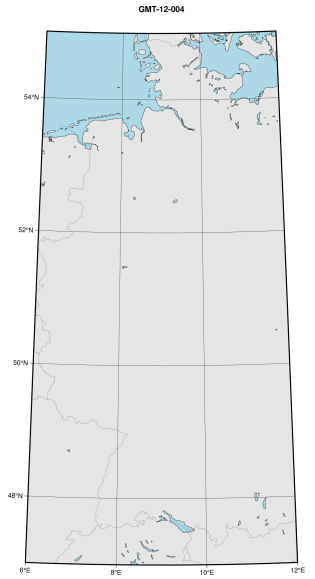
Use a local UTM zone

-JU32N/13c uses UTM zone 32 in the northern hemisphere. The explicitly selected region fits that zone. Choosing UTM requires the appropriate zone and datum for the actual project; this example teaches the projection syntax.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-12-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R6/12/47/55 -JU32N/13c -Dh -Ggray90 -Slightblue -W0.3p -N1/0.25p,gray50
-Bxa2g2 -Bya2g2
gmt basemap -B+t"GMT-12-004"
gmt end
```

Actual output



GMT-12-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-12-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-12-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-12-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-12-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-12-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-12-004 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R6/12/47/55`	Geographic bounds west/east/south/north = 6/12/47/55 degrees. Negative longitude is west; negative latitude is south.
`-JU32N/13c`	UTM zone 32, northern hemisphere (N); map width 13 cm.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-N1/0.25p,gray50`	Draw national boundaries (level 1) with a 0.25-point gray50 stroke.
`-Bxa2g2`	On the longitude (x) axis, label every 2 degrees; draw grid lines every 2 degrees (g).
`-Bya2g2`	On the latitude (y) axis, label every 2 degrees; draw grid lines every 2 degrees (g).

GMT-12-004 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-12-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-12-004 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-12-005

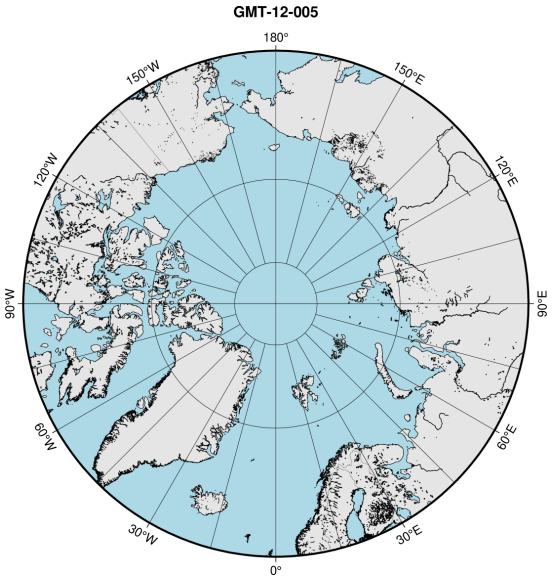
Map the Arctic with stereographic projection

-JS0/90/13c gives a north-polar stereographic view. The region extends from 60 to 90 degrees north. The longitude graticule converges at the pole; rectangular latitude-longitude display conventions are not suitable for every polar map.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-12-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-180/180/60/90 -JS0/90/13c -Di -Ggray90 -Slightblue -W0.3p
-N1/0.25p,gray50 -B30g15
gmt basemap -B+t"GMT-12-005"
gmt end
```

Actual output



GMT-12-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-12-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-12-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-12-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-12-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-12-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-12-005 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-180/180/60/90`	Geographic bounds west/east/south/north = -180/180/60/90 degrees. Negative longitude is west; negative latitude is south.
`-JS0/90/13c`	Stereographic conformal projection, centred at longitude 0, latitude 90 degrees; map width 13 cm.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-N1/0.25p,gray50`	Draw national boundaries (level 1) with a 0.25-point gray50 stroke.
`-B30g15`	On both geographic axes, label every 30 degrees and draw grid lines every 15 degrees.

GMT-12-005 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-12-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-12-005 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-12-006

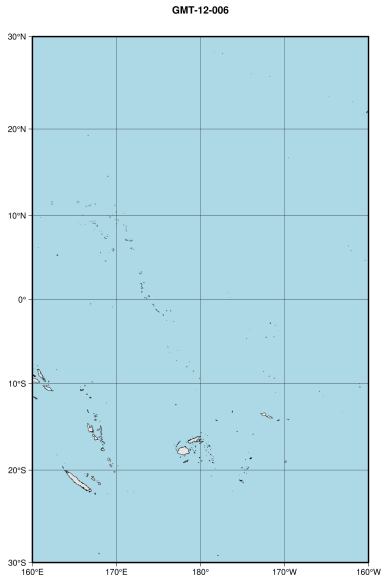
Cross the international date line

Use a continuous longitude interval from 160 to 200 degrees and centre the Mercator projection at 180. This draws one region spanning the date line. Do not split a continuous study area merely because longitude labels wrap between east and west.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-12-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R160/200/-30/30 -JM180/13c -Di -Ggray90 -Slightblue -W0.3p
-N1/0.25p,gray50 -B10g10
gmt basemap -B+t"GMT-12-006"
gmt end
```

Actual output



GMT-12-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-12-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-12-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-12-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-12-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-12-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-12-006 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R160/200/-30/30`	Geographic bounds west/east/south/north = 160/200/-30/30 degrees. Negative longitude is west; negative latitude is south.
`-JM180/13c`	Mercator projection; central meridian 180 degrees; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.3p`	Draw 0.3-point black (the default) stroke.
`-N1/0.25p,gray50`	Draw national boundaries (level 1) with a 0.25-point gray50 stroke.
`-B10g10`	On both geographic axes, label every 10 degrees and draw grid lines every 10 degrees.

GMT-12-006 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-12-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-12-006 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Grid interpolation and contour quality

GMT-13-001

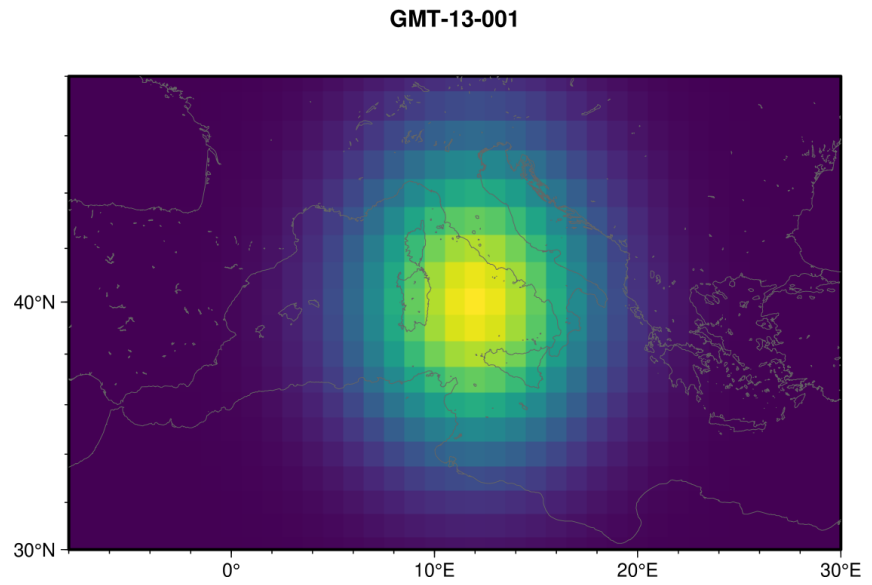
Expose a coarse grid with nearest-neighbour display

Evaluate the synthetic Gaussian field only every degree and display it with -nn, nearest-neighbour interpolation. grdimage -E200 fixes the projected image resampling resolution at 200 dpi for this comparison. Individual grid cells become conspicuous. The coarse grid is deliberate; it is a field defined by the formula, not a terrain measurement.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-13-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt grdmath -R-8/30/30/48 -I1 X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP
1000 MUL = hill.nc
gmt grdimage hill.nc -JM13c -Cviridis -nn -E200 -Baf
gmt coast -Di -W0.3p,gray40
gmt basemap -B+t"GMT-13-001"
gmt end
```

Actual output



GMT-13-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-13-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-13-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-13-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-13-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-13-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-13-001 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-I1`	Grid-node spacing 1 degrees in both longitude and latitude; evaluate the formula at these nodes.
`X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP 1000 MUL = hill.nc`	Evaluate 1000 * exp(-0.03 * ((longitude - 12)^2 + (latitude - 40)^2)). X and Y are node coordinates; SUB subtracts, DUP duplicates, MUL multiplies, ADD adds and EXP exponentiates. = hill.nc writes the result. Values are synthetic amplitude units.

GMT-13-001 · 4 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Cviridis`	Colour the synthetic grid with viridis, automatically scaled to the grid-value range.
`-nn`	Nearest-neighbour interpolation: use the closest grid node; coarse cells remain visible.
`-E200`	Resample the projected grid image at 200 dpi; separate from the final PNG export DPI set by begin.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-13-001 · 5 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.3p,gray40`	Draw 0.3-point gray40 stroke.

GMT-13-001 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-13-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-13-001 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-13-002

Change the image interpolation

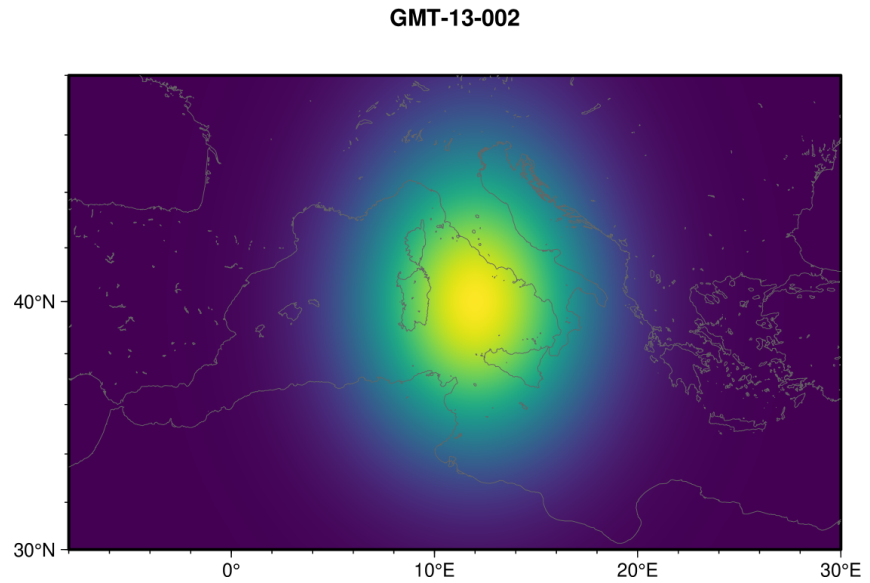
With grdimage -E200 fixing the projected image resampling resolution, change -nn to -nc for bicubic image interpolation. The displayed colour transitions become smoother while the input grid still has one-degree spacing. Interpolation changes how the field is displayed between its nodes; it does not add measured information.

Compare with GMT-13-001 · Expose a coarse grid with nearest-neighbour display.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-13-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt grdmath -R-8/30/30/48 -I1 X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP
1000 MUL = hill.nc
gmt grdimage hill.nc -JM13c -Cviridis -nc -E200 -Baf
gmt coast -Di -W0.3p,gray40
gmt basemap -B+t"GMT-13-002"
gmt end
```

Actual output



GMT-13-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-13-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-13-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-13-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-13-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-13-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-13-002 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-I1`	Grid-node spacing 1 degrees in both longitude and latitude; evaluate the formula at these nodes.
`X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP 1000 MUL = hill.nc`	Evaluate 1000 * exp(-0.03 * ((longitude - 12)^2 + (latitude - 40)^2)). X and Y are node coordinates; SUB subtracts, DUP duplicates, MUL multiplies, ADD adds and EXP exponentiates. = hill.nc writes the result. Values are synthetic amplitude units.

GMT-13-002 · 4 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Cviridis`	Colour the synthetic grid with viridis, automatically scaled to the grid-value range.
`-nc`	Bicubic interpolation between existing grid nodes; this adds no measured information.
`-E200`	Resample the projected grid image at 200 dpi; separate from the final PNG export DPI set by begin.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-13-002 · 5 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.3p,gray40`	Draw 0.3-point gray40 stroke.

GMT-13-002 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-13-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-13-002 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-13-003

Evaluate the model on a finer grid

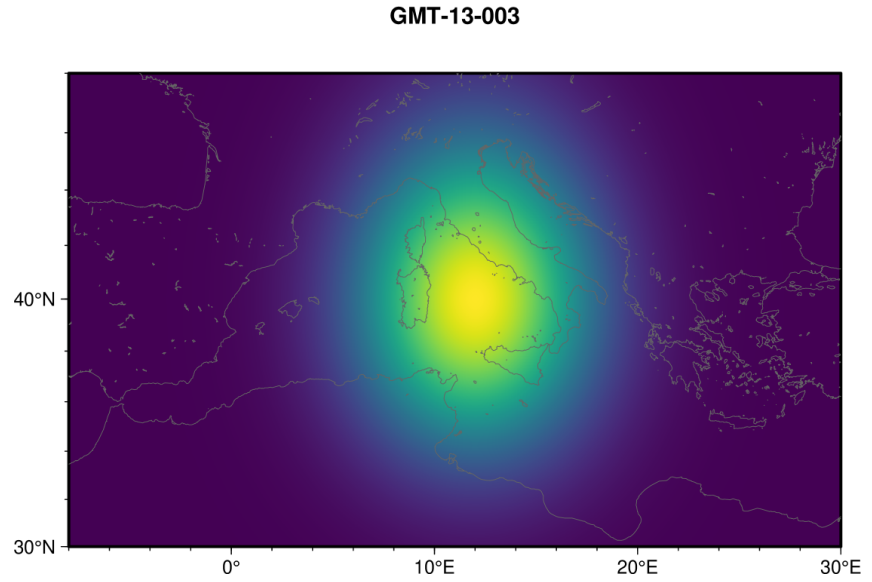
Change the grdmath spacing from one degree to 0.1 degree. Here the formula is known, so new nodes are direct evaluations of that model. This differs from interpolating a coarse measured grid, where finer spacing alone cannot recover unsampled detail.

Compare with GMT-13-002 · Change the image interpolation.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-13-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt grdmath -R-8/30/30/48 -I0.1 X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP
1000 MUL = hill.nc
gmt grdimage hill.nc -JM13c -Cviridis -nc -E200 -Baf
gmt coast -Di -W0.3p,gray40
gmt basemap -B+t"GMT-13-003"
gmt end
```

Actual output



GMT-13-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-13-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-13-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-13-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-13-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-13-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-13-003 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-I0.1`	Grid-node spacing 0.1 degrees in both longitude and latitude; evaluate the formula at these nodes.
`X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP 1000 MUL = hill.nc`	Evaluate 1000 * exp(-0.03 * ((longitude - 12)^2 + (latitude - 40)^2)). X and Y are node coordinates; SUB subtracts, DUP duplicates, MUL multiplies, ADD adds and EXP exponentiates. = hill.nc writes the result. Values are synthetic amplitude units.

GMT-13-003 · 4 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Cviridis`	Colour the synthetic grid with viridis, automatically scaled to the grid-value range.
`-nc`	Bicubic interpolation between existing grid nodes; this adds no measured information.
`-E200`	Resample the projected grid image at 200 dpi; separate from the final PNG export DPI set by begin.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-13-003 · 5 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.3p,gray40`	Draw 0.3-point gray40 stroke.

GMT-13-003 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-13-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-13-003 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-13-004

Resample the coarse grid explicitly

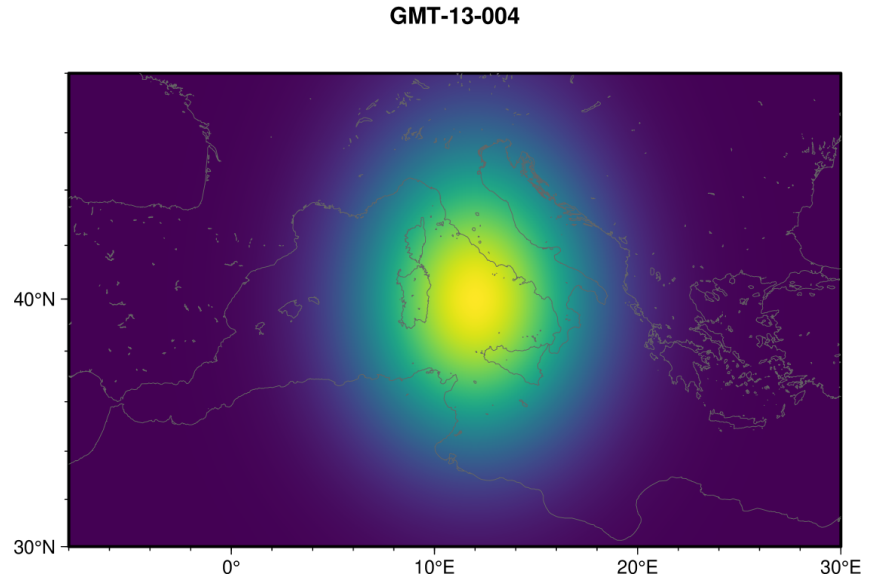
grdsample -I0.1 -nc creates a finer grid by bicubic interpolation of the original one-degree grid. Compare it with the direct model evaluation. A denser file and a smoother image do not imply that the source measurements became more accurate.

Compare with GMT-13-003 · Evaluate the model on a finer grid.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-13-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt grdmath -R-8/30/30/48 -I1 X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP
1000 MUL = hill.nc
gmt grdsample hill.nc -I0.1 -nc -Gresampled.nc
gmt grdimage resampled.nc -JM13c -Cviridis -nc -E200 -Baf
gmt coast -Di -W0.3p,gray40
gmt basemap -B+t"GMT-13-004"
gmt end
```

Actual output



GMT-13-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-13-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-13-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-13-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-13-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-13-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-13-004 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-I1`	Grid-node spacing 1 degrees in both longitude and latitude; evaluate the formula at these nodes.
`X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP 1000 MUL = hill.nc`	Evaluate 1000 * exp(-0.03 * ((longitude - 12)^2 + (latitude - 40)^2)). X and Y are node coordinates; SUB subtracts, DUP duplicates, MUL multiplies, ADD adds and EXP exponentiates. = hill.nc writes the result. Values are synthetic amplitude units.

GMT-13-004 · 4 · gmt grdsample · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-I0.1`	Grid-node spacing 0.1 degrees in both longitude and latitude; interpolate the existing coarse grid onto these nodes.
`-nc`	Bicubic interpolation between existing grid nodes; this adds no measured information.
`-Gresampled.nc`	Write the interpolated output grid to resampled.nc; the input grid is unchanged.

GMT-13-004 · 5 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`resampled.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Cviridis`	Colour the synthetic grid with viridis, automatically scaled to the grid-value range.
`-nc`	Bicubic interpolation between existing grid nodes; this adds no measured information.
`-E200`	Resample the projected grid image at 200 dpi; separate from the final PNG export DPI set by begin.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-13-004 · 6 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.3p,gray40`	Draw 0.3-point gray40 stroke.

GMT-13-004 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-13-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-13-004 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-13-005

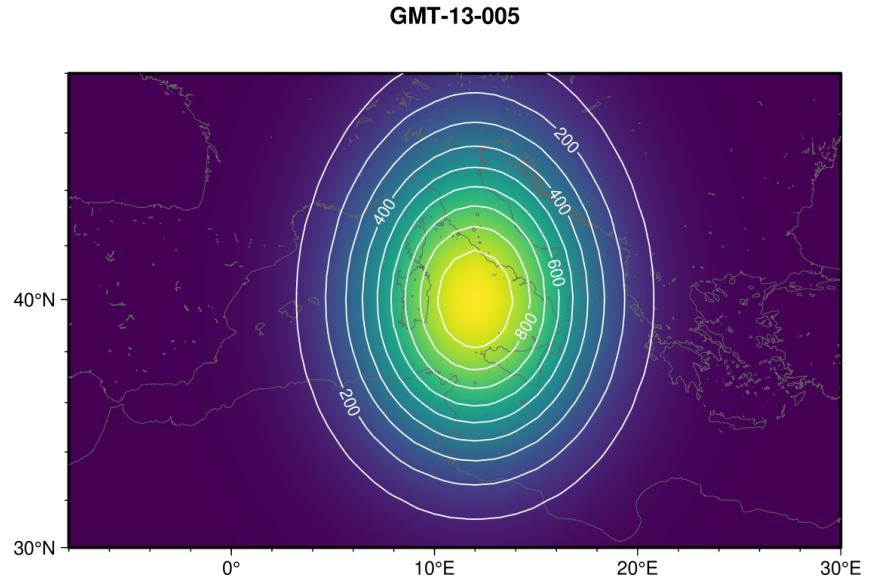
Inspect unsmoothed contour segments

Extract contours from the coarse one-degree grid with -S1, keeping the default contour-smoothing factor explicitly low. The background uses bicubic display interpolation. Its smooth colours and the contour segment geometry are separate choices.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-13-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt grdmath -R-8/30/30/48 -I1 X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP
1000 MUL = hill.nc
gmt grdimage hill.nc -JM13c -Cviridis -nc -E200 -Baf
gmt coast -Di -W0.3p,gray40
gmt grdcontour hill.nc -C100 -A200+f8p -S1 -W0.6p,white
gmt basemap -B+t"GMT-13-005"
gmt end
```

Actual output



GMT-13-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-13-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-13-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-13-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-13-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-13-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-13-005 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-I1`	Grid-node spacing 1 degrees in both longitude and latitude; evaluate the formula at these nodes.
`X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP 1000 MUL = hill.nc`	Evaluate 1000 * exp(-0.03 * ((longitude - 12)^2 + (latitude - 40)^2)). X and Y are node coordinates; SUB subtracts, DUP duplicates, MUL multiplies, ADD adds and EXP exponentiates. = hill.nc writes the result. Values are synthetic amplitude units.

