

EarthScope InSAR 理论与实践暑期课程

GMT 绘图入门

田冬冬

中国地质大学（武汉）

2024-07-16

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01

GMT 简介



THE GENERIC MAPPING TOOLS

主页：<https://www.generic-mapping-tools.org/>

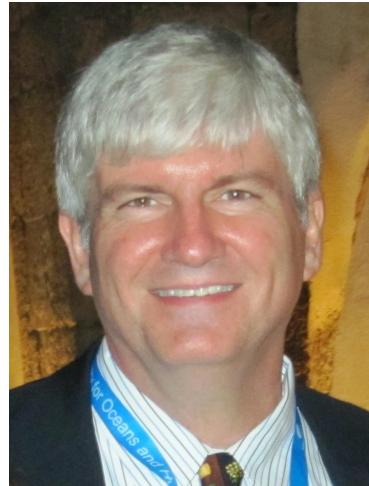
源码：<https://github.com/GenericMappingTools/>

论坛：<https://forum.generic-mapping-tools.org/>

1988 年 GMT 1.0

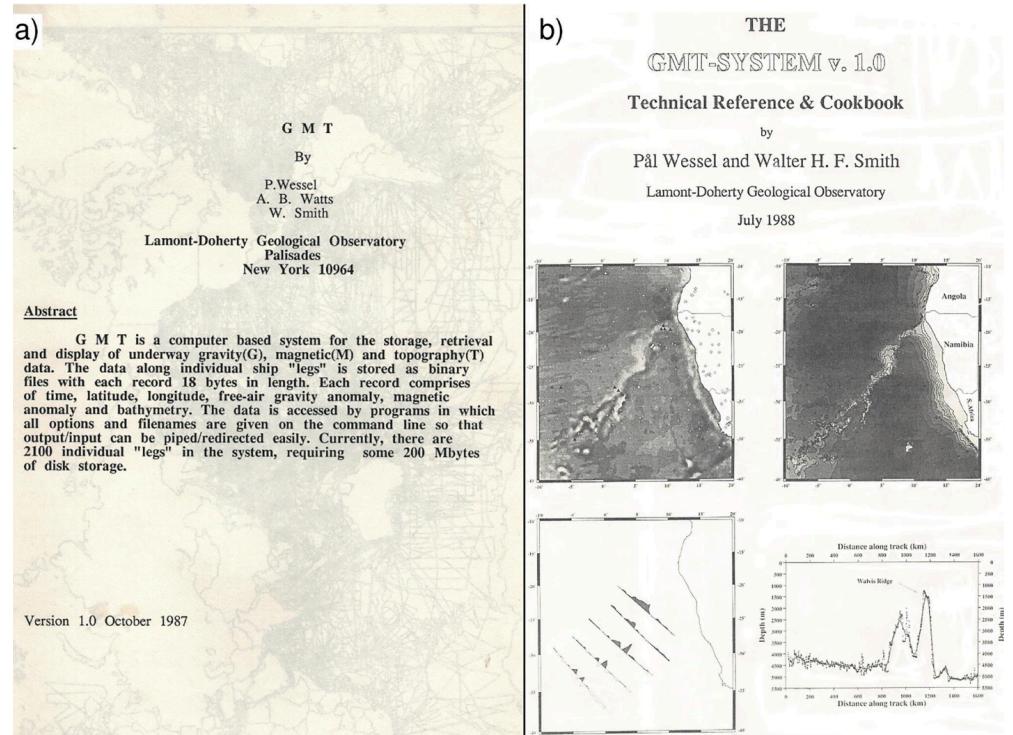


Paul Wessel
University of Hawai‘i at Mānoa
(1959-2024)



Walter H. F. Smith
NOAA

The GMT-System: Gravity, Magnetics, Topography



GMT v1.0 Technical Reference & Cookbook

GMT 发展历程

- 1988 年: GMT 1.0
- 1991 年: GMT 2.0
- 1995 年: GMT 3.0
- 2004–2018: GMT 4.x (30 个小版本)
- 2013–2019: GMT 5.x (14 个小版本)
- 2019 至今: GMT 6.x (7 个小版本)

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- 1988 年: GMT 1.0
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- 1995 年: GMT 3.0
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- 2013–2019: GMT 5.x (14 个小版本)
- 2019 至今: GMT 6.x (7 个小版本)

GMT 最新版本: v6.5.0 (2024-01-07)

GMT 主要开发者及其活跃时间



Paul Wessel (1988-2024)



Walter Smith (1988-2007)



Joaquim Luis (1999-now)



Remko Scharroo (2004-2019)



Florian Wobbe (2011-2019)



Leonardo Uieda (2017-2020)



Dongdong Tian (2018-now)



Max Jones (2020-2022)

主要功能

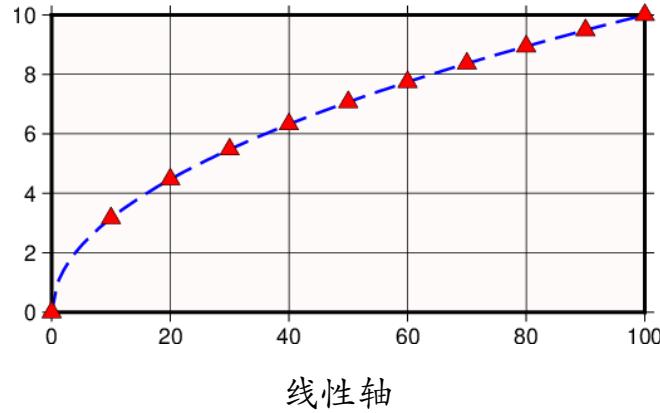
绘图功能：

- 底图：笛卡尔、极坐标、地图投影
- 海岸线、国界、河流、湖泊
- 点、线、多边形、文字
- 二维网格数据
- 比例尺、图例、色标
- 3D 视角
- ...

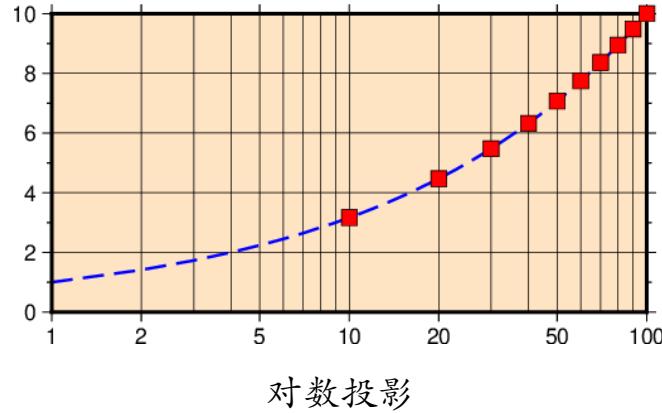
数据处理功能：

- 重采样 (1D/2D)
- 滤波 (1D/2D)
- 插值 (1D/2D/3D)
- 数据筛选 (1D/2D)
- 梯度 (2D)
- ...

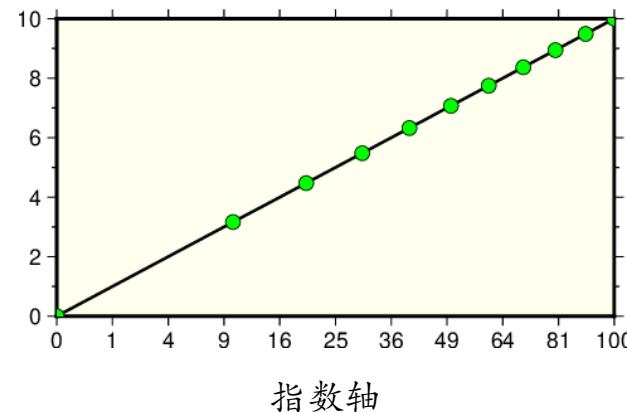
笛卡尔坐标与极坐标



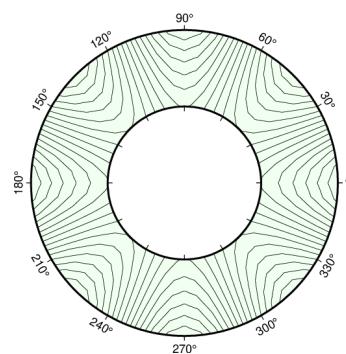
线性轴



对数投影



指数轴

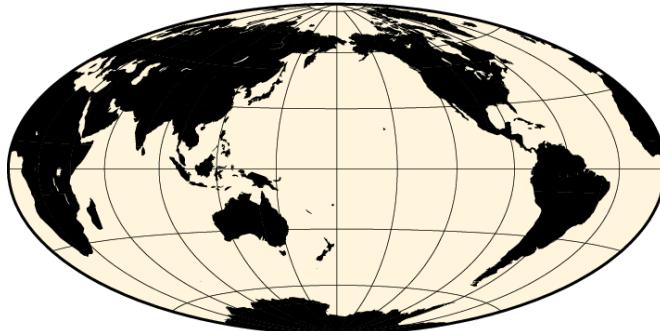


极坐标轴

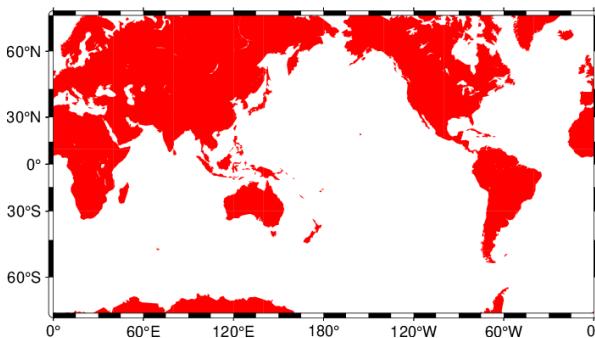
30 种地图投影方式



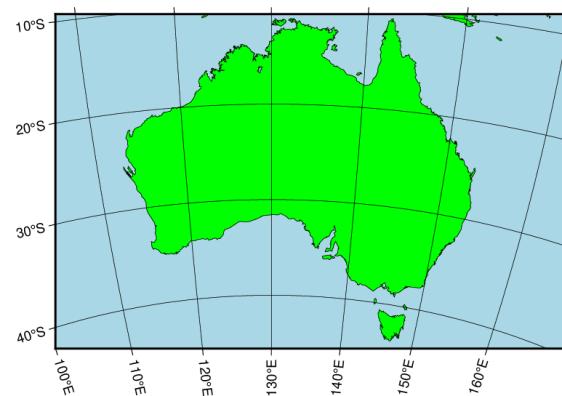
Lambert 投影



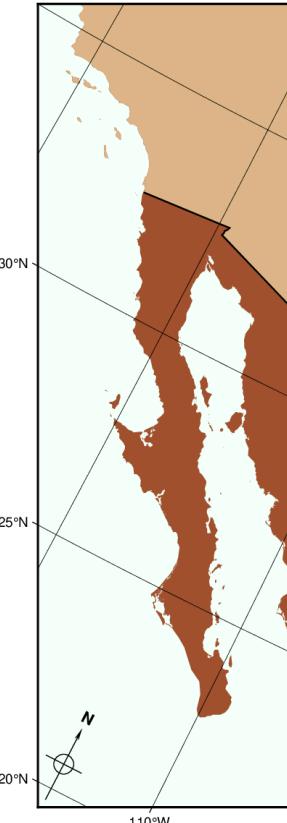
Hammer 投影



Mercator 投影

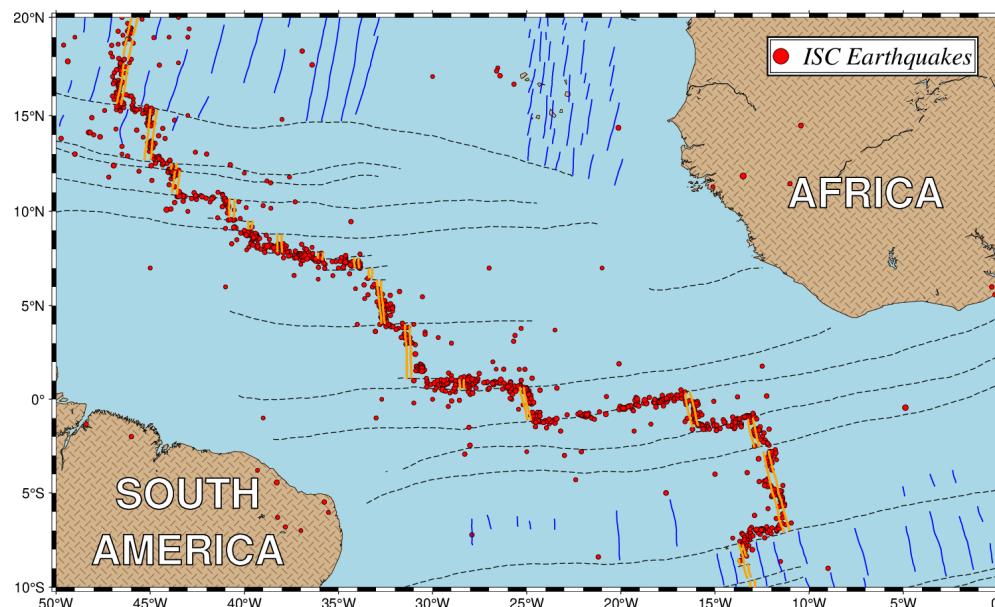


立体等角投影



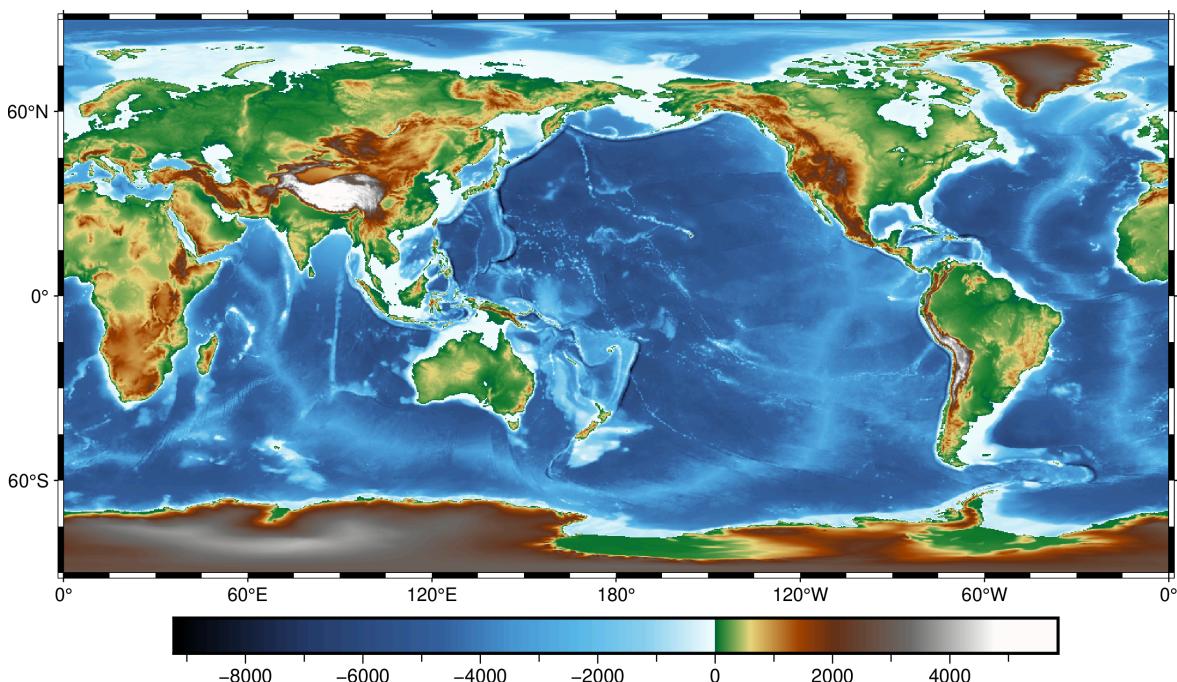
倾斜 Mercator 投影

绘制点、线数据



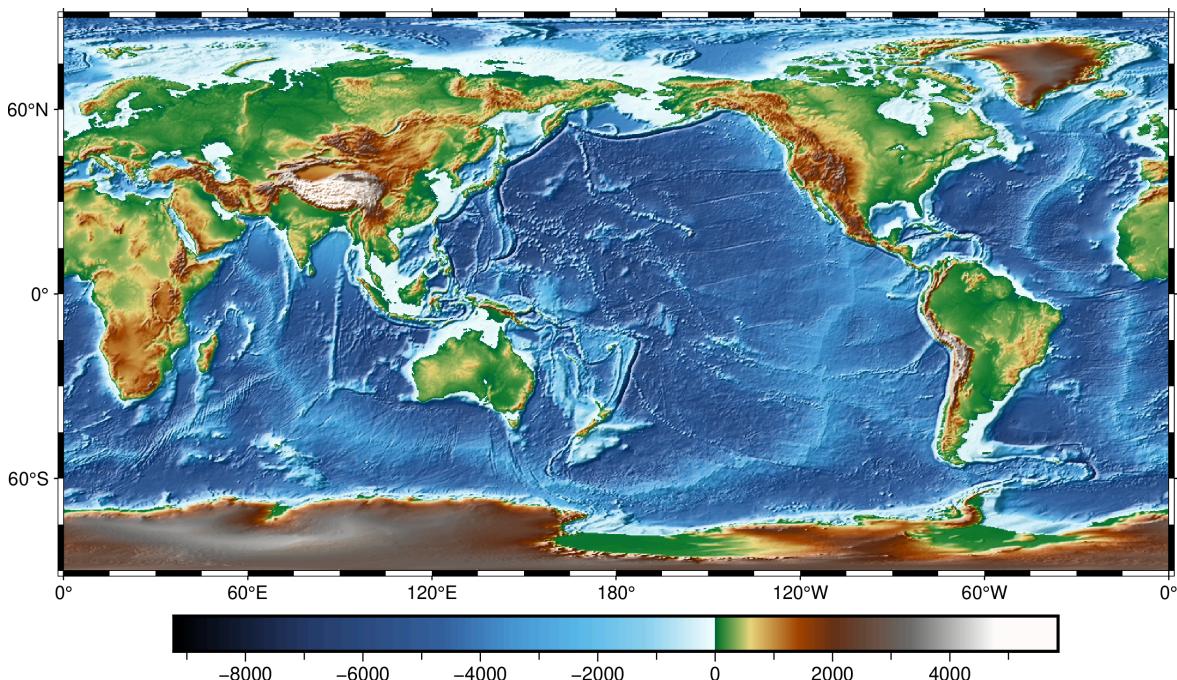
- 底图：坐标轴
- 海岸线：陆地、海洋
- 点和线
- 图例
- 文字标注

绘制网格数据



- 底图
- 2D 网格数据：经度、纬度、Z 值
- colorbar

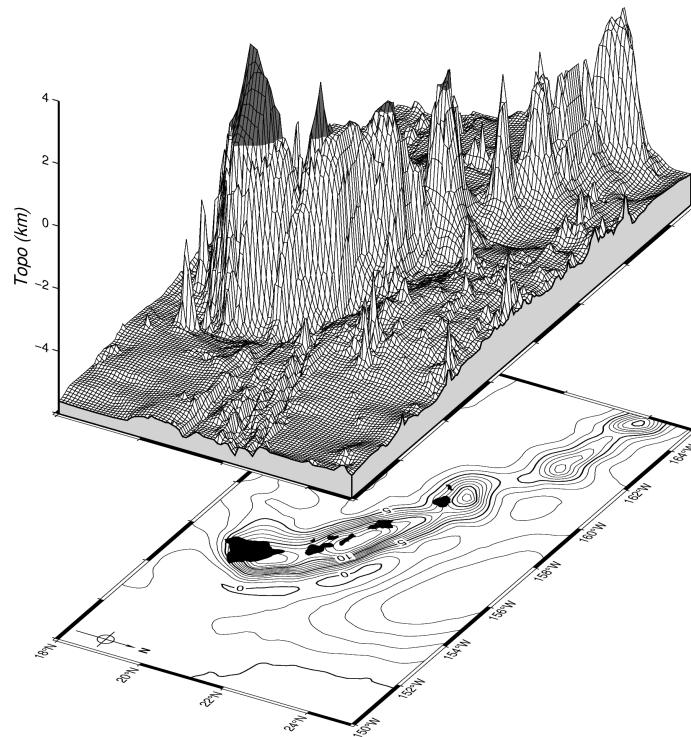
绘制网格数据



- 底图
- 2D 网格数据：经度、纬度、Z 值
- colorbar
- 立体效果

3D 立体视角

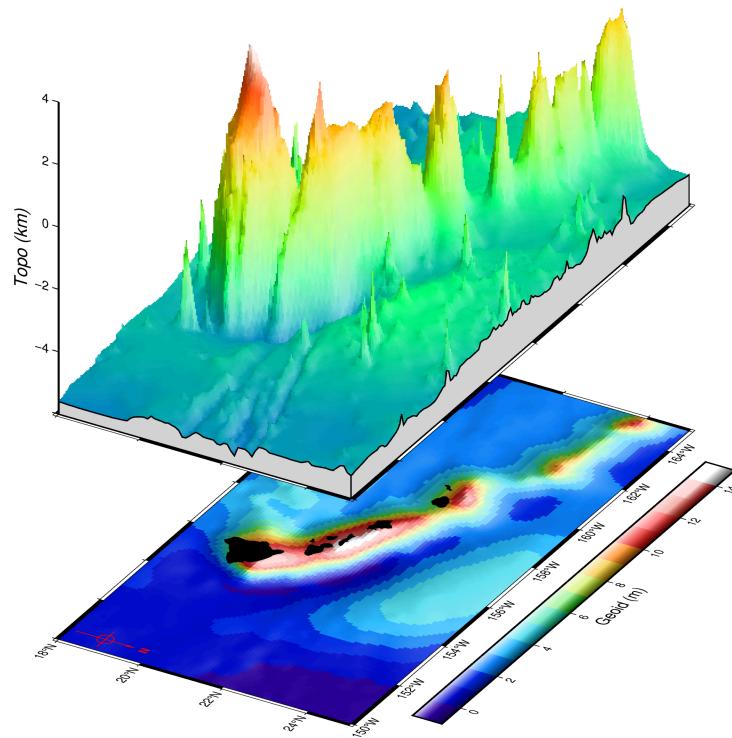
HAWAIIAN RIDGE



- 等值线
- 3D 立体视角
- 3D surface mesh plot

3D 立体视角

HAWAIIAN RIDGE



- 等值线
- 3D 立体视角
- 3D surface image plot

主要优点

主要优点

1. 图件精美
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

主要优点

1. 图件精美
2. 专注于地球科学领域：地图投影、经纬度、边界条件、海岸线、比例尺、指南针等
- 3.
- 4.
- 5.
- 6.
- 7.

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1. 图件精美
2. 专注于地球科学领域：地图投影、经纬度、边界条件、海岸线、比例尺、指南针等
3. 开源+免费：GNU LGPL 3.0 许可证
- 4.
- 5.
- 6.
- 7.

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3. 开源+免费：GNU LGPL 3.0 许可证
4. 跨平台：支持 Linux、macOS、Windows、BSD 等
- 5.
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4. 跨平台：支持 Linux、macOS、Windows、BSD 等
5. 多种图片格式：PDF、PNG、JPEG 等
- 6.
- 7.

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5. 多种图片格式：PDF、PNG、JPEG 等
6. 模块化：遵循 Unix 的设计哲学，不同的绘图和数据处理功能分别由不同的模块实现，多个模块配合实现复杂功能
- 7.