GMT-13-005 · 4 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Cviridis`	Colour the synthetic grid with viridis, automatically scaled to the grid-value range.
`-nc`	Bicubic interpolation between existing grid nodes; this adds no measured information.
`-E200`	Resample the projected grid image at 200 dpi; separate from the final PNG export DPI set by begin.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-13-005 · 5 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.3p,gray40`	Draw 0.3-point gray40 stroke.

GMT-13-005 · 6 · gmt grdcontour · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-C100`	Draw contour levels every 100 synthetic amplitude units.
`-A200+f8p`	Annotate every 200 amplitude units; +f8p uses 8-point contour labels.
`-S1`	Contour-path resampling/smoothing factor 1; 1 keeps the low-smoothing baseline.
`-W0.6p,white`	Draw 0.6-point white stroke.

GMT-13-005 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-13-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-13-005 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-13-006

Smooth the drawn contour path

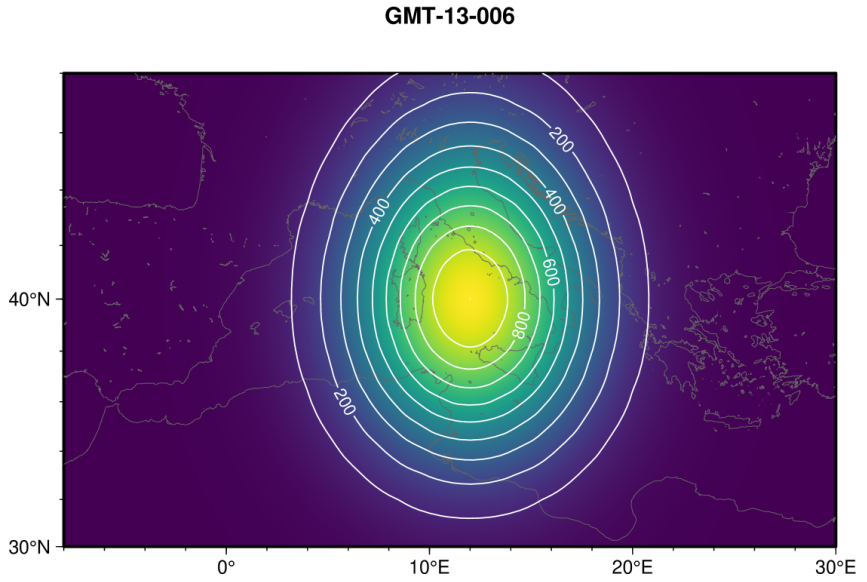
Change only grdcontour -S1 to -S8. GMT resamples the contour with a larger smoothing factor. This refines its drawn path between the coarse grid-derived segments; it does not make the underlying synthetic field or a measured dataset more detailed.

Compare with GMT-13-005 · Inspect unsmoothed contour segments.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-13-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt grdmath -R-8/30/30/48 -I1 X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP
1000 MUL = hill.nc
gmt grdimage hill.nc -JM13c -Cviridis -nc -E200 -Baf
gmt coast -Di -W0.3p,gray40
gmt grdcontour hill.nc -C100 -A200+f8p -S8 -W0.6p,white
gmt basemap -B+t"GMT-13-006"
gmt end
```

Actual output



GMT-13-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-13-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-13-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-13-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-13-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-13-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-13-006 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-I1`	Grid-node spacing 1 degrees in both longitude and latitude; evaluate the formula at these nodes.
`X 12 SUB DUP MUL Y 40 SUB DUP MUL ADD -0.03 MUL EXP 1000 MUL = hill.nc`	Evaluate 1000 * exp(-0.03 * ((longitude - 12)^2 + (latitude - 40)^2)). X and Y are node coordinates; SUB subtracts, DUP duplicates, MUL multiplies, ADD adds and EXP exponentiates. = hill.nc writes the result. Values are synthetic amplitude units.

GMT-13-006 · 4 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Cviridis`	Colour the synthetic grid with viridis, automatically scaled to the grid-value range.
`-nc`	Bicubic interpolation between existing grid nodes; this adds no measured information.
`-E200`	Resample the projected grid image at 200 dpi; separate from the final PNG export DPI set by begin.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-13-006 · 5 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-W0.3p,gray40`	Draw 0.3-point gray40 stroke.

GMT-13-006 · 6 · gmt grdcontour · GMT reference

Argument(s)	Meaning in this example
`hill.nc`	Read the locally generated synthetic Gaussian grid; its amplitude is illustrative, not elevation in metres.
`-C100`	Draw contour levels every 100 synthetic amplitude units.
`-A200+f8p`	Annotate every 200 amplitude units; +f8p uses 8-point contour labels.
`-S8`	Contour-path resampling/smoothing factor 8; 8 adds intermediate path samples for a smoother drawn contour, without refining the input grid.
`-W0.6p,white`	Draw 0.6-point white stroke.

GMT-13-006 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-13-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-13-006 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Raster quality and a polished map

GMT-14-001

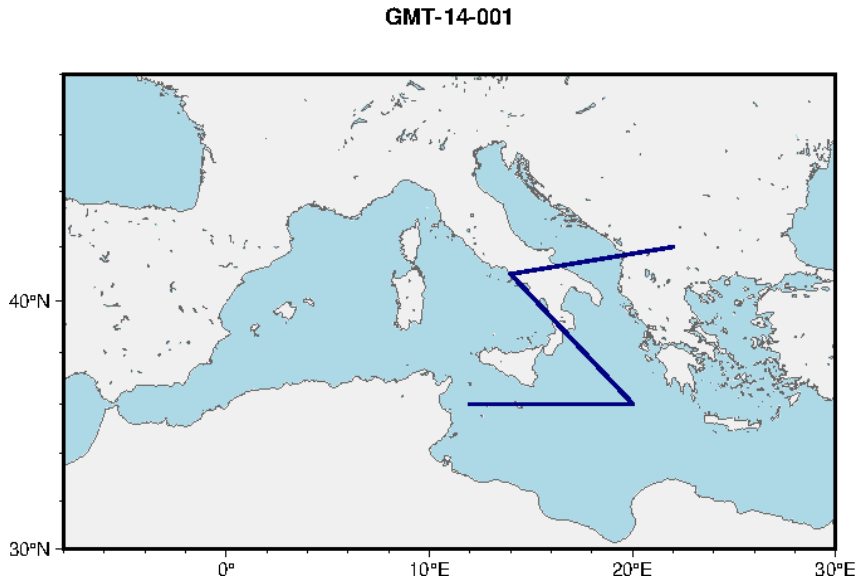
A deliberately rough raster export

Use E120,H1,Qg1,Qt1 to produce a 120-dpi PNG without graphics or text anti-aliasing. This deliberately rough export makes pixel stair-steps easier to inspect at native size. The accompanying PDF keeps vector linework; the underlying map geometry is unchanged.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-14-001 png,pdf E120,H1,Qg1,Qt1 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Di -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt set PS_LINE_CAP round PS_LINE_JOIN round
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt plot line.txt -A -W1.5p,navy
gmt basemap -B+t"GMT-14-001"
gmt end
```

Actual output



GMT-14-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-14-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-14-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-14-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-14-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E120,H1,Qg1,Qt1`	E120 sets final raster resolution to 120 dpi. H1 uses no extra supersampling. Qg1 and Qt1 disable graphics and text anti-aliasing (1).
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-14-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-14-001 · 4 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-001 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W1.5p,navy`	Draw 1.5-point navy stroke.

GMT-14-001 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-14-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-14-001 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-14-002

Anti-alias graphics and text

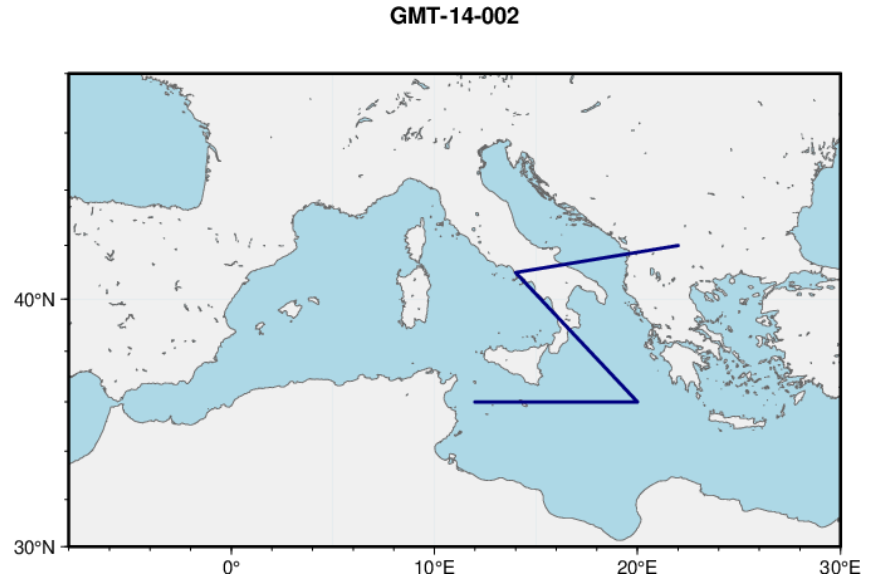
Change Qg1,Qt1 to Qg4,Qt4, keeping the same 120-dpi output. Ghostscript uses subsampling for graphics and text edges. Native image dimensions stay comparable; the benefit is edge rendering rather than new coastline vertices.

Compare with GMT-14-001 · A deliberately rough raster export.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-14-002 png,pdf E120,H1,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Di -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt set PS_LINE_CAP round PS_LINE_JOIN round
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt plot line.txt -A -W1.5p,navy
gmt basemap -B+t"GMT-14-002"
gmt end
```

Actual output



GMT-14-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-14-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-14-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-14-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-14-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E120,H1,Qg4,Qt4`	E120 sets final raster resolution to 120 dpi. H1 uses no extra supersampling. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-14-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-14-002 · 4 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-002 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W1.5p,navy`	Draw 1.5-point navy stroke.

GMT-14-002 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-14-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-14-002 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-14-003

Supersample before reducing the PNG

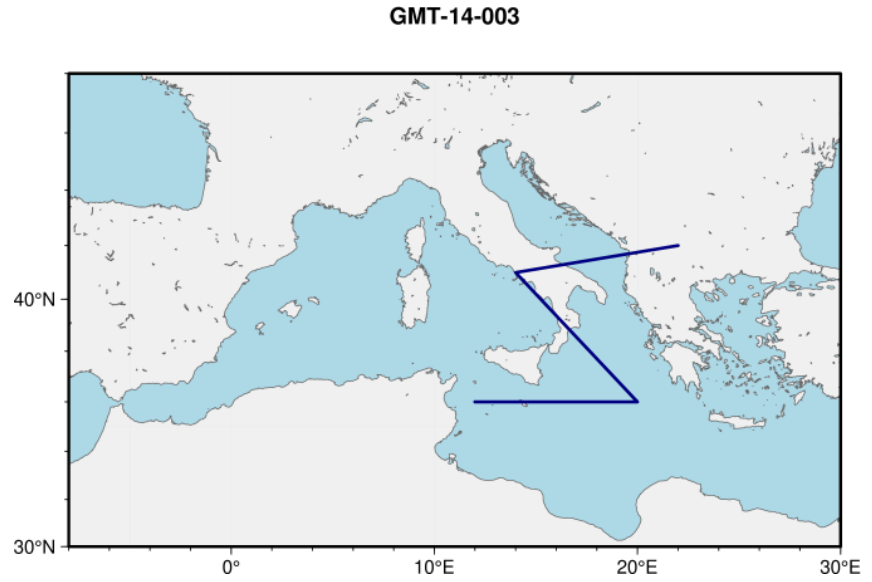
Change H1 to H3. GMT rasterizes at a temporarily higher resolution, then downsamples to the requested 120 dpi. Compare the sloping line and small text at native pixel size. This takes more processing and can reduce raster aliasing.

Compare with GMT-14-002 · Anti-alias graphics and text.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-14-003 png,pdf E120,H3,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Di -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt set PS_LINE_CAP round PS_LINE_JOIN round
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt plot line.txt -A -W1.5p,navy
gmt basemap -B+t"GMT-14-003"
gmt end
```

Actual output



GMT-14-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-14-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-14-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-14-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-14-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E120,H3,Qg4,Qt4`	E120 sets final raster resolution to 120 dpi. H3 rasterizes at 3 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-14-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-14-003 · 4 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-003 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W1.5p,navy`	Draw 1.5-point navy stroke.

GMT-14-003 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-14-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-14-003 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-14-004

Export more pixels for a larger image

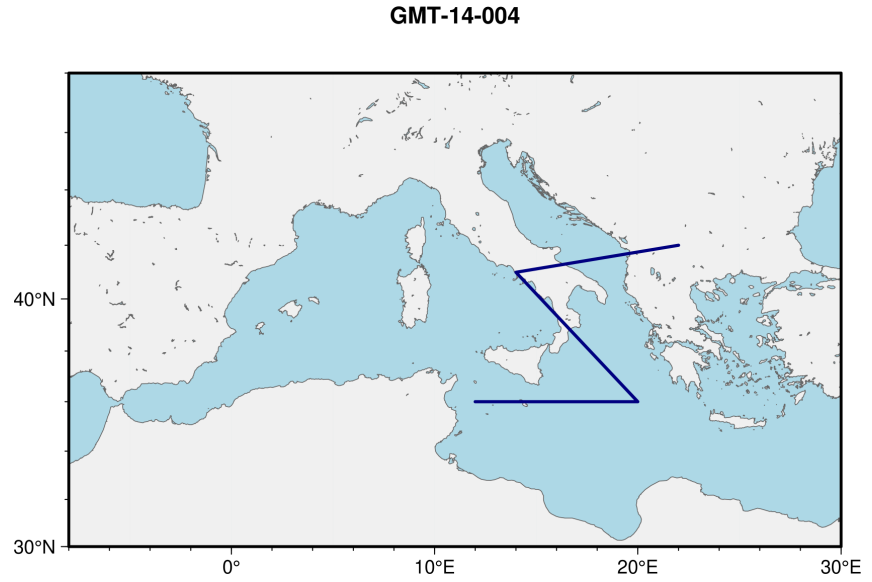
Change the output resolution to 300 dpi, with H3 and the same anti-aliasing settings. The PNG contains more pixels at the same physical map width. More pixels improve larger raster reproductions; they do not substitute for appropriate geographic resolution.

Compare with GMT-14-003 · Supersample before reducing the PNG.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-14-004 png,pdf E300,H3,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Di -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt set PS_LINE_CAP round PS_LINE_JOIN round
cat > line.txt <<'DATA'
12 36
20 36
14 41
22 42
DATA
gmt plot line.txt -A -W1.5p,navy
gmt basemap -B+t"GMT-14-004"
gmt end
```

Actual output



GMT-14-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-14-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-14-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-14-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-14-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E300,H3,Qg4,Qt4`	E300 sets final raster resolution to 300 dpi. H3 rasterizes at 3 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-14-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-004 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-14-004 · 4 · gmt set · GMT reference

Argument(s)	Meaning in this example
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-004 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`line.txt`	Read the local ordered longitude/latitude vertices as a line; its sharp turns expose the pen cap and join settings.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W1.5p,navy`	Draw 1.5-point navy stroke.

GMT-14-004 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-14-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-14-004 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-14-005

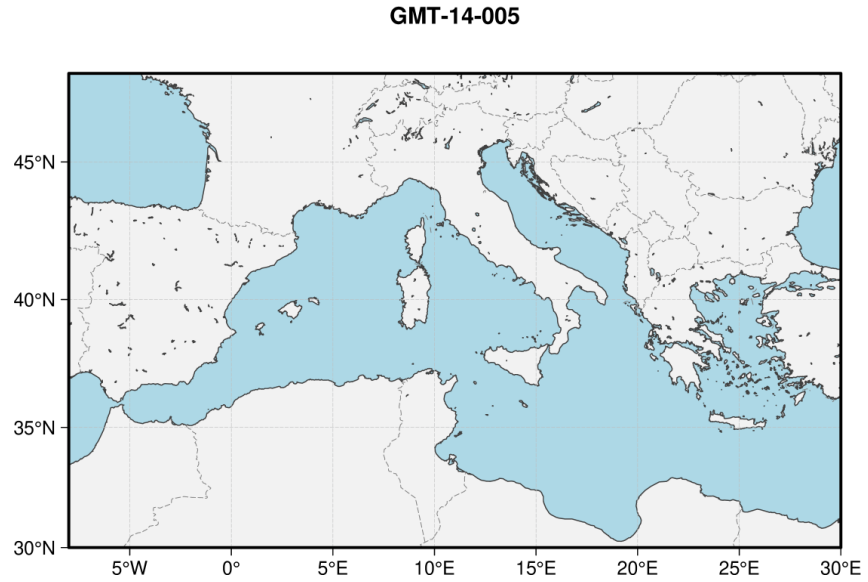
Give borders and graticules a clear hierarchy

Use an intermediate coastline with a 0.45-point shore pen, lighter dashed national borders and a very light graticule. Round joins soften the stroke corners without moving the boundary data. A clear hierarchy is often more effective than increasing the width of every line.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-14-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt set MAP_GRID_PEN_PRIMARY 0.2p,gray75,-
gmt coast -R-8/30/30/48 -JM13c -Di -Ggray95 -Slightblue -W0.45p,gray25
-N1/0.3p,gray50,- -Bxa5g5 -Bya5g5
gmt basemap -B+t"GMT-14-005"
gmt end
```

Actual output



GMT-14-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-14-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-14-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-14-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-14-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-14-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-005 · 3 · gmt set · GMT reference

Argument(s)	Meaning in this example
`MAP_GRID_PEN_PRIMARY 0.2p,gray75,-`	Draw primary graticule lines with a 0.2-point gray75 stroke with a dashed pattern.

GMT-14-005 · 4 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray95`	Fill land areas with gray95.
`-Slightblue`	Fill water areas with lightblue.
`-W0.45p,gray25`	Draw 0.45-point gray25 stroke.
`-N1/0.3p,gray50,-`	Draw national boundaries (level 1) with a 0.3-point gray50 stroke with a dashed pattern.
`-Bxa5g5`	On the longitude (x) axis, label every 5 degrees; draw grid lines every 5 degrees (g).
`-Bya5g5`	On the latitude (y) axis, label every 5 degrees; draw grid lines every 5 degrees (g).

GMT-14-005 · 5 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-14-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-14-005 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-14-006

Finish a detailed map with smooth raster edges

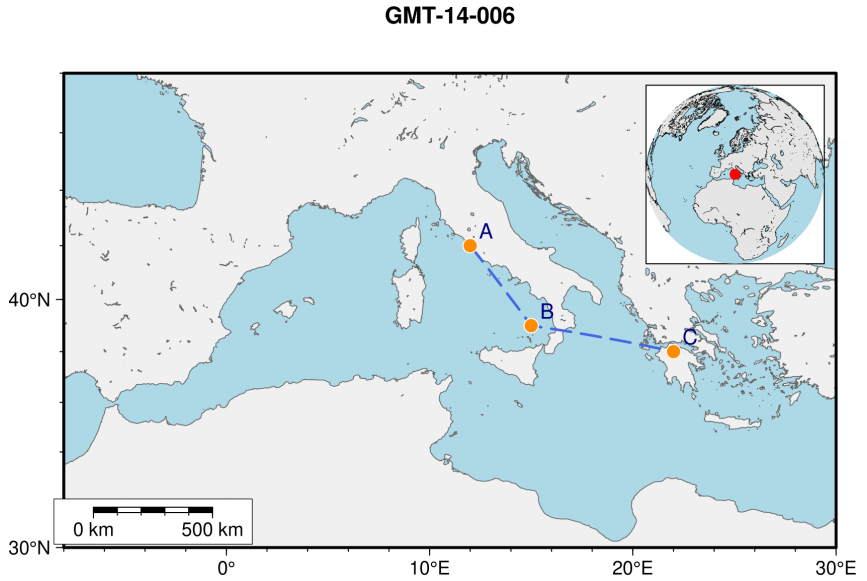
Combine the intermediate shoreline, restrained line widths, round caps and joins, labelled illustrative stations, scale bar and locator inset. Export with 300 dpi and H2 supersampling. Use the native vector PDF for scalable linework; geographic detail remains controlled by -Di, independently of raster quality.

Compare with GMT-08-003 · Assemble a finished map.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-14-006 png,pdf E300,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
gmt coast -R-8/30/30/48 -JM13c -Di -Ggray94 -Slightblue -W0.35p,gray40 -Baf
cat > sites.txt <<'DATA'
12 42 A
15 39 B
22 38 C
DATA
gmt plot sites.txt -i0,1 -W1.2p,royalblue,-
gmt plot sites.txt -i0,1 -Sc0.24c -Gdarkorange -W0.5p,white
gmt text sites.txt -F+f10p,Helvetica,navy+jBL -D0.15c/0.12c
gmt basemap -LjBL+c40+w500k+o0.5c/0.5c+f+u -F+gwhite+p0.3p
gmt inset begin -DjTR+w3c+o0.2c -F+gwhite+p0.5p
gmt coast -Rg -JG12/40/3c -Dc -Ggray90 -Slightblue -W0.2p
printf '12 40\n' | gmt plot -Sc0.18c -Gred
gmt inset end
gmt basemap -B+t"GMT-14-006"
gmt end
```

Actual output



GMT-14-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-14-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-14-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-14-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-14-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E300,H2,Qg4,Qt4`	E300 sets final raster resolution to 300 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-14-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-14-006 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R-8/30/30/48`	Geographic bounds west/east/south/north = -8/30/30/48 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Di`	Select intermediate-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-14-006 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-W1.2p,royalblue,-`	Draw 1.2-point royalblue stroke with a dashed pattern.

GMT-14-006 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.24c`	Draw circles with diameter 0.24 cm.
`-Gdarkorange`	Fill the symbols with darkorange.
`-W0.5p,white`	Draw 0.5-point white stroke.

GMT-14-006 · 6 · gmt text · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-F+f10p,Helvetica,navy+jBL`	+f selects 10-point Helvetica text in navy; +jBL anchors each label at its bottom-left corner. Read the text after longitude and latitude.
`-D0.15c/0.12c`	Offset labels by +0.15 cm horizontally and +0.12 cm vertically from the input coordinates.

GMT-14-006 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-LjBL+c40+w500k+o0.5c/0.5c+f+u`	jBL anchors inside at bottom-left; +c40 computes scale at latitude 40 degrees; +w500k sets a 500 km length; +o offsets by 0.5 cm in both directions; +f selects a fancy segmented bar; +u appends the units to annotations.
`-F+gwhite+p0.3p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.3-point black (the default) stroke.

GMT-14-006 · 8 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTR+w3c+o0.2c`	jTR anchors an inset inside the map at top-right; +w3c makes it 3 cm wide; +o0.2c offsets it inward 0.2 cm in both directions.
`-F+gwhite+p0.5p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.5-point black (the default) stroke.

GMT-14-006 · 9 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-Rg`	Global geographic region: longitudes 0 to 360 degrees, latitudes -90 to 90 degrees.
`-JG12/40/3c`	Orthographic globe view, centred at longitude 12, latitude 40 degrees; map width 3 cm.
`-Dc`	Select crude-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray90`	Fill land areas with gray90.
`-Slightblue`	Fill water areas with lightblue.
`-W0.2p`	Draw 0.2-point black (the default) stroke.

GMT-14-006 · 10 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`-Sc0.18c`	Draw circles with diameter 0.18 cm. Read longitude and latitude from the preceding printf pipeline.
`-Gred`	Fill the symbols with red.

GMT-14-006 · 11 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-14-006 · 12 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-14-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-14-006 · 13 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Zooming into a region

GMT-15-001

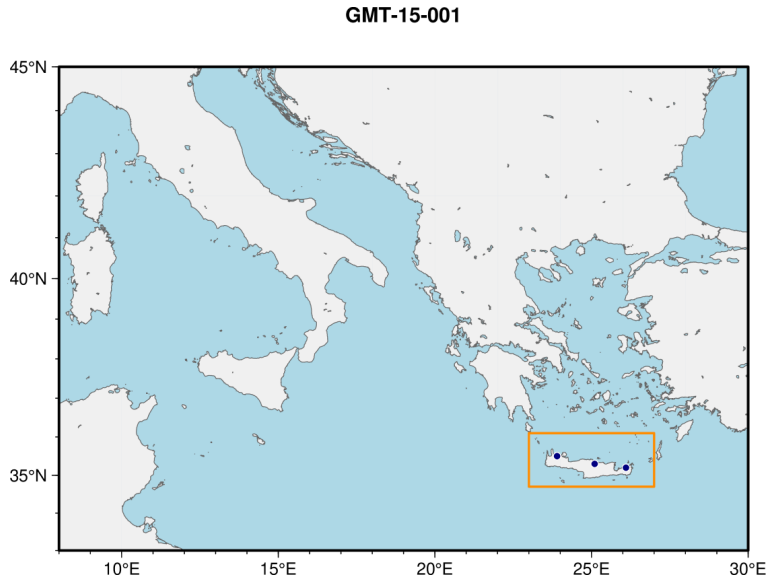
Mark the area to zoom into

Start with an eastern Mediterranean overview. The orange rectangle marks 23 to 27 degrees east and 34.7 to 36.1 degrees north around Crete. Four longitude/latitude corners define the window, and three invented sites provide landmarks for the following close-ups. This first map establishes the geographic context.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > focus.txt <<'DATA'
23 34.7
27 34.7
27 36.1
23 36.1
DATA
cat > sites.txt <<'DATA'
23.9 35.5 A
25.1 35.3 B
26.1 35.2 C
DATA
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt basemap -B+t"GMT-15-001"
gmt end
```

Actual output



GMT-15-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-15-001

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-001 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-001 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the zoom window: west 23, east 27, south 34.7, north 36.1 degrees. The same bounds define the close-up region.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-001 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-001 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-001`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-001 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-002

Zoom by narrowing the geographic region

Change only the main coast command region from -R8/30/33/45 to -R23/27/34.7/36.1. At the same 13 cm map width, the smaller extent gives more space to Crete and the same three illustrative sites. The orange outline now follows the map extent. Coastline resolution stays -Df and export stays 200 dpi: geographic zoom changes the region and map scale. Compare chapter 09 when the close-up needs finer shoreline geometry.

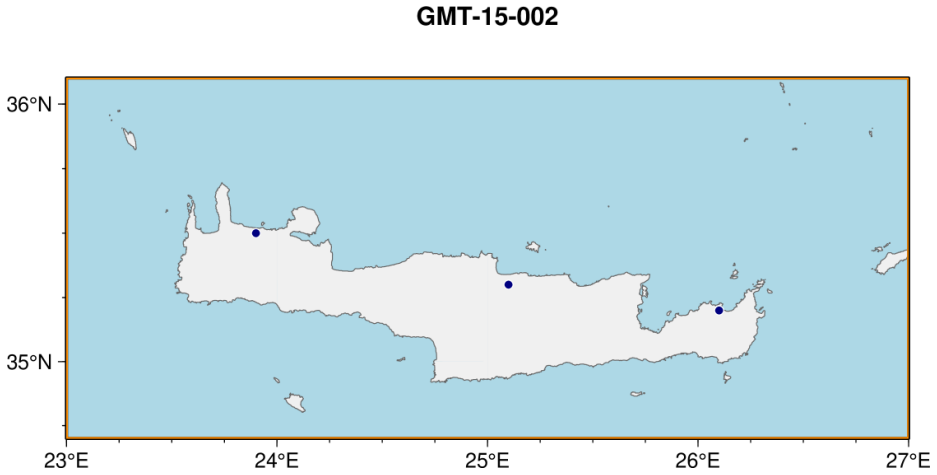
Compare with GMT-15-001 · Mark the area to zoom into.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > focus.txt <<'DATA'
23 34.7
27 34.7
27 36.1
23 36.1
DATA
cat > sites.txt <<'DATA'
23.9 35.5 A
25.1 35.3 B
26.1 35.2 C
DATA
gmt coast -R23/27/34.7/36.1 -JM13c -Df -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt basemap -B+t"GMT-15-002"
gmt end
```

Download: Runnable script · PNG map · Vector PDF map

Actual output



GMT-15-002 · Rendered by GMT

GMT · exit 0

Parameters explained · GMT-15-002

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-002 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Df`	Select full-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-002 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the zoom window: west 23, east 27, south 34.7, north 36.1 degrees. The same bounds define the close-up region.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-002 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-002 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-002`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-002 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-003

Keep the overview and add a zoom-in inset

Magnify the orange window in a matching inset. Its own region and fitted scale create the zoom; inset end restores the overview.

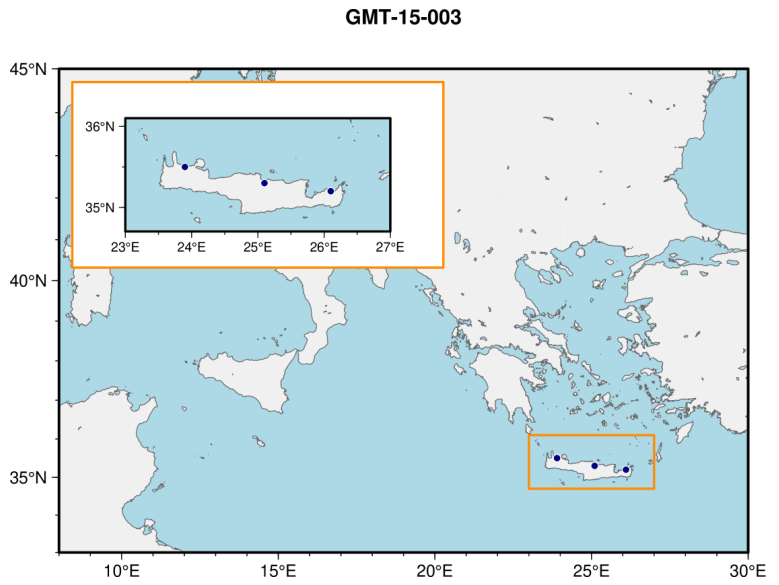
Compare with GMT-15-001 · Mark the area to zoom into.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
cat > focus.txt <<'DATA'
23 34.7
27 34.7
27 36.1
23 36.1
DATA
cat > sites.txt <<'DATA'
23.9 35.5 A
25.1 35.3 B
26.1 35.2 C
DATA
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset begin -DjTL+w7c/3.5c+o0.25c -C1c/0.5c -F+gwhite+p1.2p,darkorange
gmt coast -R23/27/34.7/36.1 -JM -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Bxa1f0.5
-Bya1f0.5 --FONT_ANNOT_PRIMARY=7p
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset end
gmt basemap -B+t"GMT-15-003"
gmt end
```

Download: Runnable script · PNG map · Vector PDF map

Actual output



GMT-15-003 · Rendered by GMT

GMT · exit 0

Parameters explained · GMT-15-003

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-003 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-003 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the zoom window: west 23, east 27, south 34.7, north 36.1 degrees. The same bounds define the close-up region.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-003 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-003 · 6 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTL+w7c/3.5c+o0.25c`	Place the inset inside the top-left (jTL) of the main map. +w sets a 7 cm by 3.5 cm box; +o offsets it inward by 0.25 cm in both directions. Position it away from the highlighted Crete window.
`-C1c/0.5c`	Reserve 1 cm on the left and right and 0.5 cm on the top and bottom of the inset box, leaving space for the close-up frame and annotations.
`-F+gwhite+p1.2p,darkorange`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1.2-point darkorange stroke.

GMT-15-003 · 7 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM`	Mercator projection with width omitted: GMT fits the new region into the inset plot area after subtracting its clearances. The inset has its own region and scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa1f0.5`	On the longitude (x) axis, label every 1 degree; draw ticks every 0.5 degrees (f).
`-Bya1f0.5`	On the latitude (y) axis, label every 1 degree; draw ticks every 0.5 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis annotations for this inset command only; the main-map annotation setting stays at 9 points.

GMT-15-003 · 8 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-003 · 9 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-003 · 10 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-003`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-003 · 11 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-004

Move the enlarged inset to bottom-left

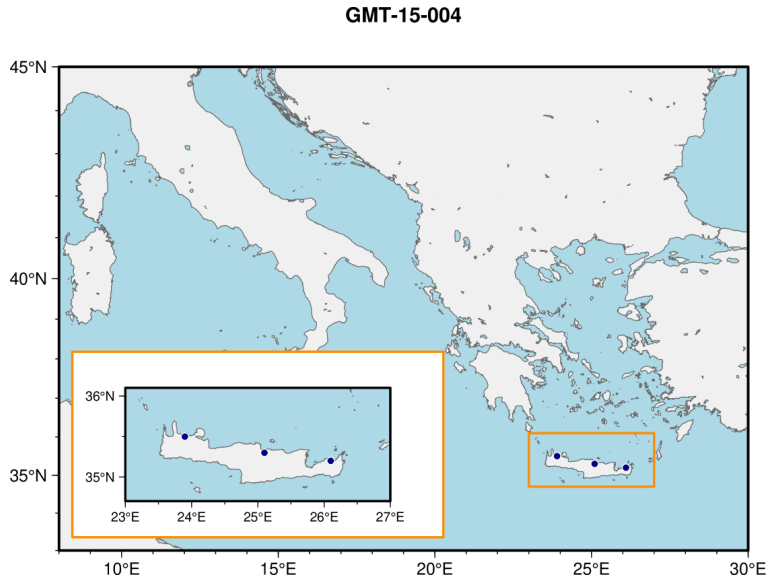
Change only the inset anchor from top-left to bottom-left. Keep the selected Crete window visible beside the inset.

Compare with GMT-15-003 · Keep the overview and add a zoom-in inset.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
printf '23 34.7\n27 34.7\n27 36.1\n23 36.1\n' > focus.txt
printf '23.9 35.5 A\n25.1 35.3 B\n26.1 35.2 C\n' > sites.txt
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset begin -DjBL+w7c/3.5c+o0.25c -C1c/0.5c -F+gwhite+p1.2p,darkorange
gmt coast -R23/27/34.7/36.1 -JM -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Bxa1f0.5
-Bya1f0.5 --FONT_ANNOT_PRIMARY=7p
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset end
gmt basemap -B+t"GMT-15-004"
gmt end
```

Actual output



GMT-15-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-15-004

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-004 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-004 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the highlighted region. Its bounds match the close-up coast command in this script.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-004 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-004 · 6 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjBL+w7c/3.5c+o0.25c`	Anchor inside the main map at bottom-left; +w sets panel width/height to 7c/3.5c and +o offsets it inward by 0.25c. c means cm.
`-C1c/0.5c`	Reserve 1c horizontally and 0.5c vertically inside the inset panel for its frame and annotations; c means cm.
`-F+gwhite+p1.2p,darkorange`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1.2-point darkorange stroke.

GMT-15-004 · 7 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM`	Mercator projection with width omitted: fit the inset region into its panel after subtracting the clearances.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa1f0.5`	Label the longitude (x) axis every 1 degree. Add ticks every 0.5 degrees (f).
`-Bya1f0.5`	Label the latitude (y) axis every 1 degree. Add ticks every 0.5 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.

GMT-15-004 · 8 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-004 · 9 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-004 · 10 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-004`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-004 · 11 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-005

Allocate a larger inset panel

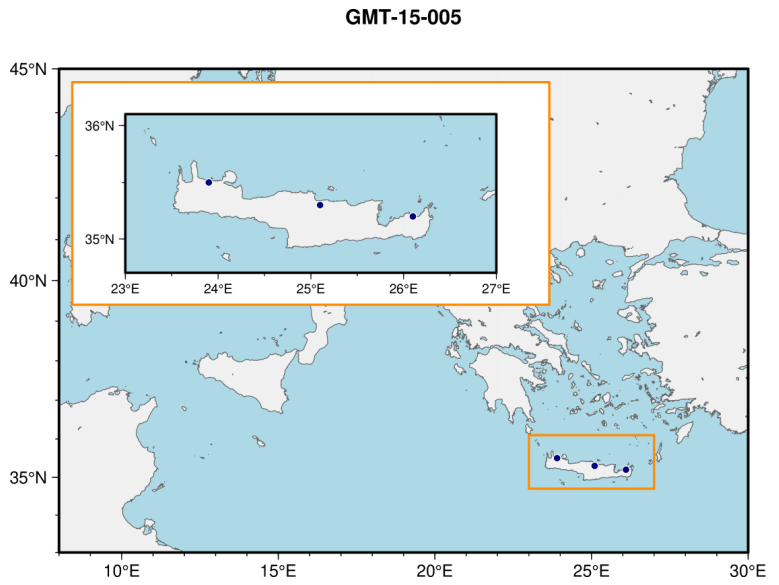
Increase the inset box to 9 by 4.2 cm. Its fitted map scale grows while the highlighted geographic region stays fixed.

Compare with GMT-15-003 · Keep the overview and add a zoom-in inset.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
printf '23 34.7\n27 34.7\n27 36.1\n23 36.1\n' > focus.txt
printf '23.9 35.5 A\n25.1 35.3 B\n26.1 35.2 C\n' > sites.txt
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset begin -DjTL+w9c/4.2c+o0.25c -C1c/0.5c -F+gwhite+p1.2p,darkorange
gmt coast -R23/27/34.7/36.1 -JM -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Bxa1f0.5
-Bya1f0.5 --FONT_ANNOT_PRIMARY=7p
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset end
gmt basemap -B+t"GMT-15-005"
gmt end
```

Actual output



GMT-15-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-15-005

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-005 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-005 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the highlighted region. Its bounds match the close-up coast command in this script.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-005 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-005 · 6 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTL+w9c/4.2c+o0.25c`	Anchor inside the main map at top-left; +w sets panel width/height to 9c/4.2c and +o offsets it inward by 0.25c. c means cm.
`-C1c/0.5c`	Reserve 1c horizontally and 0.5c vertically inside the inset panel for its frame and annotations; c means cm.
`-F+gwhite+p1.2p,darkorange`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1.2-point darkorange stroke.

GMT-15-005 · 7 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM`	Mercator projection with width omitted: fit the inset region into its panel after subtracting the clearances.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa1f0.5`	Label the longitude (x) axis every 1 degree. Add ticks every 0.5 degrees (f).
`-Bya1f0.5`	Label the latitude (y) axis every 1 degree. Add ticks every 0.5 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.

GMT-15-005 · 8 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-005 · 9 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-005 · 10 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-005`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-005 · 11 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-006

Use finer geography in the close-up

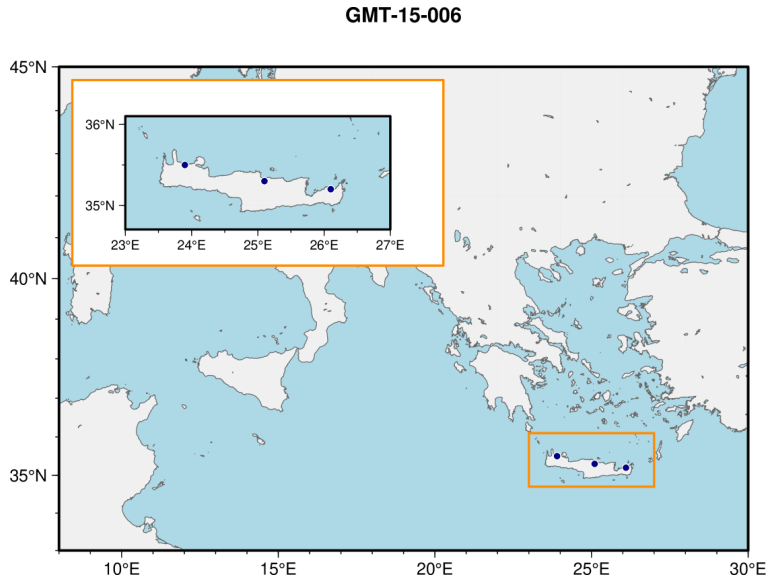
Keep high-resolution geography on the overview and switch only the inset from high to full resolution. Zoom and source detail can be controlled independently.

Compare with GMT-15-003 · Keep the overview and add a zoom-in inset.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-006 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
printf '23 34.7\n27 34.7\n27 36.1\n23 36.1\n' > focus.txt
printf '23.9 35.5 A\n25.1 35.3 B\n26.1 35.2 C\n' > sites.txt
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset begin -DjTL+w7c/3.5c+o0.25c -C1c/0.5c -F+gwhite+p1.2p,darkorange
gmt coast -R23/27/34.7/36.1 -JM -Df -Ggray94 -Slightblue -W0.35p,gray40 -Bxa1f0.5
-Bya1f0.5 --FONT_ANNOT_PRIMARY=7p
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset end
gmt basemap -B+t"GMT-15-006"
gmt end
```

Actual output



GMT-15-006 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-15-006

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-006 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-006 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-006 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-006 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-006 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-006 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the highlighted region. Its bounds match the close-up coast command in this script.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-006 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-006 · 6 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTL+w7c/3.5c+o0.25c`	Anchor inside the main map at top-left; +w sets panel width/height to 7c/3.5c and +o offsets it inward by 0.25c. c means cm.
`-C1c/0.5c`	Reserve 1c horizontally and 0.5c vertically inside the inset panel for its frame and annotations; c means cm.
`-F+gwhite+p1.2p,darkorange`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1.2-point darkorange stroke.

GMT-15-006 · 7 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM`	Mercator projection with width omitted: fit the inset region into its panel after subtracting the clearances.
`-Df`	Select full-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa1f0.5`	Label the longitude (x) axis every 1 degree. Add ticks every 0.5 degrees (f).
`-Bya1f0.5`	Label the latitude (y) axis every 1 degree. Add ticks every 0.5 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.

GMT-15-006 · 8 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-006 · 9 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-006 · 10 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-006`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-006 · 11 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-007

Choose an independent inset projection

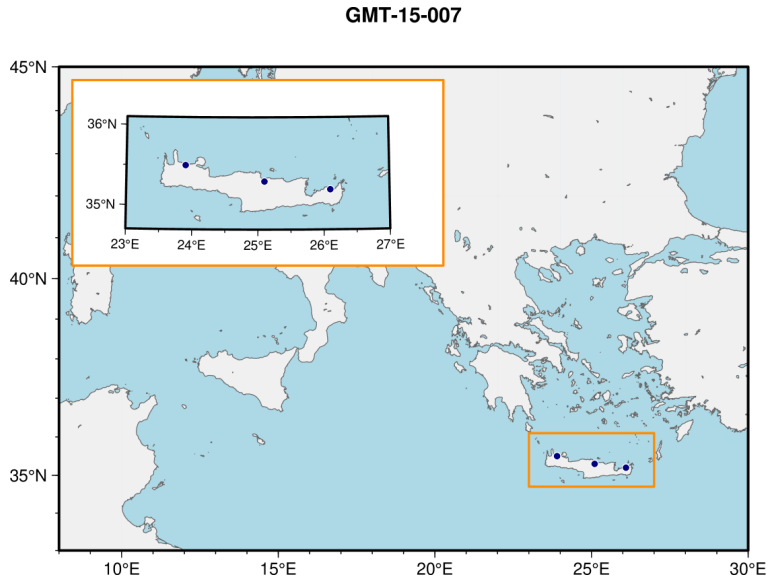
Use a Lambert conformal conic projection inside the Mercator overview. Each inset has its own region, projection and fitted scale.

Compare with GMT-15-003 · Keep the overview and add a zoom-in inset.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-007 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
printf '23 34.7\n27 34.7\n27 36.1\n23 36.1\n' > focus.txt
printf '23.9 35.5 A\n25.1 35.3 B\n26.1 35.2 C\n' > sites.txt
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset begin -DjTL+w7c/3.5c+o0.25c -C1c/0.5c -F+gwhite+p1.2p,darkorange
gmt coast -R23/27/34.7/36.1 -JL25/35.4/35/36/ -Dh -Ggray94 -Slightblue -W0.35p,gray40
-Bxa1f0.5 -Bya1f0.5 --FONT_ANNOT_PRIMARY=7p
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset end
gmt basemap -B+t"GMT-15-007"
gmt end
```

Actual output



GMT-15-007 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-15-007

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-007 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-007 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-007 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-007 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-007 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-007 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the highlighted region. Its bounds match the close-up coast command in this script.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-007 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-007 · 6 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTL+w7c/3.5c+o0.25c`	Anchor inside the main map at top-left; +w sets panel width/height to 7c/3.5c and +o offsets it inward by 0.25c. c means cm.
`-C1c/0.5c`	Reserve 1c horizontally and 0.5c vertically inside the inset panel for its frame and annotations; c means cm.
`-F+gwhite+p1.2p,darkorange`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1.2-point darkorange stroke.