主要优点

1. 图件精美
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7. 命令行工具，绘图脚本化



Paul Wessel

Professor Emeritus, [University of Hawaii at Manoa](#) (USA), Visiting Scientist at Ceed
Verified email at hawaii.edu

Plate tectonics Geoinformatics

FOLLOW

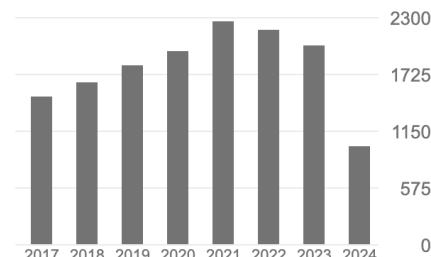
TITLE	CITED BY	YEAR
New, improved version of Generic Mapping Tools released P Wessel, WHF Smith Eos, Transactions American Geophysical Union 79 (47), 579-579	8170	1998
Free software helps map and display data P Wessel, WHF Smith Eos, Transactions American Geophysical Union 72 (41), 441-446	5018	1991
Generic mapping tools: improved version released P Wessel, WHF Smith, R Scharroo, J Luis, F Wobbe Eos, Transactions American Geophysical Union 94 (45), 409-410	3877	2013
New version of the generic mapping tools P Wessel, WHF Smith Eos, Transactions American Geophysical Union 76 (33), 329-329	3187	1995
Gridding with continuous curvature splines in tension WHF Smith, P Wessel Geophysics 55 (3), 293-305	1854	1990
The generic mapping tools version 6 P Wessel, JF Luis, L Uieda, R Scharroo, F Wobbe, WHF Smith, D Tian Geochemistry, Geophysics, Geosystems 20 (11), 5556-5564	1792	2019
A global, self-consistent, hierarchical, high-resolution shoreline database P Wessel, WHF Smith Journal of Geophysical Research: Solid Earth 101 (B4), 8741-8743	1555	1996

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not available	available
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Based on funding mandates



02

GMT 基础

Windows

1. 下载安装包 <https://mirrors.ustc.edu.cn/gmt/bin/gmt-6.5.0-win64.exe>
2. 双击安装

Windows

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2. 双击安装

macOS

```
brew install gmt
```

Windows

1. 下载安装包 <https://mirrors.ustc.edu.cn/gmt/bin/gmt-6.5.0-win64.exe>
2. 双击安装

macOS

```
brew install gmt
```

Linux

- **Ubuntu:** sudo apt install gmt gmt-dcw gmt-gshhg
- **Fedora:** sudo dnf install GMT GMT-common GMT-dev GMT-doc