GMT-15-007 · 7 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JL25/35.4/35/36/`	Lambert conformal conic centred at longitude 25 and latitude 35.4 degrees, with standard parallels 35 and 36. The final width is omitted so GMT fits the inset panel.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa1f0.5`	Label the longitude (x) axis every 1 degree. Add ticks every 0.5 degrees (f).
`-Bya1f0.5`	Label the latitude (y) axis every 1 degree. Add ticks every 0.5 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.

GMT-15-007 · 8 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-007 · 9 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-007 · 10 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-007`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-007 · 11 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-008

Show two successive zoom levels

The orange panel magnifies Crete. A blue window inside it selects the smaller region shown in the blue panel. The same synthetic stations are reused at both scales.

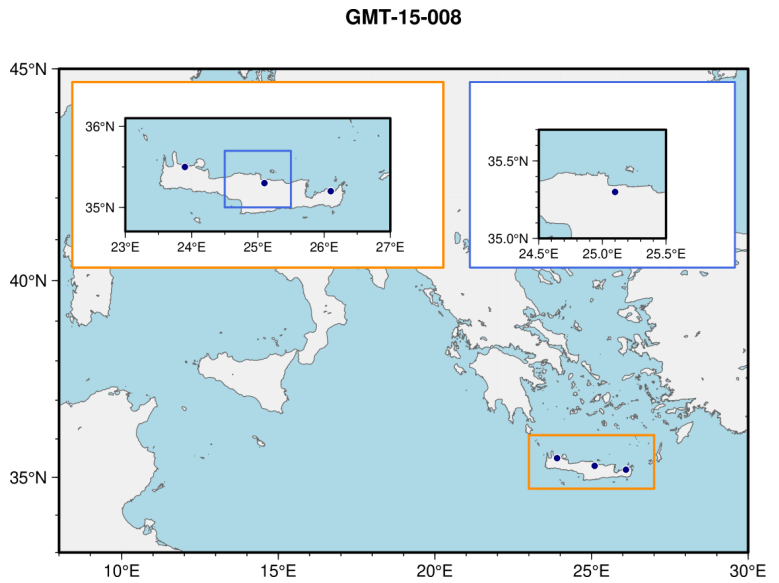
Compare with GMT-15-003 · Keep the overview and add a zoom-in inset.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-008 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
printf '23 34.7\n27 34.7\n27 36.1\n23 36.1\n' > focus.txt
printf '23.9 35.5 A\n25.1 35.3 B\n26.1 35.2 C\n' > sites.txt
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
printf '24.5 35\n25.5 35\n25.5 35.7\n24.5 35.7\n' > inner.txt
gmt inset begin -DjTL+w7c/3.5c+o0.25c -C1c/0.5c -F+gwhite+p1.2p,darkorange
gmt coast -R23/27/34.7/36.1 -JM -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Bxa1f0.5
-Bya1f0.5 --FONT_ANNOT_PRIMARY=7p
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt plot inner.txt -A -L -W1p,royalblue
gmt inset end
gmt inset begin -DjTR+w5c/3.5c+o0.25c -C1.3c/0.55c -F+gwhite+p1p,royalblue
gmt coast -R24.5/25.5/35/35.7 -JM -Df -Ggray94 -Slightblue -W0.35p,gray40 -Bxa0.5f0.1
-Bya0.5f0.1 --FONT_ANNOT_PRIMARY=7p --FORMAT_GEO_MAP=ddd.xF
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset end
gmt basemap -B+t"GMT-15-008"
gmt end
```

Download: Runnable script · PNG map · Vector PDF map

Actual output



GMT-15-008 · Rendered by GMT

GMT · exit 0

Parameters explained · GMT-15-008

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-008 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-008 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-008 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-008 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-008 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-008 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the highlighted region. Its bounds match the close-up coast command in this script.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-008 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-008 · 6 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTL+w7c/3.5c+o0.25c`	Anchor inside the main map at top-left; +w sets panel width/height to 7c/3.5c and +o offsets it inward by 0.25c. c means cm.
`-C1c/0.5c`	Reserve 1c horizontally and 0.5c vertically inside the inset panel for its frame and annotations; c means cm.
`-F+gwhite+p1.2p,darkorange`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1.2-point darkorange stroke.

GMT-15-008 · 7 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM`	Mercator projection with width omitted: fit the inset region into its panel after subtracting the clearances.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa1f0.5`	Label the longitude (x) axis every 1 degree. Add ticks every 0.5 degrees (f).
`-Bya1f0.5`	Label the latitude (y) axis every 1 degree. Add ticks every 0.5 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.

GMT-15-008 · 8 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-008 · 9 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`inner.txt`	Read the corners of the second zoom window: longitudes 24.5 to 25.5 and latitudes 35 to 35.7 degrees, within the Crete window.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1p,royalblue`	Draw 1-point royalblue stroke.

GMT-15-008 · 10 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-008 · 11 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTR+w5c/3.5c+o0.25c`	Anchor inside the main map at top-right; +w sets panel width/height to 5c/3.5c and +o offsets it inward by 0.25c. c means cm.
`-C1.3c/0.55c`	Reserve 1.3c horizontally and 0.55c vertically inside the inset panel for its frame and annotations; c means cm.
`-F+gwhite+p1p,royalblue`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1-point royalblue stroke.

GMT-15-008 · 12 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R24.5/25.5/35/35.7`	Geographic bounds west/east/south/north = 24.5/25.5/35/35.7 degrees. Negative longitude is west; negative latitude is south.
`-JM`	Mercator projection with width omitted: fit the inset region into its panel after subtracting the clearances.
`-Df`	Select full-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa0.5f0.1`	Label the longitude (x) axis every 0.5 degrees. Add ticks every 0.1 degrees (f).
`-Bya0.5f0.1`	Label the latitude (y) axis every 0.5 degrees. Add ticks every 0.1 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.
`--FORMAT_GEO_MAP=ddd.xF`	Format geographic annotations as decimal degrees with one decimal place and a hemisphere suffix; keep close-up tick labels compact.

GMT-15-008 · 13 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-008 · 14 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-008 · 15 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-008`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-008 · 16 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-009

Connect the selection to its inset

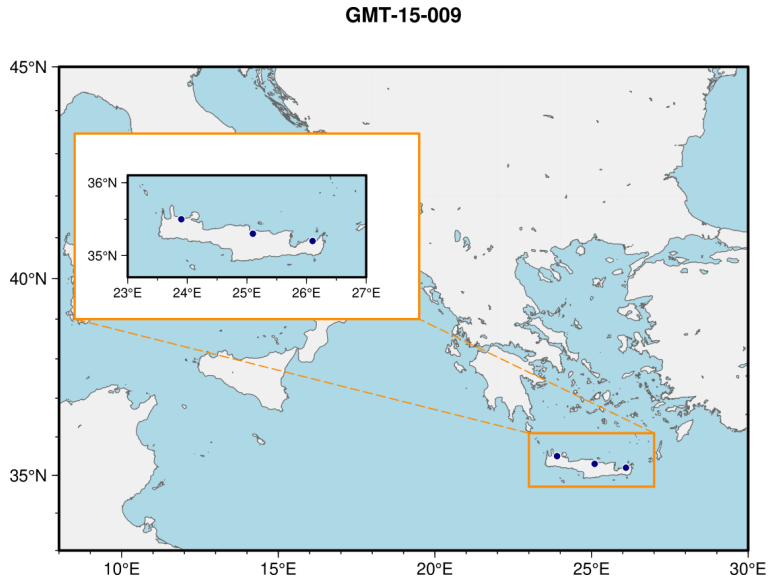
Anchor the panel in main-map coordinates and connect its bottom corners to the orange selection with dashed guides. Draw the connectors before the panel so they remain behind it.

Compare with GMT-15-003 · Keep the overview and add a zoom-in inset.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-009 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
printf '23 34.7\n27 34.7\n27 36.1\n23 36.1\n' > focus.txt
printf '23.9 35.5 A\n25.1 35.3 B\n26.1 35.2 C\n' > sites.txt
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
printf '23 36.1\n8.5 39\n>\n27 36.1\n19.5 39\n' > connectors.txt
gmt plot connectors.txt -A -W0.6p,darkorange,-
gmt inset begin -Dg8.5/39+w6.5c/3.5c+jBL -C1c/0.5c -F+gwhite+p1.2p,darkorange
gmt coast -R23/27/34.7/36.1 -JM -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Bxa1f0.5
-Bya1f0.5 --FONT_ANNOT_PRIMARY=7p
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset end
gmt basemap -B+t"GMT-15-009"
gmt end
```

Actual output



GMT-15-009 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-15-009

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-009 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-009 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-009 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-009 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-009 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-009 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the highlighted region. Its bounds match the close-up coast command in this script.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-009 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-009 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`connectors.txt`	Read two separate longitude/latitude connector segments. A line containing > starts the second segment; these guides connect the selection corners to the inset panel corners.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-W0.6p,darkorange,-`	Draw 0.6-point darkorange stroke with a dashed pattern.

GMT-15-009 · 7 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-Dg8.5/39+w6.5c/3.5c+jBL`	Anchor the panel bottom-left (+jBL) at main-map longitude 8.5 and latitude 39 (g). Use a 6.5 by 3.5 cm panel (+w). Its width is half the 13 cm main map, so its bottom-right corner is at longitude 19.5; these exact corners define the connector endpoints.
`-C1c/0.5c`	Reserve 1c horizontally and 0.5c vertically inside the inset panel for its frame and annotations; c means cm.
`-F+gwhite+p1.2p,darkorange`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1.2-point darkorange stroke.

GMT-15-009 · 8 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM`	Mercator projection with width omitted: fit the inset region into its panel after subtracting the clearances.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa1f0.5`	Label the longitude (x) axis every 1 degree. Add ticks every 0.5 degrees (f).
`-Bya1f0.5`	Label the latitude (y) axis every 1 degree. Add ticks every 0.5 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.

GMT-15-009 · 9 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-009 · 10 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-009 · 11 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-009`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-009 · 12 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-010

Reuse the zoom layout for Sicily

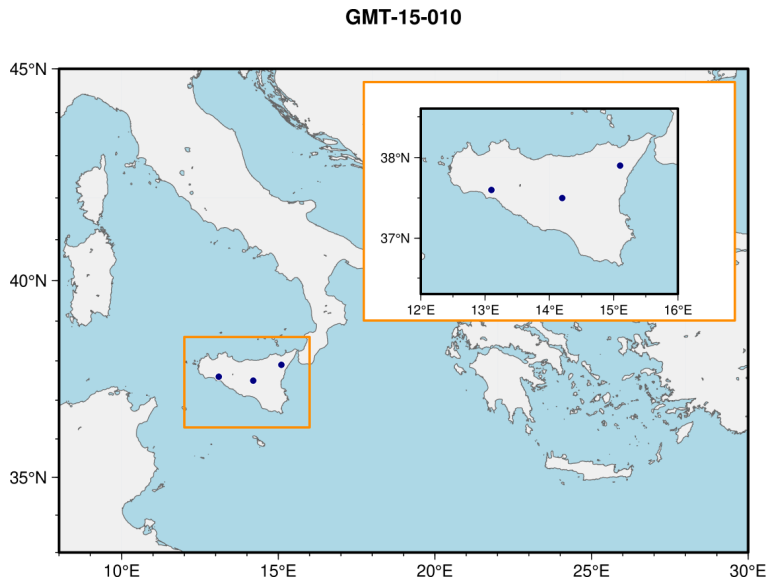
Select a different geographic window and synthetic station table. Place the enlarged Sicily view at top-right, clear of its highlighted source area.

Compare with GMT-15-003 · Keep the overview and add a zoom-in inset.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-010 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
printf '12 36.3\n16 36.3\n16 38.6\n12 38.6\n' > focus.txt
printf '13.1 37.6 A\n14.2 37.5 B\n15.1 37.9 C\n' > sites.txt
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset begin -DjTR+w7c/4.5c+o0.25c -C1c/0.5c -F+gwhite+p1.2p,darkorange
gmt coast -R12/16/36.3/38.6 -JM -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Bxa1f0.5
-Bya1f0.5 --FONT_ANNOT_PRIMARY=7p
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset end
gmt basemap -B+t"GMT-15-010"
gmt end
```

Actual output



GMT-15-010 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-15-010

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-010 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-010 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-010 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-010 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-010 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-010 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the highlighted region. Its bounds match the close-up coast command in this script.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-010 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-010 · 6 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTR+w7c/4.5c+o0.25c`	Anchor inside the main map at top-right; +w sets panel width/height to 7c/4.5c and +o offsets it inward by 0.25c. c means cm.
`-C1c/0.5c`	Reserve 1c horizontally and 0.5c vertically inside the inset panel for its frame and annotations; c means cm.
`-F+gwhite+p1.2p,darkorange`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1.2-point darkorange stroke.

GMT-15-010 · 7 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R12/16/36.3/38.6`	Geographic bounds west/east/south/north = 12/16/36.3/38.6 degrees. Negative longitude is west; negative latitude is south.
`-JM`	Mercator projection with width omitted: fit the inset region into its panel after subtracting the clearances.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa1f0.5`	Label the longitude (x) axis every 1 degree. Add ticks every 0.5 degrees (f).
`-Bya1f0.5`	Label the latitude (y) axis every 1 degree. Add ticks every 0.5 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.

GMT-15-010 · 8 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-010 · 9 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-010 · 10 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-010`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-010 · 11 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-011

Use geographic distances for circle sizes

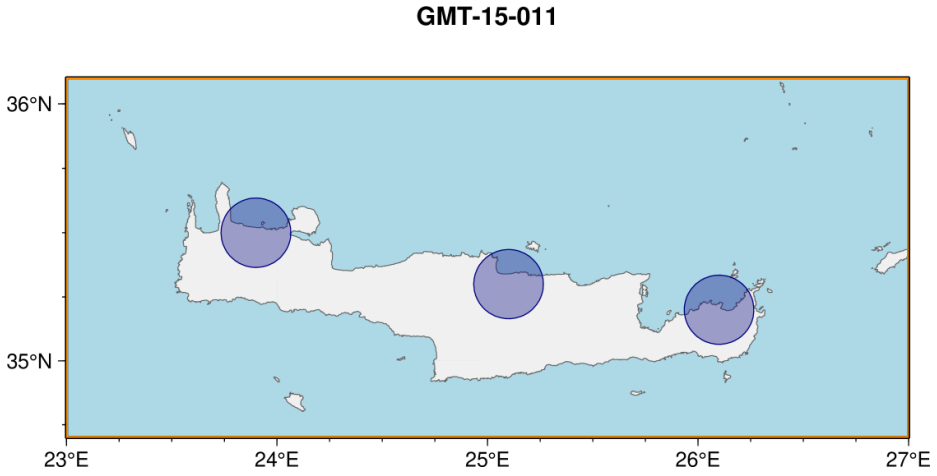
Draw 30 km diameter circles at the same sites. Geographic size follows map scale; the earlier -Sc symbols used a fixed physical diameter on the page.

Compare with GMT-15-002 · Zoom by narrowing the geographic region.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-011 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
printf '23 34.7\n27 34.7\n27 36.1\n23 36.1\n' > focus.txt
printf '23.9 35.5 A\n25.1 35.3 B\n26.1 35.2 C\n' > sites.txt
gmt coast -R23/27/34.7/36.1 -JM13c -Df -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -SE30k -Gnavy@65 -W0.4p,navy
gmt basemap -B+t"GMT-15-011"
gmt end
```

Actual output



GMT-15-011 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-15-011

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-011 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-011 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-011 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-011 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-011 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Df`	Select full-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-011 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the highlighted region. Its bounds match the close-up coast command in this script.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-011 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-SE30k`	Draw geographic circles with a 30 km diameter (15 km radius). Uppercase E uses map distances; the projection determines their appearance on the page.
`-Gnavy@65`	Fill symbols with navy at 65 percent transparency (0 is opaque; 100 is invisible).
`-W0.4p,navy`	Draw 0.4-point navy stroke.

GMT-15-011 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-011`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-011 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-15-012

Explain the close-up scale inside its panel

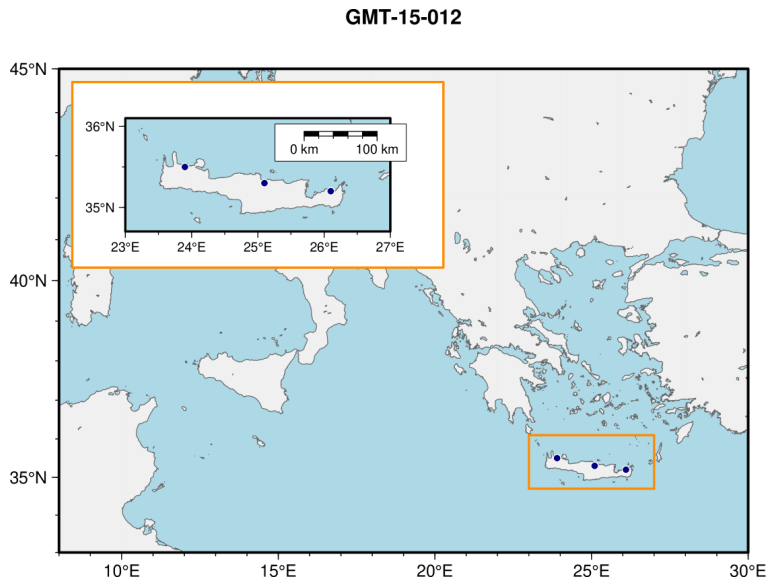
Place a 100 km scale bar inside the enlarged map. Compute it at latitude 35.4 degrees and keep its annotation sizes local to the inset.

Compare with GMT-15-003 · Keep the overview and add a zoom-in inset.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-15-012 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round
printf '23 34.7\n27 34.7\n27 36.1\n23 36.1\n' > focus.txt
printf '23.9 35.5 A\n25.1 35.3 B\n26.1 35.2 C\n' > sites.txt
gmt coast -R8/30/33/45 -JM13c -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Baf
gmt plot focus.txt -A -L -W1.2p,darkorange
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt inset begin -DjTL+w7c/3.5c+o0.25c -C1c/0.5c -F+gwhite+p1.2p,darkorange
gmt coast -R23/27/34.7/36.1 -JM -Dh -Ggray94 -Slightblue -W0.35p,gray40 -Bxa1f0.5
-Bya1f0.5 --FONT_ANNOT_PRIMARY=7p
gmt plot sites.txt -i0,1 -Sc0.14c -Gnavy -W0.4p,white
gmt basemap -LjTR+c35.4+w100k+o0.25c/0.25c+f+u -F+gwhite+p0.3p --
FONT_ANNOT_PRIMARY=7p --FONT_LABEL=8p
gmt inset end
gmt basemap -B+t"GMT-15-012"
gmt end
```

Actual output



GMT-15-012 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-15-012

Commands follow script order. Coordinates are longitude, then latitude, in degrees; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-15-012 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-15-012 png,pdf`	Start an independent modern session; the output stem figures/GMT-15-012 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-15-012 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Draw a plain map border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.

GMT-15-012 · 3 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R8/30/33/45`	Geographic bounds west/east/south/north = 8/30/33/45 degrees. Negative longitude is west; negative latitude is south.
`-JM13c`	Mercator projection; map width 13 cm. Uppercase M specifies width rather than scale.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Baf`	Draw the frame with automatically chosen annotation (a) and tick (f) intervals; this does not request grid lines.

GMT-15-012 · 4 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`focus.txt`	Read the four longitude/latitude corners of the highlighted region. Its bounds match the close-up coast command in this script.
`-A`	Connect the supplied geographic vertices as straight projected segments; suppress automatic great-circle resampling.
`-L`	Close the longitude/latitude input as a polygon, connecting its final vertex to its first.
`-W1.2p,darkorange`	Draw 1.2-point darkorange stroke.

GMT-15-012 · 5 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-012 · 6 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`begin`	Save the main-map state and enter a separate inset coordinate system; the following coast command defines its own region and projection.
`-DjTL+w7c/3.5c+o0.25c`	Anchor inside the main map at top-left; +w sets panel width/height to 7c/3.5c and +o offsets it inward by 0.25c. c means cm.
`-C1c/0.5c`	Reserve 1c horizontally and 0.5c vertically inside the inset panel for its frame and annotations; c means cm.
`-F+gwhite+p1.2p,darkorange`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 1.2-point darkorange stroke.

GMT-15-012 · 7 · gmt coast · GMT reference

Argument(s)	Meaning in this example
`-R23/27/34.7/36.1`	Geographic bounds west/east/south/north = 23/27/34.7/36.1 degrees. Negative longitude is west; negative latitude is south.
`-JM`	Mercator projection with width omitted: fit the inset region into its panel after subtracting the clearances.
`-Dh`	Select high-resolution GSHHG geography from the local installation; this controls source geometry, not raster DPI.
`-Ggray94`	Fill land areas with gray94.
`-Slightblue`	Fill water areas with lightblue.
`-W0.35p,gray40`	Draw 0.35-point gray40 stroke.
`-Bxa1f0.5`	Label the longitude (x) axis every 1 degree. Add ticks every 0.5 degrees (f).
`-Bya1f0.5`	Label the latitude (y) axis every 1 degree. Add ticks every 0.5 degrees (f).
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.

GMT-15-012 · 8 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sites.txt`	Read the local table: longitude, latitude, site name. plot selects numeric columns; text uses the trailing name.
`-i0,1`	Read zero-based columns 0 and 1 as longitude and latitude; ignore the trailing site name.
`-Sc0.14c`	Draw circles with diameter 0.14 cm.
`-Gnavy`	Fill the symbols with navy.
`-W0.4p,white`	Draw 0.4-point white stroke.

GMT-15-012 · 9 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-LjTR+c35.4+w100k+o0.25c/0.25c+f+u`	Anchor a scale at the inset top-right (jTR), compute it at latitude 35.4 degrees (+c), use a 100 km length (+w), offset by 0.25 cm in both directions (+o), draw a fancy bar (+f) and append units (+u).
`-F+gwhite+p0.3p`	Place a white background panel (+gwhite) behind this map decoration; +p sets a 0.3-point black (the default) stroke.
`--FONT_ANNOT_PRIMARY=7p`	Use 7-point axis or scale annotations for this command only; keep the main-map defaults.
`--FONT_LABEL=8p`	Use 8-point scale labels for this command only.

GMT-15-012 · 10 · gmt inset · GMT reference

Argument(s)	Meaning in this example
`end`	Leave the inset and restore the main-map region, projection and plotting origin.

GMT-15-012 · 11 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-15-012`	Add the stable example ID as the map title, reusing the current region and projection.

GMT-15-012 · 12 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Scattered samples become a grid

Interpolation between sparse samples is a modelling choice. These examples use Cartesian x/y and 25 synthetic samples, not longitude/latitude or measured terrain. Compare support and gaps as well as smooth appearance. See surface, nearneighbor and triangulate.

GMT-16-001

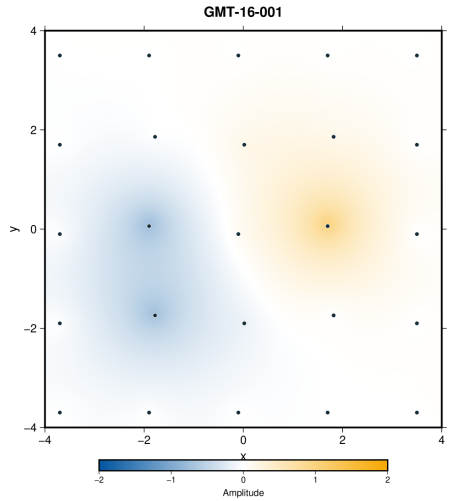
Interpolate scattered samples with tension

Start with 25 slightly irregular, synthetic x/y/amplitude records. surface solves a continuous-curvature grid with tension 0.35. Dots show the constraints; the space between them is interpolated, not measured.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-16-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm FONT_ANNOT_PRIMARY
9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN round COLOR_NAN gray85
printf -- '-3.70 -3.70 -0.000103\n-1.90 -3.70 -0.003495\n-0.10 -3.70 -0.001275\n1.70 -3.70
-0.000005\n3.50 -3.70 -0.000000\n-3.70 -1.90 -0.015851\n-1.78 -1.74 -0.730415\n0.02 -1.90
-0.154352\n1.82 -1.74 0.006190\n3.50 -1.90 0.000012\n-3.70 -0.10 -0.026238\n-1.90 0.06
-0.749954\n-0.10 -0.10 0.089985\n1.70 0.06 1.008522\n3.50 -0.10 0.002694\n-3.70 1.70
-0.000465\n-1.78 1.86 -0.009437\n0.02 1.70 0.176760\n1.82 1.86 0.160590\n3.50 1.70
0.000915\n-3.70 3.50 -0.000000\n-1.90 3.50 -0.000003\n-0.10 3.50 0.000073\n1.70 3.50
0.000151\n3.50 3.50 0.000000\n' > samples.txt
gmt surface samples.txt -R-4/4/-4/4 -I0.1 -T0.35 -Ggridded.nc
gmt makecpt '-C#00549f,white,#f6a800' -T-2/2/0.1 -Z -H > field.cpt
gmt grdimage gridded.nc -R-4/4/-4/4 -JX11c -Cfield.cpt -E200 -nc -Bxa2+lx -Bya2+ly -BWSne
gmt plot samples.txt -i0,1 -Sc0.12c '-G#132b36' -W0.3p,white
gmt colorbar -Cfield.cpt -DJBC+w8c/0.3c+h+o0/0.9c -Bxa1+lAmplitude
gmt basemap -B+t"GMT-16-001"
gmt end
```

Actual output



GMT-16-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-16-001

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-16-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-16-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-16-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-16-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-16-001 · 3 · gmt surface · GMT reference

Argument(s)	Meaning in this example
`samples.txt`	Read the 25 local synthetic x/y/amplitude triplets. Coordinates are Cartesian teaching units and the amplitudes are sampled from the formula printed in chapter 17.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`-T0.35`	Set both interior and boundary tension to 0.35 (allowed range 0 to 1). This controls the continuous-curvature solution; it is not an error estimate. Each input here occupies a different output cell.
`-Ggridded.nc`	Write the resulting NetCDF grid to gridded.nc. The original input is retained.

GMT-16-001 · 4 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`'-C#00549f,white,#f6a800'`	Interpolate through RWTH blue, white and orange; with the symmetric limits white represents zero.
`-T-2/2/0.1`	Palette limits and colour-slice increment are -2/2/0.1. These are synthetic amplitude units, or amplitude per coordinate unit for the derivative.
`-Z`	Interpolate colours continuously between the colour nodes.
`-H`	Write the palette to standard output in modern mode so the shell can save an explicit, reusable CPT file.
`> field.cpt`	Shell output redirection: save the generated table or palette in field.cpt.

GMT-16-001 · 5 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`gridded.nc`	Read the grid produced by this example gridding algorithm; its 0.1-unit nodes interpolate the same local synthetic samples.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c`	Use linear Cartesian axes with a 11 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-E200`	Resample the displayed image at 200 dpi; this changes the image sampling, not the input grid spacing or the support of the sample data.
`-nc`	Use bicubic interpolation when resampling the displayed grid image. This improves its visual sampling but adds no observations.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya2+ly`	On the y axis, annotate every 2 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-16-001 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`samples.txt`	Read the 25 local synthetic x/y/amplitude triplets. Coordinates are Cartesian teaching units and the amplitudes are sampled from the formula printed in chapter 17.
`-i0,1`	Read zero-based columns 0 and 1 as Cartesian sample positions; column 2 contains the synthetic scalar value.
`-Sc0.12c`	Draw sample locations as circles with a fixed diameter of 0.12 cm, independent of their scalar values.
`'-G#132b36'`	Fill symbols, arrowheads or bins with #132b36.
`-W0.3p,white`	Draw a 0.3-point white stroke.

GMT-16-001 · 7 · gmt colorbar · GMT reference

Argument(s)	Meaning in this example
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-DJBC+w8c/0.3c+h+o0/0.9c`	Place a horizontal colour bar outside the bottom-centre of the frame (JBC); make it 8 cm long and 0.3 cm thick and offset it 0.9 cm down.
`-Bxa1+lAmplitude`	On the x axis, annotate every 1 data units; label it Amplitude.

GMT-16-001 · 8 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-16-001`	Add MT-16-001 as the stable example title.

GMT-16-001 · 9 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-16-002

Keep gaps where local coverage is insufficient

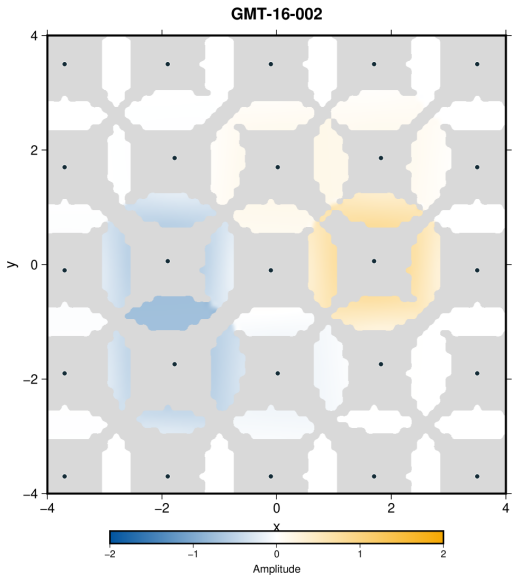
Replace only the gridding algorithm with nearneighbor. Its radius and sector requirement leave unsupported grid nodes undefined (NaN), shown in light gray. A smaller display pixel cannot restore missing observations.

Compare with GMT-16-001 · Interpolate scattered samples with tension.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-16-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
printf -- '-3.70 -3.70 -0.000103\n-1.90 -3.70 -0.003495\n-0.10 -3.70 -0.001275\n1.70
-3.70 -0.000005\n3.50 -3.70 -0.000000\n-3.70 -1.90 -0.015851\n-1.78 -1.74
-0.730415\n0.02 -1.90 -0.154352\n1.82 -1.74 0.006190\n3.50 -1.90 0.000012\n-3.70 -0.10
-0.026238\n-1.90 0.06 -0.749954\n-0.10 -0.10 0.089985\n1.70 0.06 1.008522\n3.50 -0.10
0.002694\n-3.70 1.70 -0.000465\n-1.78 1.86 -0.009437\n0.02 1.70 0.176760\n1.82 1.86
0.160590\n3.50 1.70 0.000915\n-3.70 3.50 -0.000000\n-1.90 3.50 -0.000003\n-0.10 3.50
0.000073\n1.70 3.50 0.000151\n3.50 3.50 0.000000\n' > samples.txt
gmt nearneighbor samples.txt -R-4/4/-4/4 -I0.1 -S1.2 -N4+m2 -Ggridded.nc
gmt makecpt '-C#00549f,white,#f6a800' -T-2/2/0.1 -Z -H > field.cpt
gmt grdimage gridded.nc -R-4/4/-4/4 -JX11c -Cfield.cpt -E200 -nc -Bxa2+lx -Bya2+ly
-BWSne
gmt plot samples.txt -i0,1 -Sc0.12c '-G#132b36' -W0.3p,white
gmt colorbar -Cfield.cpt -DJBC+w8c/0.3c+h+o0/0.9c -Bxa1+lAmplitude
gmt basemap -B+t"GMT-16-002"
gmt end
```

Actual output



GMT-16-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-16-002

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-16-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-16-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-16-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-16-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-16-002 · 3 · gmt nearneighbor · GMT reference

Argument(s)	Meaning in this example
`samples.txt`	Read the 25 local synthetic x/y/amplitude triplets. Coordinates are Cartesian teaching units and the amplitudes are sampled from the formula printed in chapter 17.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`-S1.2`	Search within radius 1.2 in the same Cartesian units as x and y; this is a local weighted average, not a global spline.
`-N4+m2`	Split the search circle into four sectors and require data in at least two (+m2); nodes without enough coverage become NaN. A sector contributes its nearest sample.
`-Ggridded.nc`	Write the resulting NetCDF grid to gridded.nc. The original input is retained.

GMT-16-002 · 4 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`'-C#00549f,white,#f6a800'`	Interpolate through RWTH blue, white and orange; with the symmetric limits white represents zero.
`-T-2/2/0.1`	Palette limits and colour-slice increment are -2/2/0.1. These are synthetic amplitude units, or amplitude per coordinate unit for the derivative.
`-Z`	Interpolate colours continuously between the colour nodes.
`-H`	Write the palette to standard output in modern mode so the shell can save an explicit, reusable CPT file.
`> field.cpt`	Shell output redirection: save the generated table or palette in field.cpt.

GMT-16-002 · 5 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`gridded.nc`	Read the grid produced by this example gridding algorithm; its 0.1-unit nodes interpolate the same local synthetic samples.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c`	Use linear Cartesian axes with a 11 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-E200`	Resample the displayed image at 200 dpi; this changes the image sampling, not the input grid spacing or the support of the sample data.
`-nc`	Use bicubic interpolation when resampling the displayed grid image. This improves its visual sampling but adds no observations.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya2+ly`	On the y axis, annotate every 2 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-16-002 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`samples.txt`	Read the 25 local synthetic x/y/amplitude triplets. Coordinates are Cartesian teaching units and the amplitudes are sampled from the formula printed in chapter 17.
`-i0,1`	Read zero-based columns 0 and 1 as Cartesian sample positions; column 2 contains the synthetic scalar value.
`-Sc0.12c`	Draw sample locations as circles with a fixed diameter of 0.12 cm, independent of their scalar values.
`'-G#132b36'`	Fill symbols, arrowheads or bins with #132b36.
`-W0.3p,white`	Draw a 0.3-point white stroke.

GMT-16-002 · 7 · gmt colorbar · GMT reference

Argument(s)	Meaning in this example
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-DJBC+w8c/0.3c+h+o0/0.9c`	Place a horizontal colour bar outside the bottom-centre of the frame (JBC); make it 8 cm long and 0.3 cm thick and offset it 0.9 cm down.
`-Bxa1+lAmplitude`	On the x axis, annotate every 1 data units; label it Amplitude.

GMT-16-002 · 8 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-16-002`	Add MT-16-002 as the stable example title.

GMT-16-002 · 9 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-16-003

Interpolate within Delaunay triangles

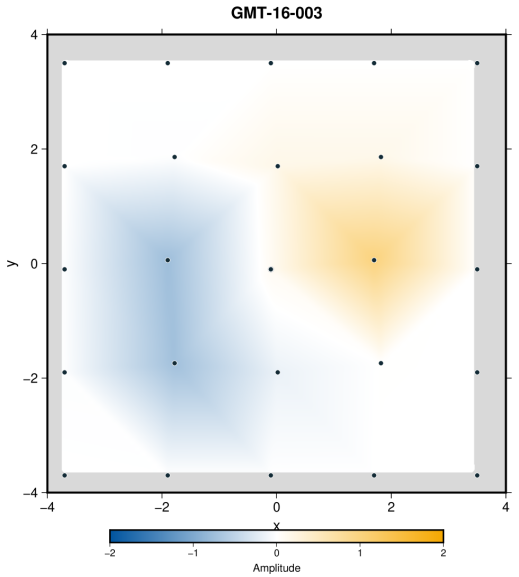
Use triangulate to linearly interpolate the same samples within their Delaunay triangles. Outside the convex hull, grid cells remain undefined and appear light gray. Compare its local planar pieces with the tensioned surface.

Compare with GMT-16-001 · Interpolate scattered samples with tension.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-16-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
printf -- '-3.70 -3.70 -0.000103\n-1.90 -3.70 -0.003495\n-0.10 -3.70 -0.001275\n1.70
-3.70 -0.000005\n3.50 -3.70 -0.000000\n-3.70 -1.90 -0.015851\n-1.78 -1.74
-0.730415\n0.02 -1.90 -0.154352\n1.82 -1.74 0.006190\n3.50 -1.90 0.000012\n-3.70 -0.10
-0.026238\n-1.90 0.06 -0.749954\n-0.10 -0.10 0.089985\n1.70 0.06 1.008522\n3.50 -0.10
0.002694\n-3.70 1.70 -0.000465\n-1.78 1.86 -0.009437\n0.02 1.70 0.176760\n1.82 1.86
0.160590\n3.50 1.70 0.000915\n-3.70 3.50 -0.000000\n-1.90 3.50 -0.000003\n-0.10 3.50
0.000073\n1.70 3.50 0.000151\n3.50 3.50 0.000000\n' > samples.txt
gmt triangulate samples.txt -R-4/4/-4/4 -I0.1 -Ggridded.nc
gmt makecpt '-C#00549f,white,#f6a800' -T-2/2/0.1 -Z -H > field.cpt
gmt grdimage gridded.nc -R-4/4/-4/4 -JX11c -Cfield.cpt -E200 -nc -Bxa2+lx -Bya2+ly
-BWSne
gmt plot samples.txt -i0,1 -Sc0.12c '-G#132b36' -W0.3p,white
gmt colorbar -Cfield.cpt -DJBC+w8c/0.3c+h+o0/0.9c -Bxa1+lAmplitude
gmt basemap -B+t"GMT-16-003"
gmt end
```

Actual output



GMT-16-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-16-003

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-16-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-16-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-16-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-16-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-16-003 · 3 · gmt triangulate · GMT reference

Argument(s)	Meaning in this example
`samples.txt`	Read the 25 local synthetic x/y/amplitude triplets. Coordinates are Cartesian teaching units and the amplitudes are sampled from the formula printed in chapter 17.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`-Ggridded.nc`	Write the resulting NetCDF grid to gridded.nc. The original input is retained.

GMT-16-003 · 4 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`'-C#00549f,white,#f6a800'`	Interpolate through RWTH blue, white and orange; with the symmetric limits white represents zero.
`-T-2/2/0.1`	Palette limits and colour-slice increment are -2/2/0.1. These are synthetic amplitude units, or amplitude per coordinate unit for the derivative.
`-Z`	Interpolate colours continuously between the colour nodes.
`-H`	Write the palette to standard output in modern mode so the shell can save an explicit, reusable CPT file.
`> field.cpt`	Shell output redirection: save the generated table or palette in field.cpt.

GMT-16-003 · 5 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`gridded.nc`	Read the grid produced by this example gridding algorithm; its 0.1-unit nodes interpolate the same local synthetic samples.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c`	Use linear Cartesian axes with a 11 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-E200`	Resample the displayed image at 200 dpi; this changes the image sampling, not the input grid spacing or the support of the sample data.
`-nc`	Use bicubic interpolation when resampling the displayed grid image. This improves its visual sampling but adds no observations.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya2+ly`	On the y axis, annotate every 2 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-16-003 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`samples.txt`	Read the 25 local synthetic x/y/amplitude triplets. Coordinates are Cartesian teaching units and the amplitudes are sampled from the formula printed in chapter 17.
`-i0,1`	Read zero-based columns 0 and 1 as Cartesian sample positions; column 2 contains the synthetic scalar value.
`-Sc0.12c`	Draw sample locations as circles with a fixed diameter of 0.12 cm, independent of their scalar values.
`'-G#132b36'`	Fill symbols, arrowheads or bins with #132b36.
`-W0.3p,white`	Draw a 0.3-point white stroke.

GMT-16-003 · 7 · gmt colorbar · GMT reference

Argument(s)	Meaning in this example
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-DJBC+w8c/0.3c+h+o0/0.9c`	Place a horizontal colour bar outside the bottom-centre of the frame (JBC); make it 8 cm long and 0.3 cm thick and offset it 0.9 cm down.
`-Bxa1+lAmplitude`	On the x axis, annotate every 1 data units; label it Amplitude.

GMT-16-003 · 8 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-16-003`	Add MT-16-003 as the stable example title.

GMT-16-003 · 9 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Calculate with grids and extract a transect

Use one signed synthetic field to distinguish data processing from rendering. Its formula is f(x,y)=2 exp(-((x-1)^2+(y-0.5)^2))-1.5 exp(-0.7((x+1.4)^2+(y+0.8)^2)). Coordinates have local Cartesian units; values have synthetic amplitude units. A narrower palette can make a small residual look strong. DDX measures only change along x; it does not report steepest-slope magnitude. See grdmath, grdfilter, project and grdtrack.