Windows

1. 下载安装包 <https://mirrors.ustc.edu.cn/gmt/bin/gmt-6.5.0-win64.exe>
2. 双击安装

macOS

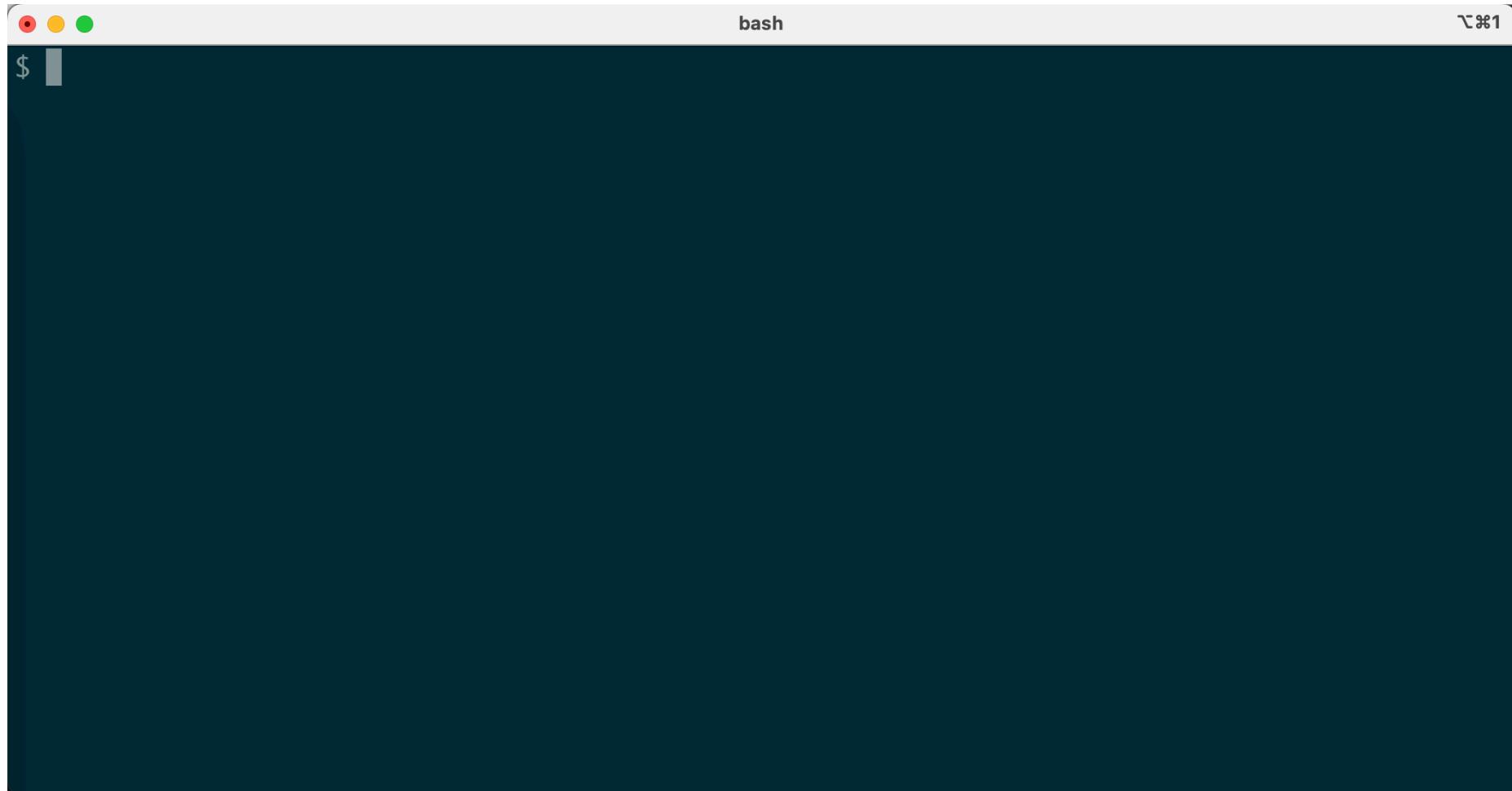
```
brew install gmt
```

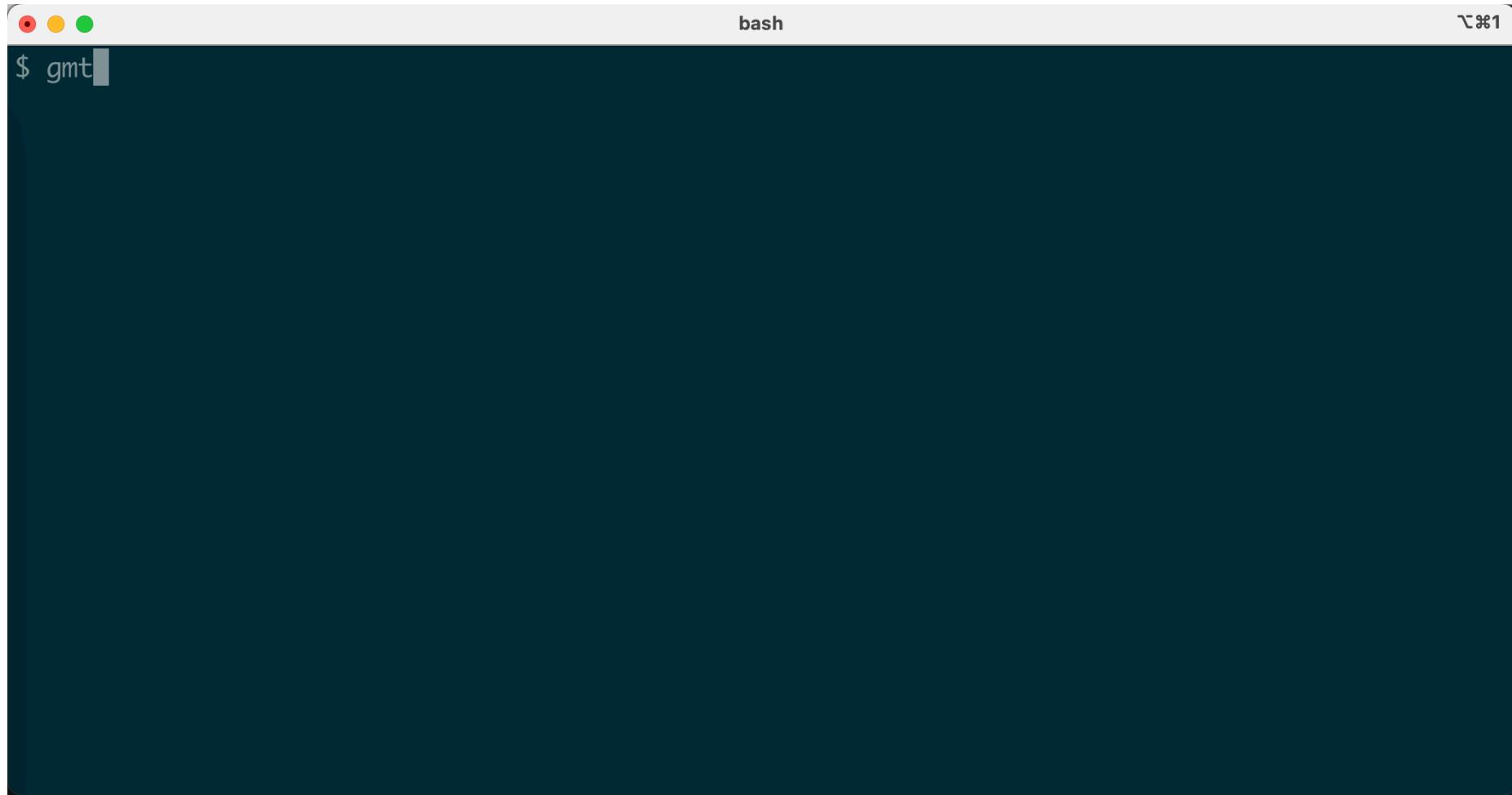
Linux

- **Ubuntu:** sudo apt install gmt gmt-dcw gmt-gshhg
- **Fedora:** sudo dnf install GMT GMT-common GMT-dev GMT-doc

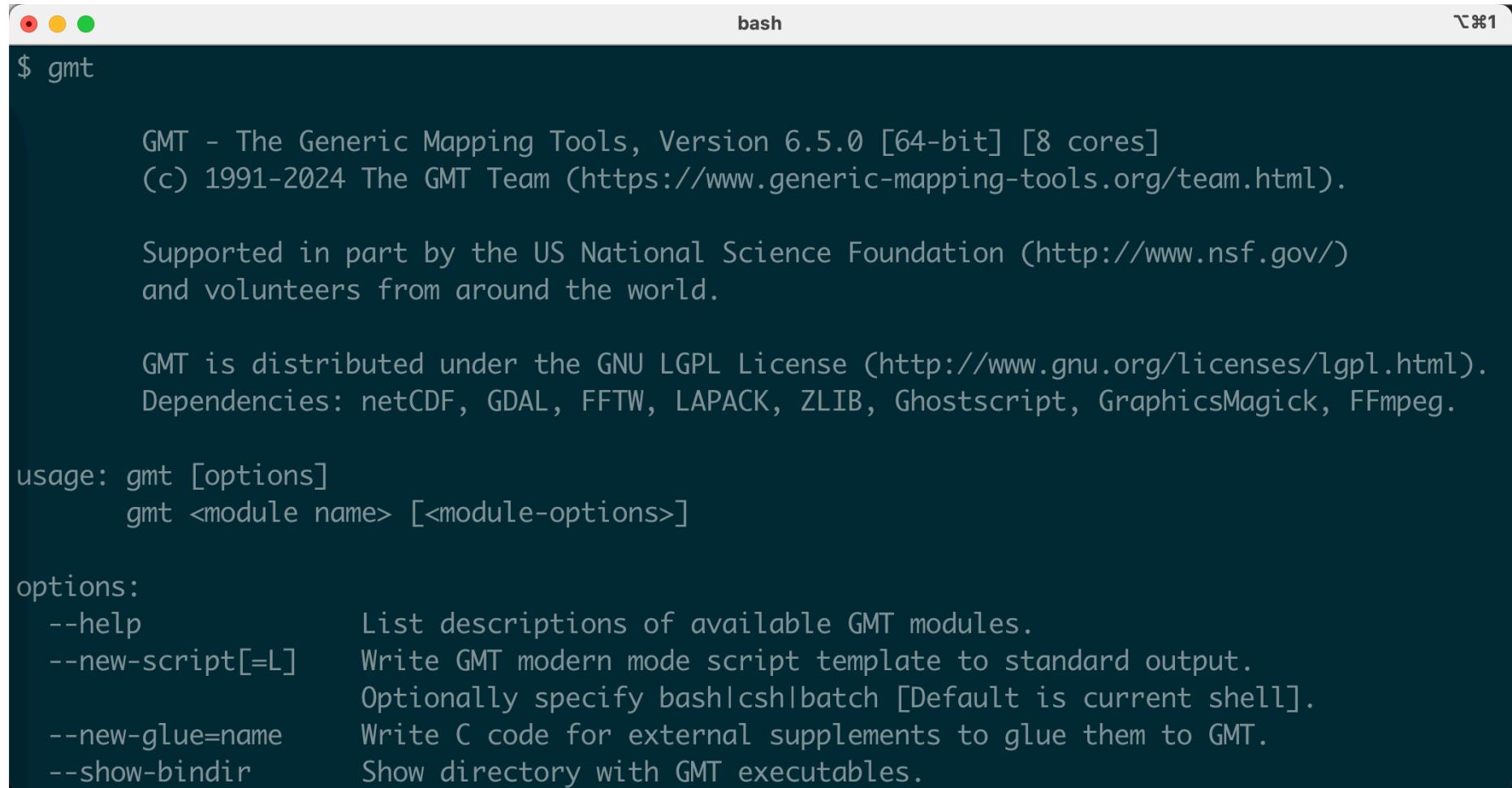
跨平台

```
conda install gmt -c conda-forge  
mamba install gmt -c conda-forge
```



A screenshot of a terminal window titled "bash". The window has a dark blue background. In the top left corner, there are three small colored circles (red, yellow, green). In the top right corner, there is a small icon with the text "⌘⌘1". The terminal prompt is "\$ gmt", where "gmt" is partially typed and followed by a cursor. The rest of the window is blank.

```
$ gmt
```