GMT-17-001

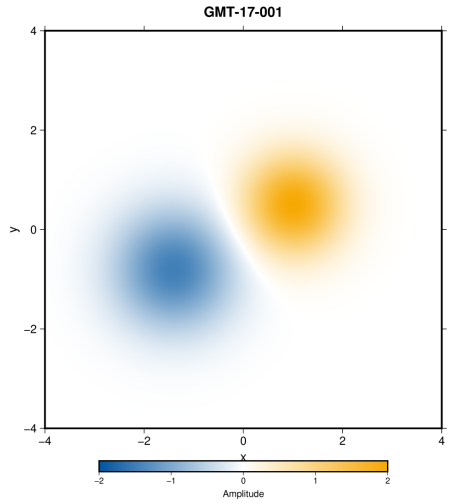
Build a signed analytic field

Two explicitly synthetic Gaussian anomalies make a positive peak and a negative basin. x and y are Cartesian teaching units; amplitudes are not metres. This is the reference for the following grid calculations.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-17-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm FONT_ANNOT_PRIMARY
9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN round COLOR_NAN gray85
gmt grdmath -R-4/4/-4/4 -I0.1 X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD SQR Y
0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc
gmt makecpt '-C#00549f,white,#f6a800' -T-2/2/0.1 -Z -H > field.cpt
gmt grdimage field.nc -R-4/4/-4/4 -JX11c -Cfield.cpt -E200 -nc -Bxa2+lx -Bya2+ly -BWSne
gmt colorbar -Cfield.cpt -DJBC+w8c/0.3c+h+o0/0.9c -Bxa1+lAmplitude
gmt basemap -B+t"GMT-17-001"
gmt end
```

Actual output



GMT-17-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-17-001

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-17-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-17-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-17-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-17-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-17-001 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc`	Evaluate f(x,y)=2 exp(-((x-1)^2+(y-0.5)^2))-1.5 exp(-0.7((x+1.4)^2+(y+0.8)^2)). X/Y are node coordinates; SUB subtracts, ADD adds, SQR squares, NEG negates, MUL multiplies and EXP exponentiates. The final SUB subtracts the negative anomaly; = field.nc saves the grid.

GMT-17-001 · 4 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`'-C#00549f,white,#f6a800'`	Interpolate through RWTH blue, white and orange; with the symmetric limits white represents zero.
`-T-2/2/0.1`	Palette limits and colour-slice increment are -2/2/0.1. These are synthetic amplitude units, or amplitude per coordinate unit for the derivative.
`-Z`	Interpolate colours continuously between the colour nodes.
`-H`	Write the palette to standard output in modern mode so the shell can save an explicit, reusable CPT file.
`> field.cpt`	Shell output redirection: save the generated table or palette in field.cpt.

GMT-17-001 · 5 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`field.nc`	Read the locally generated signed field: a positive Gaussian centred at (1,0.5), minus a broader negative Gaussian centred at (-1.4,-0.8). These are synthetic amplitudes.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c`	Use linear Cartesian axes with a 11 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-E200`	Resample the displayed image at 200 dpi; this changes the image sampling, not the input grid spacing or the support of the sample data.
`-nc`	Use bicubic interpolation when resampling the displayed grid image. This improves its visual sampling but adds no observations.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya2+ly`	On the y axis, annotate every 2 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-17-001 · 6 · gmt colorbar · GMT reference

Argument(s)	Meaning in this example
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-DJBC+w8c/0.3c+h+o0/0.9c`	Place a horizontal colour bar outside the bottom-centre of the frame (JBC); make it 8 cm long and 0.3 cm thick and offset it 0.9 cm down.
`-Bxa1+lAmplitude`	On the x axis, annotate every 1 data units; label it Amplitude.

GMT-17-001 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-17-001`	Add MT-17-001 as the stable example title.

GMT-17-001 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-17-002

Filter the field without changing its grid

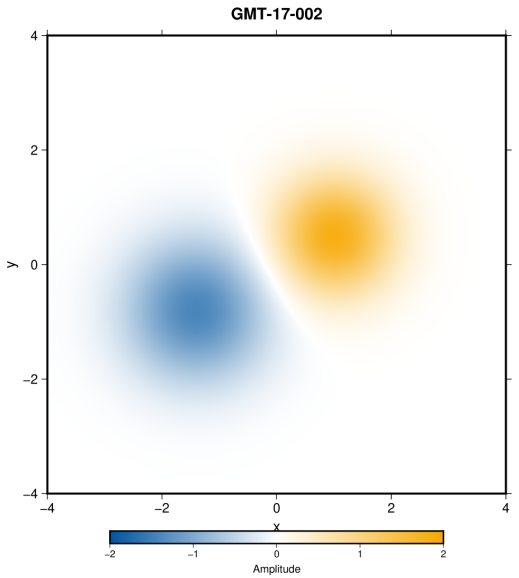
Apply a Gaussian filter of full width 1.2 coordinate units. The output has the same nodes and colour limits as the reference; smoothing changes amplitudes and spatial detail.

Compare with GMT-17-001 · Build a signed analytic field.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-17-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
gmt grdmath -R-4/4/-4/4 -I0.1 X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD
SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc
gmt grdfilter field.nc -D0 -Fg1.2 -Gsmooth.nc
gmt makecpt '-C#00549f,white,#f6a800' -T-2/2/0.1 -Z -H > field.cpt
gmt grdimage smooth.nc -R-4/4/-4/4 -JX11c -Cfield.cpt -E200 -nc -Bxa2+lx -Bya2+ly
-BWSne
gmt colorbar -Cfield.cpt -DJBC+w8c/0.3c+h+o0/0.9c -Bxa1+lAmplitude
gmt basemap -B+t"GMT-17-002"
gmt end
```

Actual output



GMT-17-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-17-002

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-17-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-17-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-17-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-17-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-17-002 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc`	Evaluate f(x,y)=2 exp(-((x-1)^2+(y-0.5)^2))-1.5 exp(-0.7((x+1.4)^2+(y+0.8)^2)). X/Y are node coordinates; SUB subtracts, ADD adds, SQR squares, NEG negates, MUL multiplies and EXP exponentiates. The final SUB subtracts the negative anomaly; = field.nc saves the grid.

GMT-17-002 · 4 · gmt grdfilter · GMT reference

Argument(s)	Meaning in this example
`field.nc`	Read the locally generated signed field: a positive Gaussian centred at (1,0.5), minus a broader negative Gaussian centred at (-1.4,-0.8). These are synthetic amplitudes.
`-D0`	Treat x and y as Cartesian coordinates with the same units; filter distances use those coordinate units.
`-Fg1.2`	Apply a Gaussian filter with full width 1.2 coordinate units (six standard deviations); grid spacing remains 0.1.
`-Gsmooth.nc`	Write the resulting NetCDF grid to smooth.nc. The original input is retained.

GMT-17-002 · 5 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`'-C#00549f,white,#f6a800'`	Interpolate through RWTH blue, white and orange; with the symmetric limits white represents zero.
`-T-2/2/0.1`	Palette limits and colour-slice increment are -2/2/0.1. These are synthetic amplitude units, or amplitude per coordinate unit for the derivative.
`-Z`	Interpolate colours continuously between the colour nodes.
`-H`	Write the palette to standard output in modern mode so the shell can save an explicit, reusable CPT file.
`> field.cpt`	Shell output redirection: save the generated table or palette in field.cpt.

GMT-17-002 · 6 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`smooth.nc`	Read the Gaussian-filtered version of field.nc on the same grid.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c`	Use linear Cartesian axes with a 11 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-E200`	Resample the displayed image at 200 dpi; this changes the image sampling, not the input grid spacing or the support of the sample data.
`-nc`	Use bicubic interpolation when resampling the displayed grid image. This improves its visual sampling but adds no observations.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya2+ly`	On the y axis, annotate every 2 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-17-002 · 7 · gmt colorbar · GMT reference

Argument(s)	Meaning in this example
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-DJBC+w8c/0.3c+h+o0/0.9c`	Place a horizontal colour bar outside the bottom-centre of the frame (JBC); make it 8 cm long and 0.3 cm thick and offset it 0.9 cm down.
`-Bxa1+lAmplitude`	On the x axis, annotate every 1 data units; label it Amplitude.

GMT-17-002 · 8 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-17-002`	Add MT-17-002 as the stable example title.

GMT-17-002 · 9 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-17-003

Subtract the smooth field to show a residual

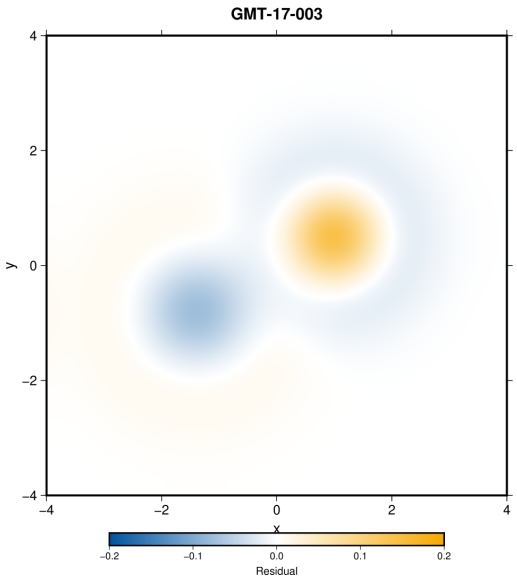
Subtract the filtered grid from the original at corresponding nodes. The narrower symmetric palette makes small local differences visible. Check the colour bar before comparing apparent contrast with the original field.

Compare with GMT-17-002 · Filter the field without changing its grid.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-17-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
gmt grdmath -R-4/4/-4/4 -I0.1 X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD
SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc
gmt grdfilter field.nc -D0 -Fg1.2 -Gsmooth.nc
gmt grdmath field.nc smooth.nc SUB = residual.nc
gmt makecpt '-C#00549f,white,#f6a800' -T-0.2/0.2/0.01 -Z -H > field.cpt
gmt grdimage residual.nc -R-4/4/-4/4 -JX11c -Cfield.cpt -E200 -nc -Bxa2+lx -Bya2+ly
-BWSne
gmt colorbar -Cfield.cpt -DJBC+w8c/0.3c+h+o0/0.9c -Bxa0.1+lResidual
gmt basemap -B+t"GMT-17-003"
gmt end
```

Actual output



GMT-17-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-17-003

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-17-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-17-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-17-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-17-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-17-003 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc`	Evaluate f(x,y)=2 exp(-((x-1)^2+(y-0.5)^2))-1.5 exp(-0.7((x+1.4)^2+(y+0.8)^2)). X/Y are node coordinates; SUB subtracts, ADD adds, SQR squares, NEG negates, MUL multiplies and EXP exponentiates. The final SUB subtracts the negative anomaly; = field.nc saves the grid.

GMT-17-003 · 4 · gmt grdfilter · GMT reference

Argument(s)	Meaning in this example
`field.nc`	Read the locally generated signed field: a positive Gaussian centred at (1,0.5), minus a broader negative Gaussian centred at (-1.4,-0.8). These are synthetic amplitudes.
`-D0`	Treat x and y as Cartesian coordinates with the same units; filter distances use those coordinate units.
`-Fg1.2`	Apply a Gaussian filter with full width 1.2 coordinate units (six standard deviations); grid spacing remains 0.1.
`-Gsmooth.nc`	Write the resulting NetCDF grid to smooth.nc. The original input is retained.

GMT-17-003 · 5 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`field.nc smooth.nc SUB = residual.nc`	Subtract each smooth.nc cell from the matching field.nc cell (SUB); = residual.nc writes the difference on the unchanged grid.

GMT-17-003 · 6 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`'-C#00549f,white,#f6a800'`	Interpolate through RWTH blue, white and orange; with the symmetric limits white represents zero.
`-T-0.2/0.2/0.01`	Palette limits and colour-slice increment are -0.2/0.2/0.01. These are synthetic amplitude units, or amplitude per coordinate unit for the derivative.
`-Z`	Interpolate colours continuously between the colour nodes.
`-H`	Write the palette to standard output in modern mode so the shell can save an explicit, reusable CPT file.
`> field.cpt`	Shell output redirection: save the generated table or palette in field.cpt.

GMT-17-003 · 7 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`residual.nc`	Read the original field minus its Gaussian-filtered version, cell by cell.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c`	Use linear Cartesian axes with a 11 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-E200`	Resample the displayed image at 200 dpi; this changes the image sampling, not the input grid spacing or the support of the sample data.
`-nc`	Use bicubic interpolation when resampling the displayed grid image. This improves its visual sampling but adds no observations.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya2+ly`	On the y axis, annotate every 2 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-17-003 · 8 · gmt colorbar · GMT reference

Argument(s)	Meaning in this example
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-DJBC+w8c/0.3c+h+o0/0.9c`	Place a horizontal colour bar outside the bottom-centre of the frame (JBC); make it 8 cm long and 0.3 cm thick and offset it 0.9 cm down.
`-Bxa0.1+lResidual`	On the x axis, annotate every 0.1 data units; label it Residual.

GMT-17-003 · 9 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-17-003`	Add MT-17-003 as the stable example title.

GMT-17-003 · 10 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-17-004

Differentiate in the x direction

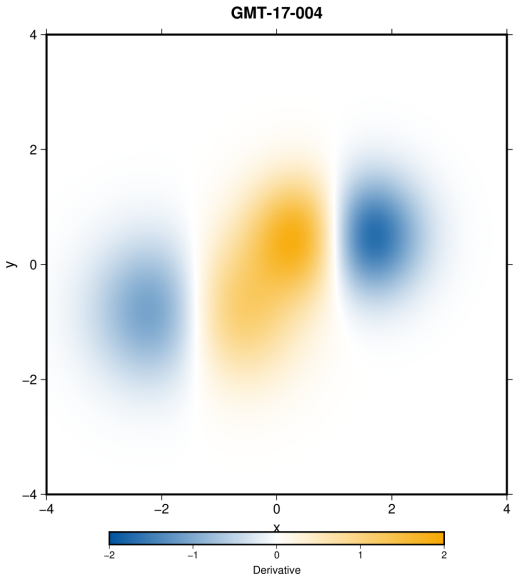
DDX estimates how amplitude changes along increasing x. It is a directional derivative, not the steepest-slope magnitude. Blue and orange distinguish falling and rising parts; units are amplitude per coordinate unit.

Compare with GMT-17-001 · Build a signed analytic field.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-17-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
gmt grdmath -R-4/4/-4/4 -I0.1 X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD
SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc
gmt grdmath field.nc DDX = slope.nc
gmt makecpt '-C#00549f,white,#f6a800' -T-2/2/0.1 -Z -H > field.cpt
gmt grdimage slope.nc -R-4/4/-4/4 -JX11c -Cfield.cpt -E200 -nc -Bxa2+lx -Bya2+ly
-BWSne
gmt colorbar -Cfield.cpt -DJBC+w8c/0.3c+h+o0/0.9c -Bxa1+lDerivative
gmt basemap -B+t"GMT-17-004"
gmt end
```

Actual output



GMT-17-004 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-17-004

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-17-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-17-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-17-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-17-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-17-004 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc`	Evaluate f(x,y)=2 exp(-((x-1)^2+(y-0.5)^2))-1.5 exp(-0.7((x+1.4)^2+(y+0.8)^2)). X/Y are node coordinates; SUB subtracts, ADD adds, SQR squares, NEG negates, MUL multiplies and EXP exponentiates. The final SUB subtracts the negative anomaly; = field.nc saves the grid.

GMT-17-004 · 4 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`field.nc DDX = slope.nc`	DDX estimates the derivative along increasing x, not gradient magnitude or steepest slope. Positive values rise toward larger x; negative values fall. = slope.nc writes amplitude per coordinate unit.

GMT-17-004 · 5 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`'-C#00549f,white,#f6a800'`	Interpolate through RWTH blue, white and orange; with the symmetric limits white represents zero.
`-T-2/2/0.1`	Palette limits and colour-slice increment are -2/2/0.1. These are synthetic amplitude units, or amplitude per coordinate unit for the derivative.
`-Z`	Interpolate colours continuously between the colour nodes.
`-H`	Write the palette to standard output in modern mode so the shell can save an explicit, reusable CPT file.
`> field.cpt`	Shell output redirection: save the generated table or palette in field.cpt.

GMT-17-004 · 6 · gmt grdimage · GMT reference

Argument(s)	Meaning in this example
`slope.nc`	Read the x derivative of the synthetic field; units are amplitude per Cartesian coordinate unit.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c`	Use linear Cartesian axes with a 11 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-E200`	Resample the displayed image at 200 dpi; this changes the image sampling, not the input grid spacing or the support of the sample data.
`-nc`	Use bicubic interpolation when resampling the displayed grid image. This improves its visual sampling but adds no observations.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya2+ly`	On the y axis, annotate every 2 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-17-004 · 7 · gmt colorbar · GMT reference

Argument(s)	Meaning in this example
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-DJBC+w8c/0.3c+h+o0/0.9c`	Place a horizontal colour bar outside the bottom-centre of the frame (JBC); make it 8 cm long and 0.3 cm thick and offset it 0.9 cm down.
`-Bxa1+lDerivative`	On the x axis, annotate every 1 data units; label it Derivative.

GMT-17-004 · 8 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-17-004`	Add MT-17-004 as the stable example title.

GMT-17-004 · 9 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-17-005

Extract a transect from the grid

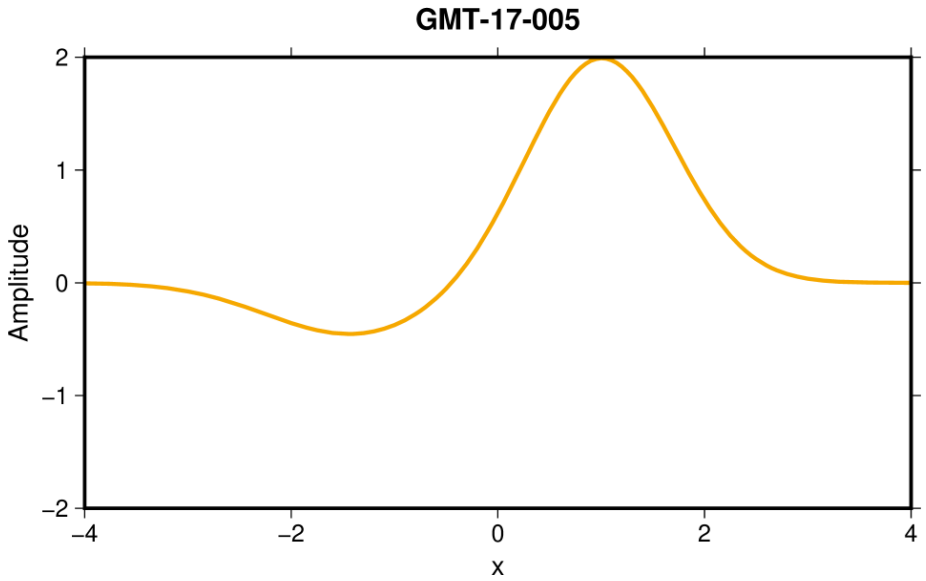
Generate a horizontal path at y=0.5, sample the field with grdtrack, then plot amplitude against x. project also writes along-track distance, but -i0,3 deliberately chooses x and the appended amplitude. All 161 positions are regenerated inside this script.

Compare with GMT-17-001 · Build a signed analytic field.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-17-005 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
gmt grdmath -R-4/4/-4/4 -I0.1 X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD
SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc
gmt project -C-4/0.5 -E4/0.5 -G0.05 -N > track.txt
gmt grdtrack track.txt -Gfield.nc > sampled.txt
gmt plot sampled.txt -i0,3 -R-4/4/-2/2 -JX11c/6c '-W1.5p,#f6a800' -Bxa2+lx
-Bya1+lAmplitude -BWSne
gmt basemap -B+t"GMT-17-005"
gmt end
```

Actual output



GMT-17-005 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-17-005

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-17-005 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-17-005 png,pdf`	Start an independent modern session; the output stem figures/GMT-17-005 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-17-005 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-17-005 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc`	Evaluate f(x,y)=2 exp(-((x-1)^2+(y-0.5)^2))-1.5 exp(-0.7((x+1.4)^2+(y+0.8)^2)). X/Y are node coordinates; SUB subtracts, ADD adds, SQR squares, NEG negates, MUL multiplies and EXP exponentiates. The final SUB subtracts the negative anomaly; = field.nc saves the grid.

GMT-17-005 · 4 · gmt project · GMT reference

Argument(s)	Meaning in this example
`-C-4/0.5`	Start the transect at Cartesian x=-4, y=0.5.
`-E4/0.5`	End the transect at x=4, y=0.5; together with -C this defines a horizontal line.
`-G0.05`	Generate positions every 0.05 coordinate units along the line; output columns are x, y and along-track distance p.
`-N`	Use Cartesian geometry; the coordinates and spacing are not longitude/latitude or kilometres.
`> track.txt`	Shell output redirection: save the generated table or palette in track.txt.

GMT-17-005 · 5 · gmt grdtrack · GMT reference

Argument(s)	Meaning in this example
`track.txt`	Read the generated transect table: x, y and distance from the start.
`-Gfield.nc`	Sample the synthetic field grid at input x/y positions and append the interpolated value as column 3 (zero-based); the input distance column is retained.
`> sampled.txt`	Shell output redirection: save the generated table or palette in sampled.txt.

GMT-17-005 · 6 · gmt plot · GMT reference

Argument(s)	Meaning in this example
`sampled.txt`	Read x, y, along-track distance and interpolated field value, in that order.
`-i0,3`	Read zero-based columns 0 and 3 as x and sampled amplitude. Column 2 is distance from the start, and is deliberately not used on this x axis.
`-R-4/4/-2/2`	Display Cartesian x from -4 to 4 and synthetic amplitude from -2 to 2; the horizontal coordinate is not along-track distance or longitude.
`-JX11c/6c`	Use linear Cartesian axes with a 11 cm width and 6 cm height.
`'-W1.5p,#f6a800'`	Draw a 1.5-point #f6a800 stroke.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya1+lAmplitude`	On the y axis, annotate every 1 data units; label it Amplitude.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-17-005 · 7 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-17-005`	Add MT-17-005 as the stable example title.

GMT-17-005 · 8 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Perspective surfaces and vector fields

A perspective view adds a display dimension; it does not add measurements. The surface uses the same signed analytic field as chapter 17. The vector example separately defines u=-y and v=x and explains the arrow scale in component units per centimetre. See grdview and grdvector.

GMT-18-001

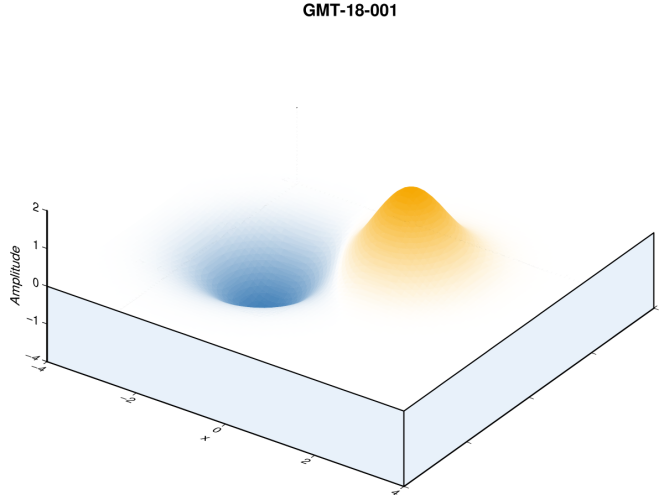
View the signed field as a 3D surface

Render the chapter-17 field as a perspective surface. -JZ sets the displayed height independently of x/y, and -p sets the viewing direction. The shape is synthetic, and changing the viewing angle adds no data.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-18-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm FONT_ANNOT_PRIMARY
9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN round COLOR_NAN gray85
gmt grdmath -R-4/4/-4/4 -I0.1 X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD SQR Y
0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc
gmt makecpt '-C#00549f,white,#f6a800' -T-2/2/0.1 -Z -H > field.cpt
gmt grdview field.nc -R-4/4/-4/4/-2/2 -JX10c -JZ4c -Cfield.cpt -Qs '-N-2+g#e8f1fa' -p145/30
-Bxa2+lx -Bya2+ly -Bza1+lAmplitude -BWSneZ+tGMT-18-001
gmt end
```

Actual output



GMT-18-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-18-001

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-18-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-18-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-18-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-18-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-18-001 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc`	Evaluate f(x,y)=2 exp(-((x-1)^2+(y-0.5)^2))-1.5 exp(-0.7((x+1.4)^2+(y+0.8)^2)). X/Y are node coordinates; SUB subtracts, ADD adds, SQR squares, NEG negates, MUL multiplies and EXP exponentiates. The final SUB subtracts the negative anomaly; = field.nc saves the grid.

GMT-18-001 · 4 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`'-C#00549f,white,#f6a800'`	Interpolate through RWTH blue, white and orange; with the symmetric limits white represents zero.
`-T-2/2/0.1`	Palette limits and colour-slice increment are -2/2/0.1. These are synthetic amplitude units, or amplitude per coordinate unit for the derivative.
`-Z`	Interpolate colours continuously between the colour nodes.
`-H`	Write the palette to standard output in modern mode so the shell can save an explicit, reusable CPT file.
`> field.cpt`	Shell output redirection: save the generated table or palette in field.cpt.

GMT-18-001 · 5 · gmt grdview · GMT reference

Argument(s)	Meaning in this example
`field.nc`	Read the locally generated signed field: a positive Gaussian centred at (1,0.5), minus a broader negative Gaussian centred at (-1.4,-0.8). These are synthetic amplitudes.
`-R-4/4/-4/4/-2/2`	Cartesian plot bounds xmin/xmax/ymin/ymax/zmin/zmax = -4/4/-4/4/-2/2. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX10c`	Use linear Cartesian axes with a 10 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-JZ4c`	Make the displayed z range 4 cm high, independently of x/y width. This is vertical exaggeration for display, not a change in the grid values.
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-Qs`	Draw a coloured surface using the palette; the grid is synthetic amplitude, not terrain elevation.
`'-N-2+g#e8f1fa'`	Extend a light-blue facade to z=-2, the bottom of the displayed z range.
`-p145/30`	View the 3D scene from azimuth 145 degrees and elevation 30 degrees above the horizontal; this changes viewpoint only.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya2+ly`	On the y axis, annotate every 2 data units; label it y.
`-Bza1+lAmplitude`	On the z axis, annotate every 1 data units; label it Amplitude.
`-BWSneZ+tGMT-18-001`	Annotate west, south and the z axis; draw the north/east frame without annotations. +t adds GMT-18-001 as the stable example title in this same frame option.

GMT-18-001 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-18-002

Reveal the grid with a perspective mesh

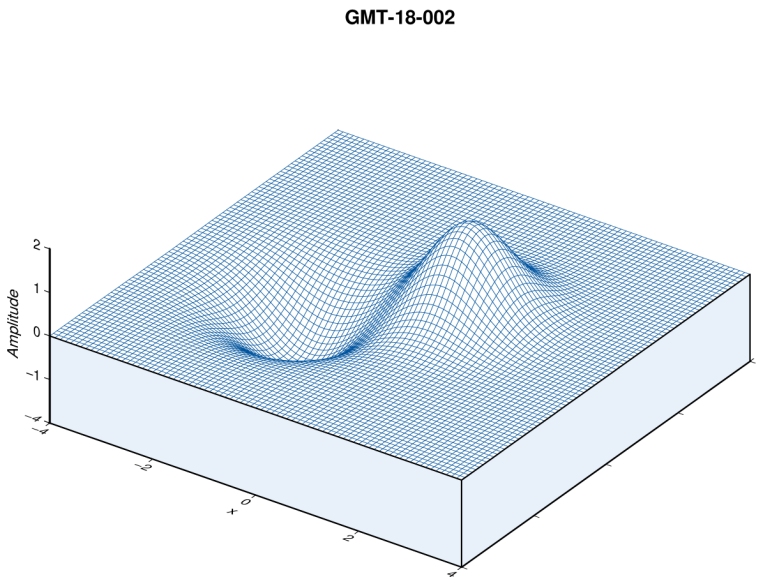
Replace the coloured surface with a wire mesh using the same field, region, vertical scale and viewpoint. The mesh exposes the 0.1-unit node spacing; its perspective changes only the display.

Compare with GMT-18-001 · View the signed field as a 3D surface.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-18-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
gmt grdmath -R-4/4/-4/4 -I0.1 X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD
SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc
gmt makecpt '-C#00549f,white,#f6a800' -T-2/2/0.1 -Z -H > field.cpt
gmt grdview field.nc -R-4/4/-4/4/-2/2 -JX10c -JZ4c -Cfield.cpt -Qm '-Wm0.25p,#00549f'
'-N-2+g#e8f1fa' -p145/30 -Bxa2+lx -Bya2+ly -Bza1+lAmplitude -BWSneZ+tGMT-18-002
gmt end
```

Actual output



GMT-18-002 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-18-002

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-18-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-18-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-18-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-18-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-18-002 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.1`	Set grid-node spacing to 0.1 in the same Cartesian units as x and y, in both directions.
`X 1 SUB SQR Y 0.5 SUB SQR ADD NEG EXP 2 MUL X 1.4 ADD SQR Y 0.8 ADD SQR ADD -0.7 MUL EXP 1.5 MUL SUB = field.nc`	Evaluate f(x,y)=2 exp(-((x-1)^2+(y-0.5)^2))-1.5 exp(-0.7((x+1.4)^2+(y+0.8)^2)). X/Y are node coordinates; SUB subtracts, ADD adds, SQR squares, NEG negates, MUL multiplies and EXP exponentiates. The final SUB subtracts the negative anomaly; = field.nc saves the grid.

GMT-18-002 · 4 · gmt makecpt · GMT reference

Argument(s)	Meaning in this example
`'-C#00549f,white,#f6a800'`	Interpolate through RWTH blue, white and orange; with the symmetric limits white represents zero.
`-T-2/2/0.1`	Palette limits and colour-slice increment are -2/2/0.1. These are synthetic amplitude units, or amplitude per coordinate unit for the derivative.
`-Z`	Interpolate colours continuously between the colour nodes.
`-H`	Write the palette to standard output in modern mode so the shell can save an explicit, reusable CPT file.
`> field.cpt`	Shell output redirection: save the generated table or palette in field.cpt.

GMT-18-002 · 5 · gmt grdview · GMT reference

Argument(s)	Meaning in this example
`field.nc`	Read the locally generated signed field: a positive Gaussian centred at (1,0.5), minus a broader negative Gaussian centred at (-1.4,-0.8). These are synthetic amplitudes.
`-R-4/4/-4/4/-2/2`	Cartesian plot bounds xmin/xmax/ymin/ymax/zmin/zmax = -4/4/-4/4/-2/2. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX10c`	Use linear Cartesian axes with a 10 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-JZ4c`	Make the displayed z range 4 cm high, independently of x/y width. This is vertical exaggeration for display, not a change in the grid values.
`-Cfield.cpt`	Read field.cpt as the explicit colour palette; fixed symmetric limits let the compared images use the same numeric colours.
`-Qm`	Draw the grid as a perspective mesh; this changes the representation without altering its node values.
`'-Wm0.25p,#00549f'`	Draw a 0.25-point #00549f stroke.
`'-N-2+g#e8f1fa'`	Extend a light-blue facade to z=-2, the bottom of the displayed z range.
`-p145/30`	View the 3D scene from azimuth 145 degrees and elevation 30 degrees above the horizontal; this changes viewpoint only.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya2+ly`	On the y axis, annotate every 2 data units; label it y.
`-Bza1+lAmplitude`	On the z axis, annotate every 1 data units; label it Amplitude.

Argument(s)	Meaning in this example
`-BWSneZ+tGMT-18-002`	Annotate west, south and the z axis; draw the north/east frame without annotations. +t adds GMT-18-002 as the stable example title in this same frame option.

GMT-18-002 · 6 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-18-003

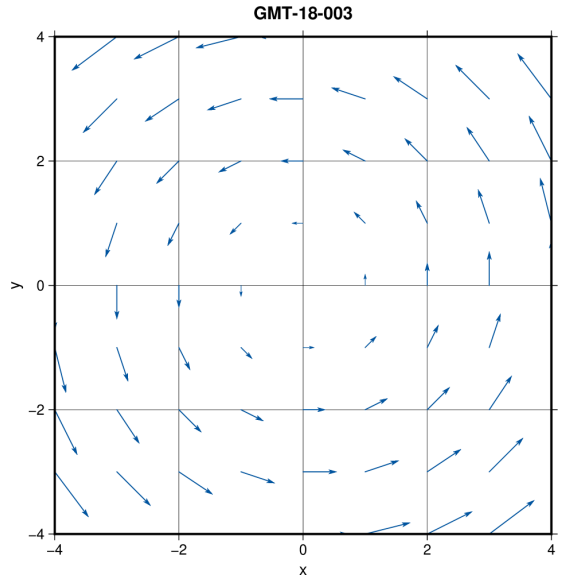
Draw a vector field from two grids

Create u=-y and v=x on a half-unit grid. The resulting arrows rotate counter-clockwise and length grows with distance from the origin. Plot every second node so arrowheads remain legible; a magnitude of 4 is drawn 1 cm long. x/y and components use synthetic units.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-18-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
gmt grdmath -R-4/4/-4/4 -I0.5 Y NEG = u.nc
gmt grdmath -R-4/4/-4/4 -I0.5 X = v.nc
gmt grdvector u.nc v.nc -R-4/4/-4/4 -JX11c -Ix2 -S4c -Q0.18c+e+n0.4c '-W0.6p,#00549f'
'-G#00549f' -Bxa2g2+lx -Bya2g2+ly -BWSne
gmt basemap -B+t"GMT-18-003"
gmt end
```

Actual output



GMT-18-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-18-003

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-18-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-18-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-18-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-18-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-18-003 · 3 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.5`	Set grid-node spacing to 0.5 in the same Cartesian units as x and y, in both directions.
`Y NEG = u.nc`	Use the negative y coordinate as the x component u=-y (NEG negates); save it to u.nc.

GMT-18-003 · 4 · gmt grdmath · GMT reference

Argument(s)	Meaning in this example
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-I0.5`	Set grid-node spacing to 0.5 in the same Cartesian units as x and y, in both directions.
`X = v.nc`	Use the x coordinate as the y component v=x; save it to v.nc. Combined with u=-y this is a counter-clockwise rotational field.

GMT-18-003 · 5 · gmt grdvector · GMT reference

Argument(s)	Meaning in this example
`u.nc`	Read the synthetic x-component grid u=-y.
`v.nc`	Read the synthetic y-component grid v=x; together with u=-y these arrows rotate counter-clockwise.
`-R-4/4/-4/4`	Cartesian plot bounds xmin/xmax/ymin/ymax = -4/4/-4/4. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c`	Use linear Cartesian axes with a 11 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-Ix2`	Draw every second row and column of the component grids; this reduces arrow density without changing the underlying grid values.
`-S4c`	Use four component-value units per centimetre of arrow length; a vector with magnitude 4 is 1 cm long. This is the direct scale, not its reciprocal.
`-Q0.18c+e+n0.4c`	Use 0.18 cm arrowheads at the end (+e); shrink head and pen attributes for vectors shorter than 0.4 cm (+n). Zero vectors have no direction or visible length.
`'-W0.6p,#00549f'`	Draw a 0.6-point #00549f stroke.
`'-G#00549f'`	Fill symbols, arrowheads or bins with #00549f.
`-Bxa2g2+lx`	On the x axis, annotate every 2 data units and draw grid lines every 2 data units; label it x.
`-Bya2g2+ly`	On the y axis, annotate every 2 data units and draw grid lines every 2 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-18-003 · 6 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-18-003`	Add MT-18-003 as the stable example title.

GMT-18-003 · 7 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Directions and scalar distributions

A rose diagram bins directions; a histogram bins scalar values. Bin width and normalization affect what is visible, so comparisons retain their complete synthetic input. Rose radii normalized to a maximum of one are not probabilities; histogram frequency percent is not density. See rose and histogram.

GMT-19-001

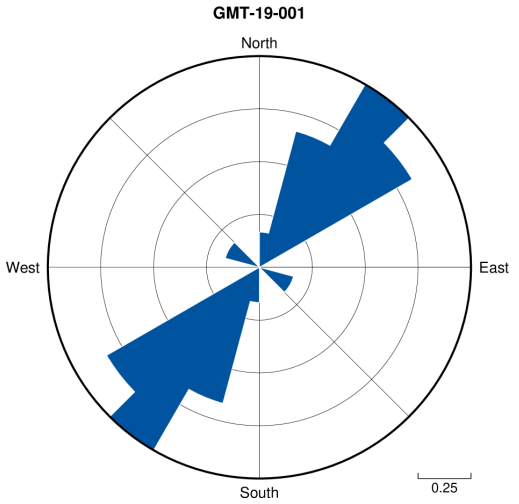
Summarize directions in a rose diagram

Bin 36 invented directions into 15-degree sectors. Angles are clockwise from north, and each observation has unit weight. -S scales the largest sector to radius 1; these relative sector radii are not percentages.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-19-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm FONT_ANNOT_PRIMARY
9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN round COLOR_NAN gray85
printf -- '1 12\n1 18\n1 22\n1 26\n1 29\n1 31\n1 33\n1 36\n1 39\n1 41\n1 44\n1 46\n1 49\n1
52\n1 55\n1 58\n1 192\n1 198\n1 202\n1 206\n1 209\n1 211\n1 213\n1 216\n1 219\n1 221\n1
224\n1 226\n1 229\n1 232\n1 235\n1 238\n1 110\n1 125\n1 290\n1 305\n' > directions.txt
gmt rose directions.txt -R0/1/0/360 -JX10c -A15 -S '-G#00549f' -W0.5p,white -Bxg0.25 -Byg45
-B+tGMT-19-001
gmt end
```

Actual output



GMT-19-001 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-19-001

Commands follow script order. Rose input is weight, then azimuth in degrees clockwise from north; -R sets radial and angular bounds. c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-19-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-19-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-19-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-19-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-19-001 · 3 · gmt rose · GMT reference

Argument(s)	Meaning in this example
`directions.txt`	Read unit weight followed by clockwise azimuth in degrees from north; all 36 directions have equal weight.
`-R0/1/0/360`	Use normalized radial bounds 0 to 1 and azimuth bounds 0 to 360 degrees; these are polar bounds, not a longitude/latitude rectangle.
`-JX10c`	Use linear Cartesian axes with a 10 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-A15`	Accumulate unit-weight directions in 15-degree sectors; angles increase clockwise from north by default.
`-S`	Normalize sector lengths so that the largest bin has radius 1; radii are relative bin totals, not probabilities summing to 1.
`'-G#00549f'`	Fill symbols, arrowheads or bins with #00549f.
`-W0.5p,white`	Draw a 0.5-point white stroke.
`-Bxg0.25`	On the x axis, draw grid lines every 0.25 data units. In rose, x is radius and y is azimuth in degrees.
`-Byg45`	On the y axis, draw grid lines every 45 data units. In rose, x is radius and y is azimuth in degrees.
`-B+tGMT-19-001`	Add MT-19-001 as the stable example title.

GMT-19-001 · 4 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-19-002

Change only the angular bin width

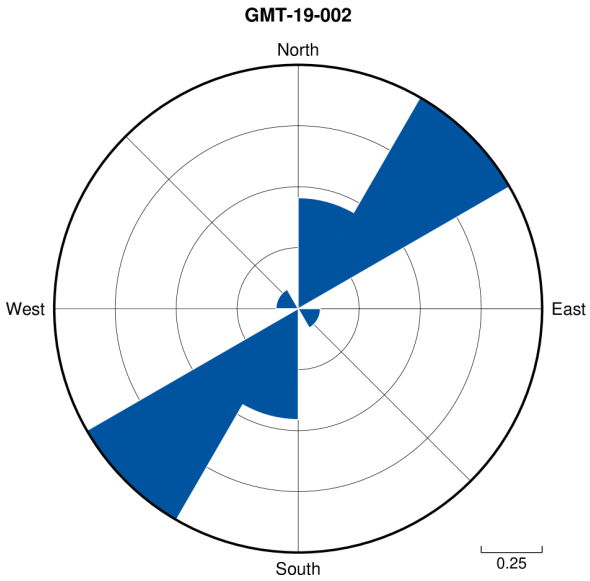
Keep every input direction and the same normalization, but use 30-degree sectors. Broader sectors combine nearby orientations. Compare the placement and width of the two preferred directions.

Compare with GMT-19-001 · Summarize directions in a rose diagram.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-19-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
printf -- '1 12\n1 18\n1 22\n1 26\n1 29\n1 31\n1 33\n1 36\n1 39\n1 41\n1 44\n1 46\n1
49\n1 52\n1 55\n1 58\n1 192\n1 198\n1 202\n1 206\n1 209\n1 211\n1 213\n1 216\n1 219\n1
221\n1 224\n1 226\n1 229\n1 232\n1 235\n1 238\n1 110\n1 125\n1 290\n1 305\n' >
directions.txt
gmt rose directions.txt -R0/1/0/360 -JX10c -A30 -S '-G#00549f' -W0.5p,white -Bxg0.25
-Byg45 -B+tGMT-19-002
gmt end
```

Actual output



GMT-19-002 · Rendered by GMT

GMT · exit 0

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Parameters explained · GMT-19-002

Commands follow script order. Rose input is weight, then azimuth in degrees clockwise from north; -R sets radial and angular bounds. c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-19-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-19-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-19-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-19-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-19-002 · 3 · gmt rose · GMT reference

Argument(s)	Meaning in this example
`directions.txt`	Read unit weight followed by clockwise azimuth in degrees from north; all 36 directions have equal weight.
`-R0/1/0/360`	Use normalized radial bounds 0 to 1 and azimuth bounds 0 to 360 degrees; these are polar bounds, not a longitude/latitude rectangle.
`-JX10c`	Use linear Cartesian axes with a 10 cm width; an omitted height retains equal x/y scales. For rose this width sets the polar diagram diameter.
`-A30`	Accumulate the same unit-weight directions in 30-degree sectors; the wider bins merge nearby orientations.
`-S`	Normalize sector lengths so that the largest bin has radius 1; radii are relative bin totals, not probabilities summing to 1.
`'-G#00549f'`	Fill symbols, arrowheads or bins with #00549f.
`-W0.5p,white`	Draw a 0.5-point white stroke.
`-Bxg0.25`	On the x axis, draw grid lines every 0.25 data units. In rose, x is radius and y is azimuth in degrees.
`-Byg45`	On the y axis, draw grid lines every 45 data units. In rose, x is radius and y is azimuth in degrees.
`-B+tGMT-19-002`	Add MT-19-002 as the stable example title.