The screenshot shows a terminal window with a dark background and light-colored text. At the top, there are three colored circles (red, yellow, green) and the word "bash". On the right side, there is a small icon and the number "281". The terminal output starts with "\$ gmt", followed by the GMT license information, supported funding, and distribution details. It then provides usage instructions for the "gmt" command and lists various options with their descriptions.

```
$ gmt

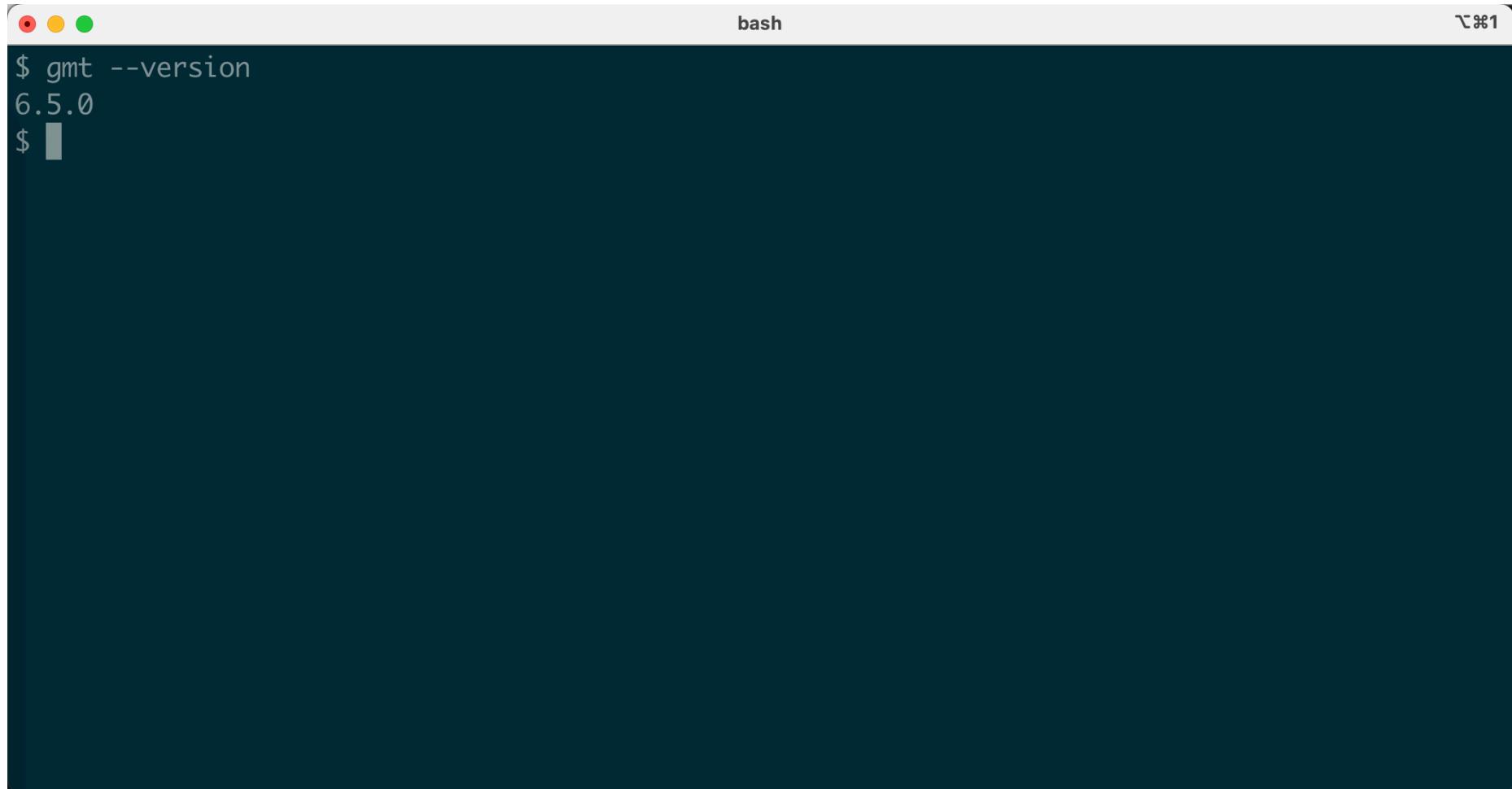
GMT - The Generic Mapping Tools, Version 6.5.0 [64-bit] [8 cores]
(c) 1991-2024 The GMT Team (https://www.generic-mapping-tools.org/team.html).

Supported in part by the US National Science Foundation (http://www.nsf.gov/)
and volunteers from around the world.

GMT is distributed under the GNU LGPL License (http://www.gnu.org/licenses/lgpl.html).
Dependencies: netCDF, GDAL, FFTW, LAPACK, ZLIB, Ghostscript, GraphicsMagick, FFmpeg.

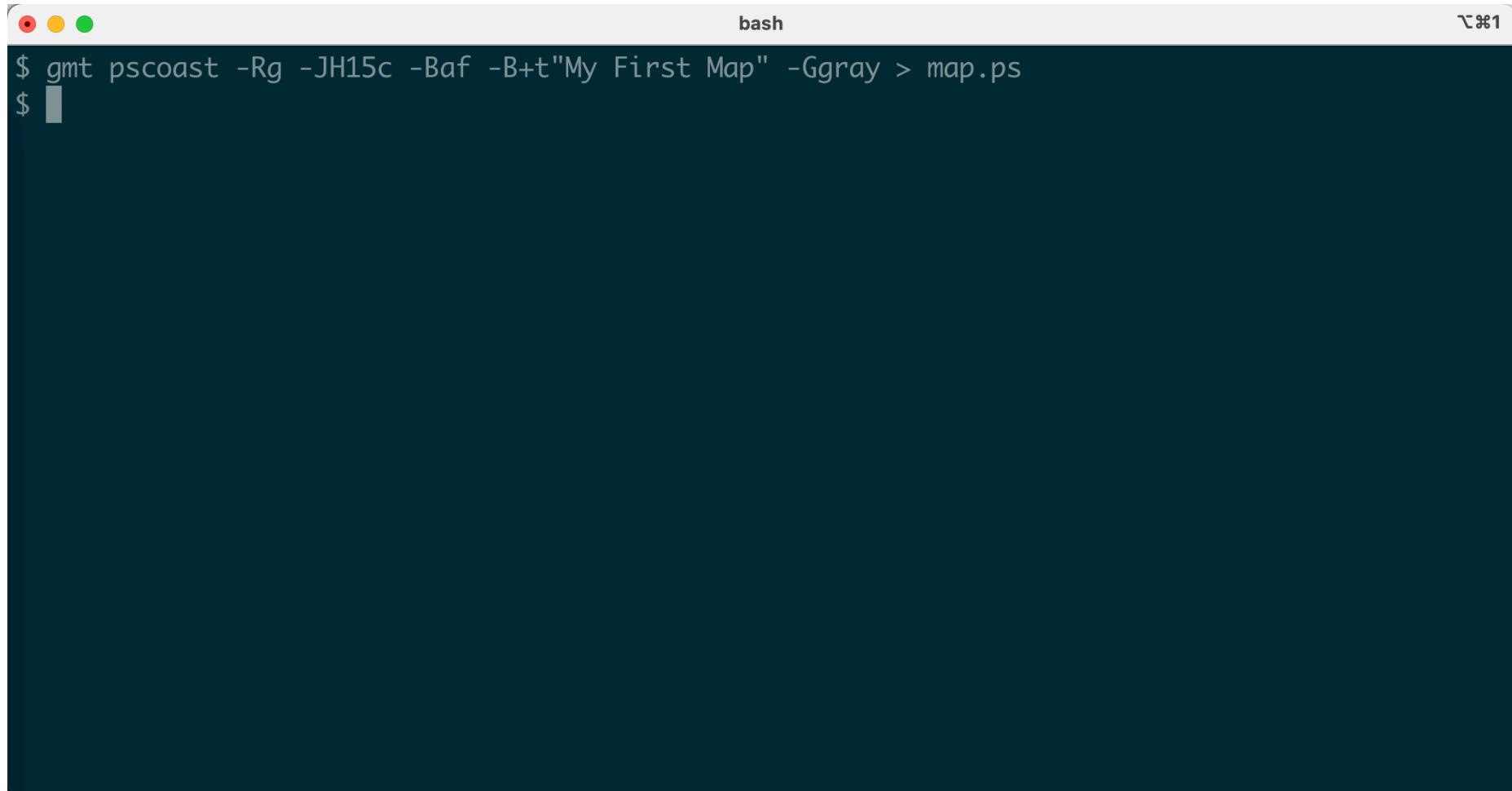
usage: gmt [options]
      gmt <module name> [<module-options>]

options:
  --help                  List descriptions of available GMT modules.
  --new-script[=L]         Write GMT modern mode script template to standard output.
                          Optionally specify bash|csh|batch [Default is current shell].
  --new-glue=name          Write C code for external supplements to glue them to GMT.
  --show-bindir            Show directory with GMT executables.
```

A screenshot of a terminal window titled "bash". The window has a dark blue background and white text. In the top right corner, there is a small icon with three colored circles (red, yellow, green) and the number "19". The terminal prompt is "\$ ". The user has entered the command "\$ gmt --version" and the output is "6.5.0".

```
$ gmt --version
6.5.0
$
```

GMT 基础：命令行

A screenshot of a terminal window titled "bash". The window has a dark blue background and white text. In the top right corner, there are three colored circles (red, yellow, green) and the text "⌘⌘1". The terminal prompt is "\$ ". Below the prompt, a command is entered: "\$ gmt pscoast -Rg -JH15c -Baf -B+t"My First Map" -Ggray > map.ps".

```
$ gmt pscoast -Rg -JH15c -Baf -B+t"My First Map" -Ggray > map.ps
```

```
gmt pscoast -JH15c -Rg -Baf -B+t"My First Map" -Ggray > map.ps
```