GMT-19-002 · 4 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-19-003

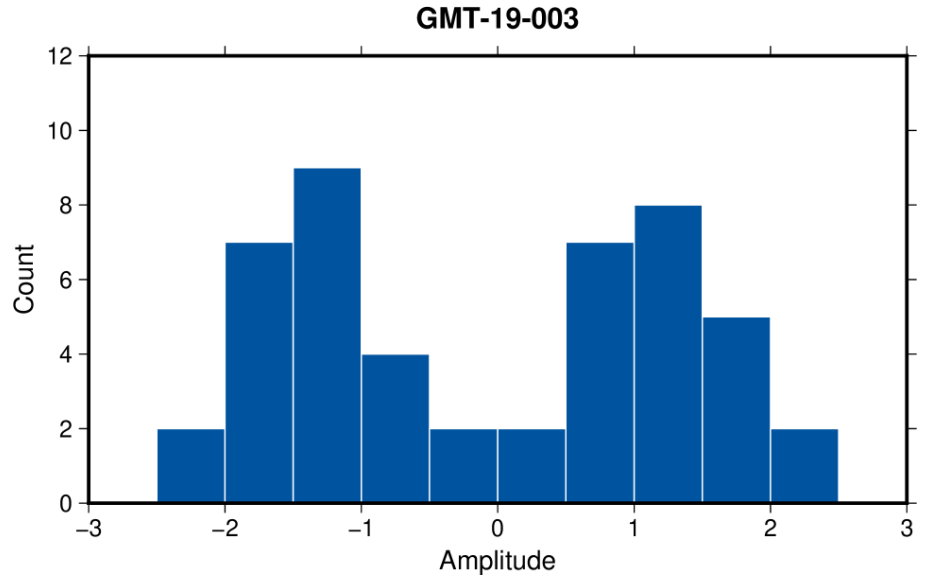
Count scalar values in fixed bins

Plot the 48 synthetic amplitudes with 0.5-unit bins. The horizontal axis keeps amplitude units, while the vertical axis counts records. The two groups are invented teaching data rather than measurements.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-19-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
printf --
'-2.4\n-2.1\n-2\n-1.9\n-1.8\n-1.8\n-1.7\n-1.6\n-1.6\n-1.5\n-1.5\n-1.4\n-1.4\n-1.3\n-1.
3\n-1.2\n-1.2\n-1.1\n-1\n-0.9\n-0.8\n-0.7\n-0.5\n-0.3\n0.1\n0.3\n0.5\n0.6\n0.7\n0.8\n0
.8\n0.9\n0.9\n1\n1\n1.1\n1.1\n1.2\n1.2\n1.3\n1.4\n1.5\n1.6\n1.7\n1.8\n1.9\n2.1\n2.3\n'
> values.txt
gmt histogram values.txt -R-3/3/0/12 -JX11c/6c -T-3/3/0.5 -Z0 '-G#00549f'
-W0.5p,white -Bxa1+lAmplitude -Bya2+lCount -BWSne
gmt basemap -B+t"GMT-19-003"
gmt end
```

Actual output



GMT-19-003 · Rendered by GMT

GMT · exit 0

Download: Runnable script · PNG map · Vector PDF map

Parameters explained · GMT-19-003

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-19-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-19-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-19-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-19-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-19-003 · 3 · gmt histogram · GMT reference

Argument(s)	Meaning in this example
`values.txt`	Read 48 locally specified synthetic scalar values from two overlapping groups; there is one value per record.
`-R-3/3/0/12`	Display amplitudes from -3 to 3 on x, and counts from 0 to 12 on y. These bounds control the axes; -T fixes bin edges.
`-JX11c/6c`	Use linear Cartesian axes with a 11 cm width and 6 cm height.
`-T-3/3/0.5`	Use fixed bin edges from -3 to 3 at intervals of 0.5 amplitude units. Both histogram examples keep these exact bins.
`-Z0`	Plot raw counts in each bin; bar heights sum to the 48 input values.
`'-G#00549f'`	Fill symbols, arrowheads or bins with #00549f.
`-W0.5p,white`	Draw a 0.5-point white stroke.
`-Bxa1+lAmplitude`	On the x axis, annotate every 1 data units; label it Amplitude.
`-Bya2+lCount`	On the y axis, annotate every 2 data units; label it Count.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-19-003 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-19-003`	Add MT-19-003 as the stable example title.

GMT-19-003 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-19-004

Express the same bins as frequency percent

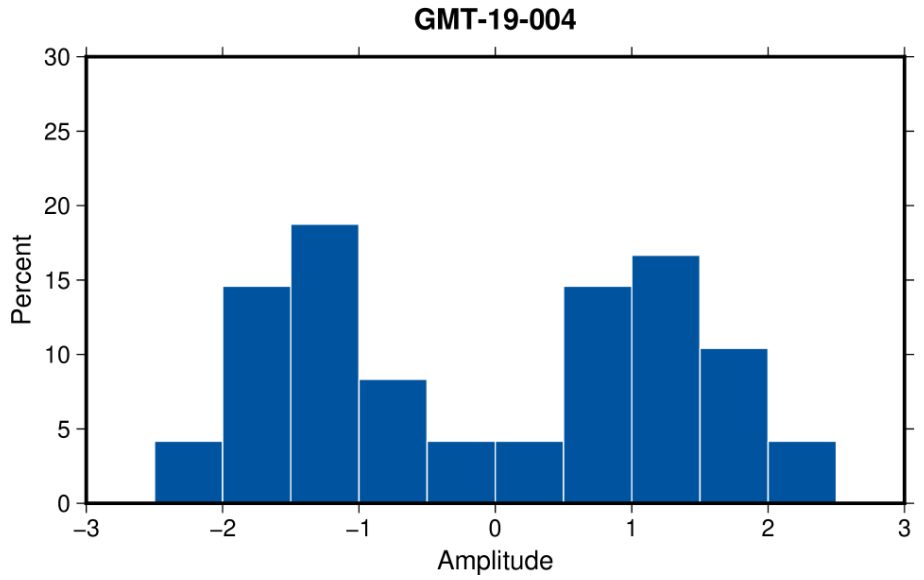
Keep the data and bin edges but request percent with -Z1. A count of 12 out of 48 becomes 25 percent; bar heights sum to 100. Percent per bin is different from probability density, which also accounts for bin width.

Compare with GMT-19-003 · Count scalar values in fixed bins.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-19-004 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
printf --
'-2.4\n-2.1\n-2\n-1.9\n-1.8\n-1.8\n-1.7\n-1.6\n-1.6\n-1.5\n-1.5\n-1.4\n-1.4\n-1.3\n-1.
3\n-1.2\n-1.2\n-1.1\n-1\n-0.9\n-0.8\n-0.7\n-0.5\n-0.3\n0.1\n0.3\n0.5\n0.6\n0.7\n0.8\n0
.8\n0.9\n0.9\n1\n1\n1.1\n1.1\n1.2\n1.2\n1.3\n1.4\n1.5\n1.6\n1.7\n1.8\n1.9\n2.1\n2.3\n'
> values.txt
gmt histogram values.txt -R-3/3/0/30 -JX11c/6c -T-3/3/0.5 -Z1 '-G#00549f'
-W0.5p,white -Bxa1+lAmplitude -Bya5+lPercent -BWSne
gmt basemap -B+t"GMT-19-004"
gmt end
```

Actual output



GMT-19-004 · Rendered by GMT

GMT · exit 0

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Parameters explained · GMT-19-004

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-19-004 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-19-004 png,pdf`	Start an independent modern session; the output stem figures/GMT-19-004 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-19-004 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-19-004 · 3 · gmt histogram · GMT reference

Argument(s)	Meaning in this example
`values.txt`	Read 48 locally specified synthetic scalar values from two overlapping groups; there is one value per record.
`-R-3/3/0/30`	Display amplitudes from -3 to 3 on x, and frequency percent from 0 to 30 on y. These bounds control the axes; -T fixes bin edges.
`-JX11c/6c`	Use linear Cartesian axes with a 11 cm width and 6 cm height.
`-T-3/3/0.5`	Use fixed bin edges from -3 to 3 at intervals of 0.5 amplitude units. Both histogram examples keep these exact bins.
`-Z1`	Plot frequency percent: 100 times each bin count divided by 48. Bar heights sum to 100; this is not probability density.
`'-G#00549f'`	Fill symbols, arrowheads or bins with #00549f.
`-W0.5p,white`	Draw a 0.5-point white stroke.
`-Bxa1+lAmplitude`	On the x axis, annotate every 1 data units; label it Amplitude.
`-Bya5+lPercent`	On the y axis, annotate every 5 data units; label it Percent.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-19-004 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-19-004`	Add MT-19-004 as the stable example title.

GMT-19-004 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

Geophysical symbols and uncertainty

Focal mechanisms and velocities use different column formats and symbol meanings. Every record here is invented, including the positions, mechanisms, motion and uncertainties. Coordinates use Cartesian teaching units. Velocity components and their one-sigma uncertainties share mm/year units; correlation describes their dependence. See meca and velo.

GMT-20-001

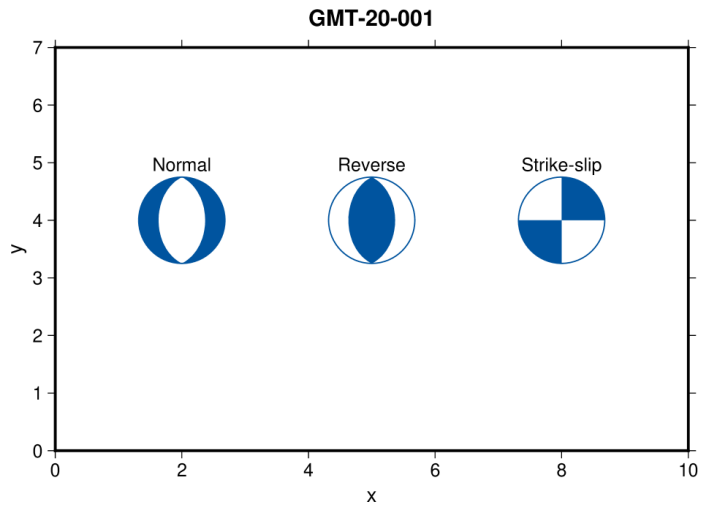
Read strike, dip and rake as focal mechanisms

Three invented magnitude-5 events illustrate normal, reverse and strike-slip mechanisms. The beachballs encode orientation and slip: strike is clockwise from north, dip is the plane inclination, and rake describes slip within that plane. Blue marks compression, white extension. These symbols are conceptual examples, not an earthquake catalogue.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-20-001 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm FONT_ANNOT_PRIMARY
9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN round COLOR_NAN gray85
printf -- '2 4 8 0 45 -90 5 0 0 Normal\n5 4 8 0 45 90 5 0 0 Reverse\n8 4 8 0 90 0 5 0 0
Strike-slip\n' > mechanisms.txt
gmt meca mechanisms.txt -R0/10/0/7 -JX11c/7c -Sa1.5c+f9p '-G#00549f' -Ewhite '-
W0.6p,#00549f' -Bxa2+lx -Bya1+ly -BWSne
gmt basemap -B+t"GMT-20-001"
gmt end
```

Actual output



GMT-20-001 · Rendered by GMT

GMT · exit 0

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Parameters explained · GMT-20-001

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-20-001 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-20-001 png,pdf`	Start an independent modern session; the output stem figures/GMT-20-001 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-20-001 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-20-001 · 3 · gmt meca · GMT reference

Argument(s)	Meaning in this example
`mechanisms.txt`	Read invented x/y, depth, strike, dip, rake, magnitude, two unused relocation coordinates (0,0), and name. Strike is clockwise from north, dip is 0-90 degrees, and rake sets slip direction. These are not real earthquakes.
`-R0/10/0/7`	Cartesian plot bounds xmin/xmax/ymin/ymax = 0/10/0/7. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c/7c`	Use linear Cartesian axes with a 11 cm width and 7 cm height.
`-Sa1.5c+f9p`	Read Aki-Richards strike/dip/rake records. A magnitude-5 mechanism has a 1.5 cm diameter; all three invented events have magnitude 5. Use 9-point labels.
`'-G#00549f'`	Fill compression quadrants with #00549f.
`-Ewhite`	Fill the extensive quadrants white; the compression quadrants use the colour supplied with -G.
`'-W0.6p,#00549f'`	Draw a 0.6-point #00549f stroke.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya1+ly`	On the y axis, annotate every 1 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-20-001 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-20-001`	Add MT-20-001 as the stable example title.

GMT-20-001 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-20-002

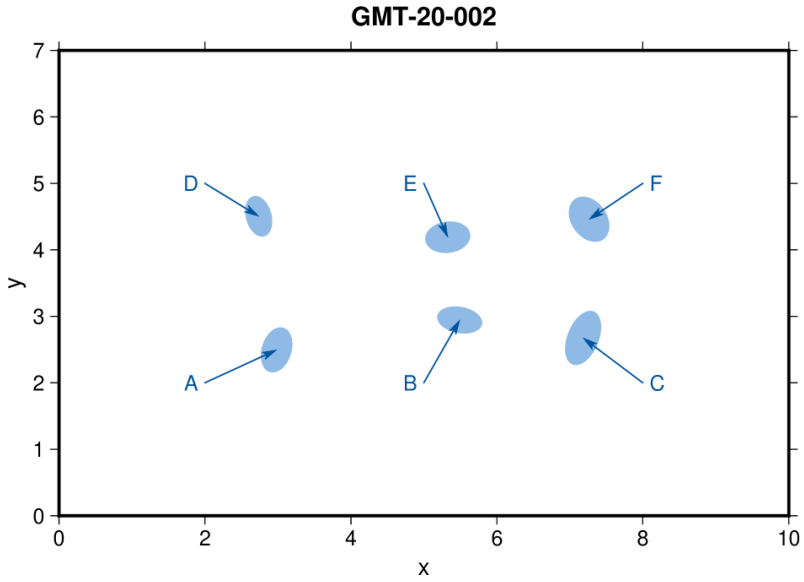
Plot horizontal motion with 68 percent ellipses

At six synthetic positions, east/north motion is measured in invented mm/year. One-sigma uncertainties and correlations define the covariance. velo draws a joint 68% confidence ellipse at each vector tip under a bivariate normal model; the input sigmas are not themselves the ellipse semiaxes.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-20-002 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
printf --
'2 2 2.4 1.1 0.35 0.5 0.25 A\n5 2 1.2 2.1 0.5 0.3 -0.2 B\n8 2 -2 1.5 0.4 0.6 0.4 C\n2
5 1.8 -1.1 0.3 0.45 -0.25 D\n5 5 0.8 -1.8 0.5 0.35 0.1 E\n8 5 -1.8 -1.2 0.45 0.5 -0.3
F\n' > velocities.txt
gmt velo velocities.txt -R0/10/0/7 -JX11c/7c -Se0.45c/0.68+f9p '-
A0.22c+e+p0.6p,#00549f' '-G#00549f' '-E#8ebae5' '-W0.6p,#00549f' -Bxa2+lx -Bya1+ly
-BWSne
gmt basemap -B+t"GMT-20-002"
gmt end
```

Actual output



GMT-20-002 · Rendered by GMT

GMT · exit 0

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Parameters explained · GMT-20-002

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-20-002 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-20-002 png,pdf`	Start an independent modern session; the output stem figures/GMT-20-002 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-20-002 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-20-002 · 3 · gmt velo · GMT reference

Argument(s)	Meaning in this example
`velocities.txt`	Read invented x/y, east/north velocity, east/north one-sigma uncertainty, correlation (-1 to 1), and name. Velocities and uncertainties use mm/year; positions use Cartesian teaching units. Ellipses assume a bivariate normal error model.
`-R0/10/0/7`	Cartesian plot bounds xmin/xmax/ymin/ymax = 0/10/0/7. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c/7c`	Use linear Cartesian axes with a 11 cm width and 7 cm height.
`-Se0.45c/0.68+f9p`	Read east/north components, their one-sigma uncertainties and correlation. Scale motion to 0.45 cm per velocity unit; draw a joint 68% confidence ellipse and 9-point station labels.
`'-A0.22c+e+p0.6p,#00549f'`	Draw a 0.22 cm arrowhead at each velocity tip (+e), with a 0.6-point RWTH-blue head outline (+p).
`'-G#00549f'`	Fill symbols, arrowheads or bins with #00549f.
`'-E#8ebae5'`	Fill the uncertainty ellipses with RWTH light blue; -G supplies the arrowhead fill.
`'-W0.6p,#00549f'`	Draw a 0.6-point #00549f stroke.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya1+ly`	On the y axis, annotate every 1 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-20-002 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-20-002`	Add MT-20-002 as the stable example title.

GMT-20-002 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

GMT-20-003

Increase confidence without changing motion

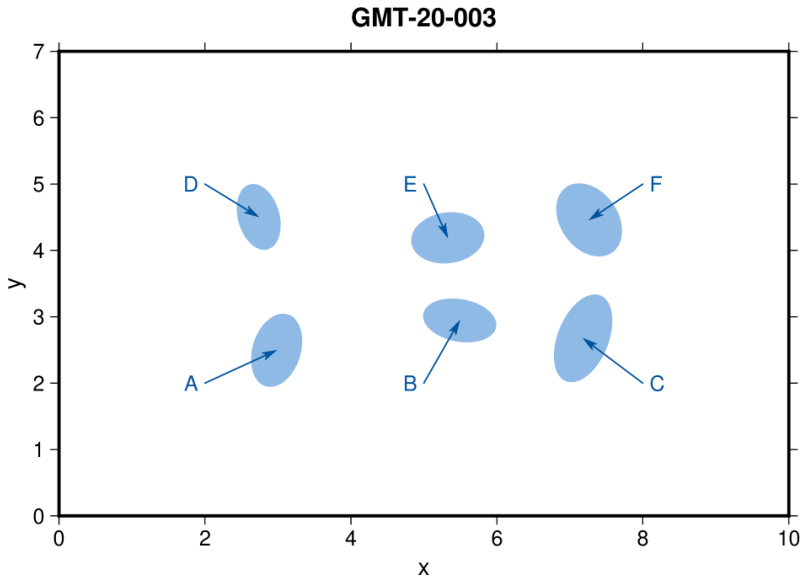
Change only the confidence level from 0.68 to 0.95. The arrows retain their direction and length; ellipses expand to enclose more probability under the same covariance model. A joint 95% ellipse is not obtained by simply doubling each input sigma.

Compare with GMT-20-002 · Plot horizontal motion with 68 percent ellipses.

Complete GMT script

```
export GMT_SESSION_NAME=$$
mkdir -p figures
gmt begin figures/GMT-20-003 png,pdf E200,H2,Qg4,Qt4 -C
gmt set GMT_AUTO_DOWNLOAD off MAP_FRAME_TYPE plain PROJ_LENGTH_UNIT cm
FONT_ANNOT_PRIMARY 9p FONT_LABEL 10p FONT_TITLE 11p PS_LINE_CAP round PS_LINE_JOIN
round COLOR_NAN gray85
printf --
'2 2 2.4 1.1 0.35 0.5 0.25 A\n5 2 1.2 2.1 0.5 0.3 -0.2 B\n8 2 -2 1.5 0.4 0.6 0.4 C\n2
5 1.8 -1.1 0.3 0.45 -0.25 D\n5 5 0.8 -1.8 0.5 0.35 0.1 E\n8 5 -1.8 -1.2 0.45 0.5 -0.3
F\n' > velocities.txt
gmt velo velocities.txt -R0/10/0/7 -JX11c/7c -Se0.45c/0.95+f9p '-
A0.22c+e+p0.6p,#00549f' '-G#00549f' '-E#8ebae5' '-W0.6p,#00549f' -Bxa2+lx -Bya1+ly
-BWSne
gmt basemap -B+t"GMT-20-003"
gmt end
```

Actual output



GMT-20-003 · Rendered by GMT

GMT · exit 0

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Parameters explained · GMT-20-003

Commands follow script order. Coordinates and axes use the Cartesian or data units explained below; c means centimetres and p means typographic points (1/72 inch). Later plotting commands reuse the current region and projection unless they supply new ones. The shell exports GMT_SESSION_NAME=$$ to keep piped commands in the same session; mkdir -p figures creates the output directory.

GMT-20-003 · 1 · gmt begin · GMT reference

Argument(s)	Meaning in this example
`figures/GMT-20-003 png,pdf`	Start an independent modern session; the output stem figures/GMT-20-003 becomes an opaque PNG and a PDF (vector linework, embedded rasters where used).
`E200,H2,Qg4,Qt4`	E200 sets final raster resolution to 200 dpi. H2 rasterizes at 2 times that resolution, then reduces to the requested DPI. Qg4 and Qt4 set graphics and text anti-aliasing subsampling to 4.
`-C`	Ignore user gmt.conf files and start from clean GMT defaults.

GMT-20-003 · 2 · gmt set · GMT reference

Argument(s)	Meaning in this example
`GMT_AUTO_DOWNLOAD off`	Disable automatic data downloads; geographic layers use locally installed GSHHG files.
`MAP_FRAME_TYPE plain`	Use a plain map frame rather than the default fancy alternating border.
`PROJ_LENGTH_UNIT cm`	Use centimetres for plot lengths that omit a unit, including variable symbol diameters.
`FONT_ANNOT_PRIMARY 9p`	Primary axis annotations use 9-point type.
`FONT_LABEL 10p`	Axis and decoration labels use 10-point type.
`FONT_TITLE 11p`	The map title uses 11-point type.
`PS_LINE_CAP round`	Use semicircular line ends.
`PS_LINE_JOIN round`	Round the joins between stroke segments.
`COLOR_NAN gray85`	Display undefined grid values (NaN) in light gray (gray85), separately from the palette colour for a defined value of zero.

GMT-20-003 · 3 · gmt velo · GMT reference

Argument(s)	Meaning in this example
`velocities.txt`	Read invented x/y, east/north velocity, east/north one-sigma uncertainty, correlation (-1 to 1), and name. Velocities and uncertainties use mm/year; positions use Cartesian teaching units. Ellipses assume a bivariate normal error model.
`-R0/10/0/7`	Cartesian plot bounds xmin/xmax/ymin/ymax = 0/10/0/7. x/y are local coordinate units, not degrees; a displayed z range is synthetic amplitude.
`-JX11c/7c`	Use linear Cartesian axes with a 11 cm width and 7 cm height.
`-Se0.45c/0.95+f9p`	Use the same 0.45 cm per velocity unit and input covariance, but draw joint 95% confidence ellipses. This increases ellipse size, not arrow length. Labels use 9-point type.
`'-A0.22c+e+p0.6p,#00549f'`	Draw a 0.22 cm arrowhead at each velocity tip (+e), with a 0.6-point RWTH-blue head outline (+p).
`'-G#00549f'`	Fill symbols, arrowheads or bins with #00549f.
`'-E#8ebae5'`	Fill the uncertainty ellipses with RWTH light blue; -G supplies the arrowhead fill.
`'-W0.6p,#00549f'`	Draw a 0.6-point #00549f stroke.
`-Bxa2+lx`	On the x axis, annotate every 2 data units; label it x.
`-Bya1+ly`	On the y axis, annotate every 1 data units; label it y.
`-BWSne`	Annotate the west and south axes (uppercase W/S); retain only the frame on the north and east sides (lowercase n/e).

GMT-20-003 · 4 · gmt basemap · GMT reference

Argument(s)	Meaning in this example
`-B+tGMT-20-003`	Add MT-20-003 as the stable example title.

GMT-20-003 · 5 · gmt end · GMT reference

Argument(s)	Meaning in this example
`(no arguments)`	End the modern session and write both requested figure formats; omitting show avoids launching a viewer.

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- GMT-20-001 · Read strike, dip and rake as focal mechanisms

- GMT-20-002 · Plot horizontal motion with 68 percent ellipses
- GMT-20-003 · Increase confidence without changing motion

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