- **gmt**: GMT 命令
- **pscoast**: GMT 模块
- **-JH15c**: 选项 + 参数
 - ▶ 选项以 **-** 开头，后接单个字符（如 **-J**）
 - ▶ 选项后加参数（如 **H15c**）
 - ▶ 子选项以 **+** 开头，后接单个字符+参数（如 **+t"My First Map"**）
 - ▶ 每个选项之间以空格分隔
 - ▶ 参数中若有空格，则用引号括起来
- **> map.ps**: 将命令的输出保存到文件 **map.ps** 中

-J 选项：指定地图投影方式

30 多种地图投影方式：

- -JM12c 墨卡托投影，图片宽度 12 cm
- -JM120/12c 墨卡托投影，投影中心为 120°E，图片宽度 12 cm
- -JH15c Hammer 投影，图片宽度 15 cm

更多地图投影见：<https://docs.gmt-china.org/latest/proj/>

笛卡尔投影：

-JXwidth/height

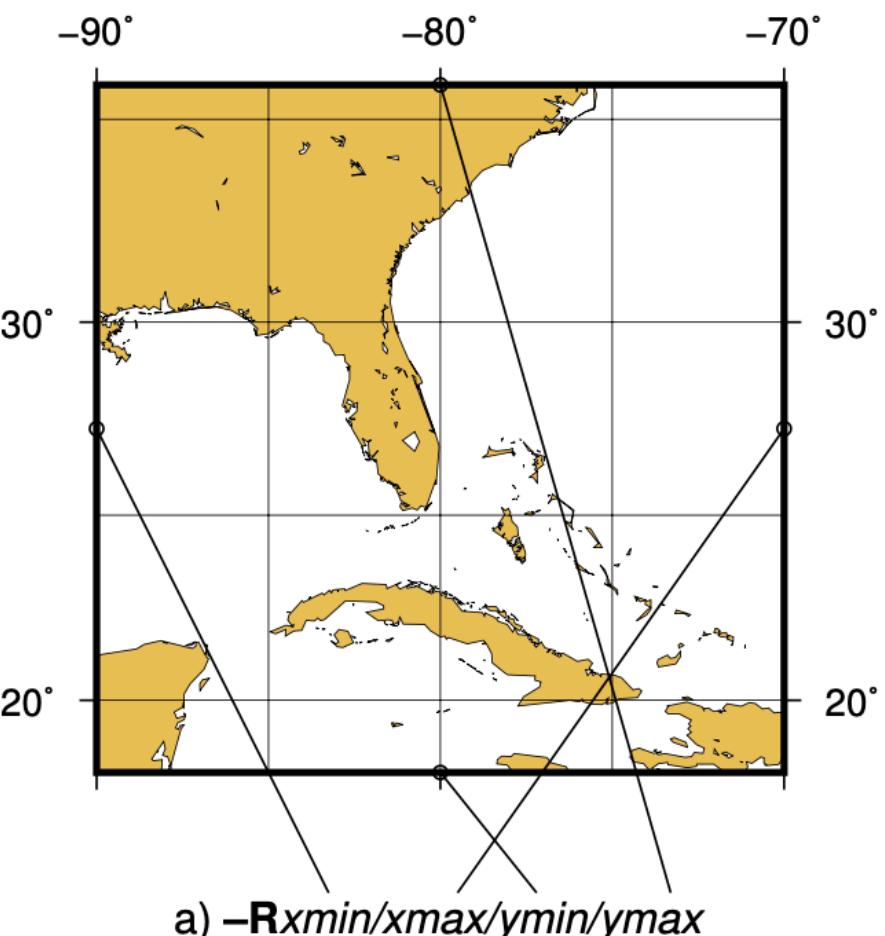
- -JX10c 宽度 10 cm，高度 10 cm
- -JX10c/5c 笛卡尔线性坐标轴，宽度 10 cm，高度 5 cm

-R 选项：指定研究区域范围

-Rxmin/xmax/ymin/ymax

示例：

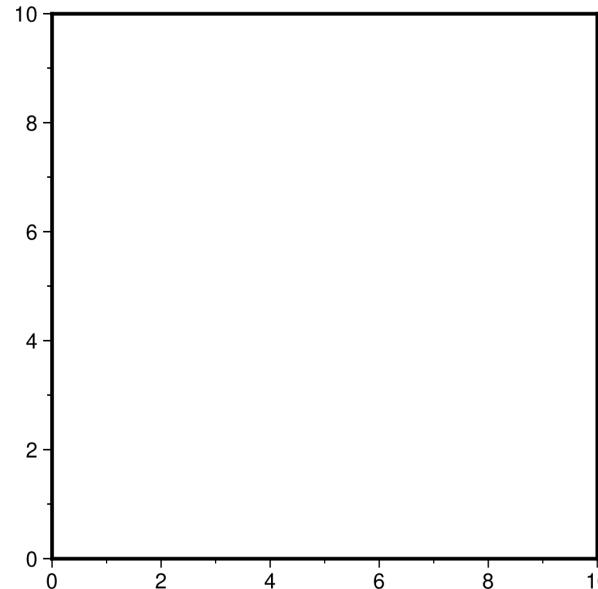
- -R0/360/-90/90 或 -Rg
- -R-180/180/-90/90 或 -Rd
- -R-90/-70/18/36



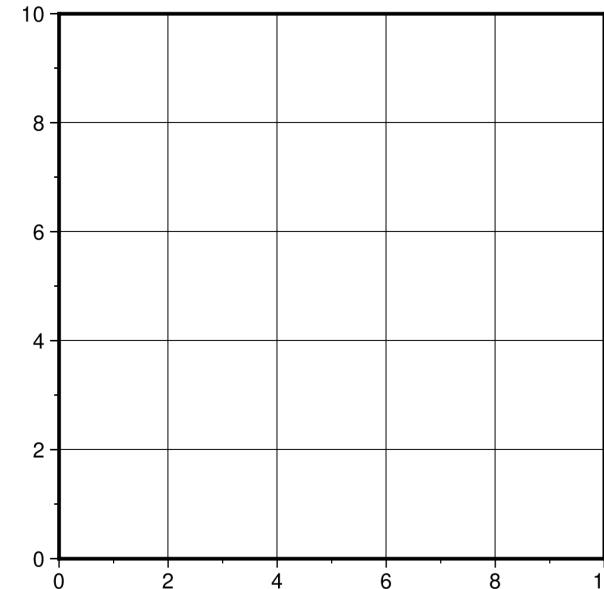
-B 选项：控制底图边框和轴。[最复杂也最简单的选项之一]

-Bafg: **a** 数字标注；**f** 刻度线；**g** 网格线

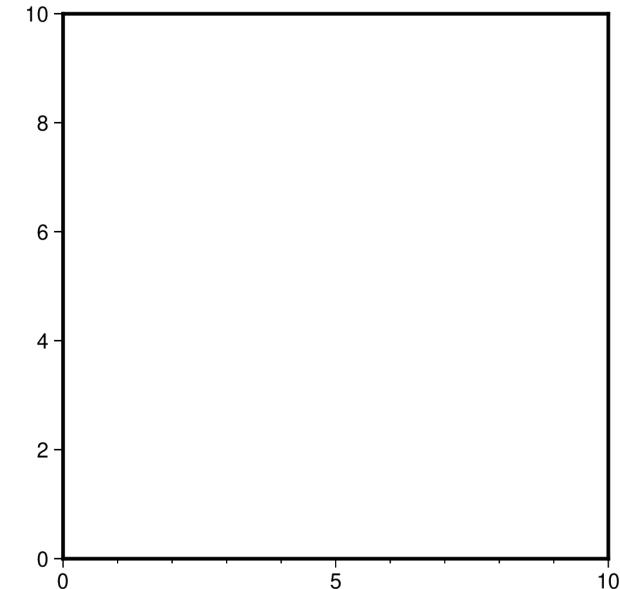
-B



-Bafg

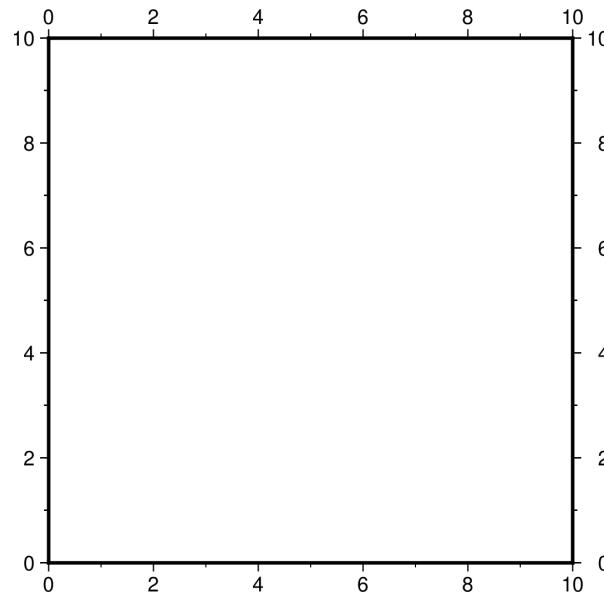


-Bxa5f1 -Bya2f2

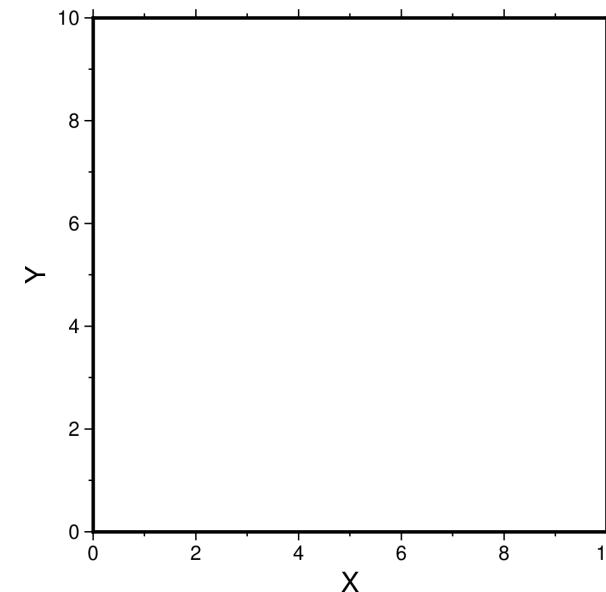


- B 选项：控制底图边框和轴。[最复杂也最简单的选项之一]
- BWSEN: 控制四条边，WSEN 表示显示标注和刻度；wesen 表示显示刻度但不显示标注

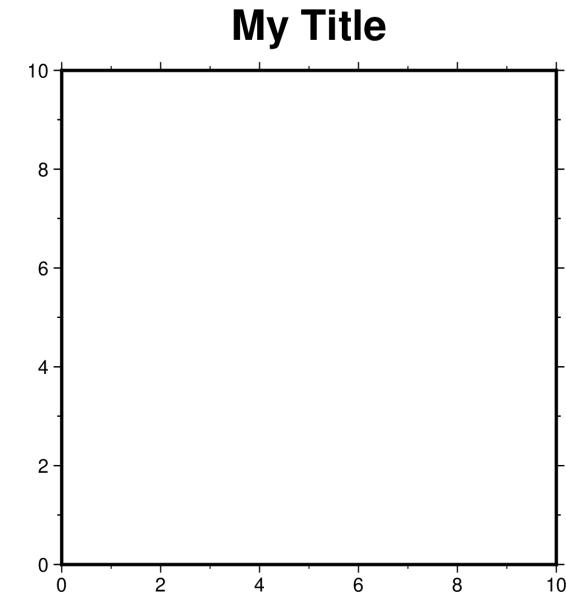
-Baf -BWSEN



-Bxaf+lX -Byaf+lY -BWSen



-Baf -BWSen+t"My Title"



PostScript 是一种用于描述矢量图形的页面描述语言。 GMT 绘图模块则输出 PostScript 语句。

```
%! PS-Adobe-3.0
% Draw a rectangle
newpath
100 100 moveto
200 0 rlineto
0 100 rlineto
-200 0 rlineto
closepath
stroke

% Draw some text
/Times-Roman findfont 24 scalefont setfont
100 150 moveto
(Hello, PostScript!) show

showpage
%%Trailer
%%EOF
```



```
gmt pscoast -JH15c -Rg -Baf -B+t"My First Map" -Ggray > map.ps
```

```
gmt pscoast -JH15c -Rg -Baf -B+t"My First Map" -Ggray > map.ps
```

如何查看 PostScript 文件？

```
gmt psconvert -A -P -Tf map.ps
```

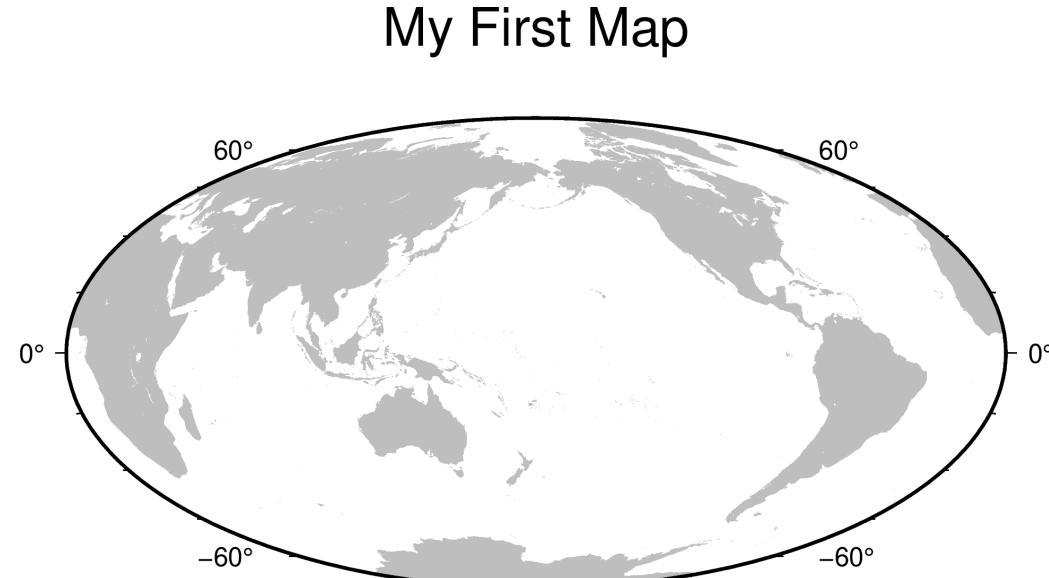
```
gmt pscoast -JH15c -Rg -Baf -B+t"My First Map" -Ggray > map.ps
```

如何查看 PostScript 文件？

```
gmt psconvert -A -P -Tf map.ps
```

-T 指定输出格式。

- -Tf PDF
- -Tj JPEG
- -Tg PNG





03

GMT 主要模块

GMT 模块一览

• batch	• gmtmath	• grdconvert	• grdmix	• project	• pstext
• blockmean	• gmtregress	• grdcut	• grdpaste	• psbasemap	• pswiggle
• blockmedian	• gmtselect	• grdedit	• grdproject	• psclip	• psxy
• blockmode	• gmtset	• grdffft	• grdsample	• pscoast	• psxyz
• dimfilter	• gmt simplify	• grdfill	• grdselect	• pscontour	• sample1d
• docs	• gmt spatial	• grdfilter	• grdtrack	• psconvert	• spectrum1d
• filter1d	• gmt split	• grgdal	• grdtrend	• psevents	• sph2grd
• fitcircle	• gmt vector	• grdgradient	• grdvector	• pshistogram	• sphdistance
• gmt2kml	• gmt which	• grdhisteq	• grdview	• psimage	• sphinterpolate
• gmtbinstats	• grd2cpt	• grdimage	• grdvolume	• pslegend	• sphtriangulate
• gmtconnect	• grd2kml	• grdinfo	• greenspline	• psmask	• surface
• gmtconvert	• grd2xyz	• grdinterpolate	• kml2gmt	• psrose	• trend1d
• gmtdefaults	• grdblend	• grdlmask	• makecpt	• psscale	• trend2d
• gmtget	• grdclip	• grdmask	• mapproject	• pssolar	• triangulate
• gmtinfo	• grdcontour	• grdmath	• nearneighbor	• psternary	• xyz2grd
• gmtlogo					

pscoast 绘制海岸线、河流和国界等

官方文档: <https://docs.generic-mapping-tools.org/dev/pscoast.html>

pscoast

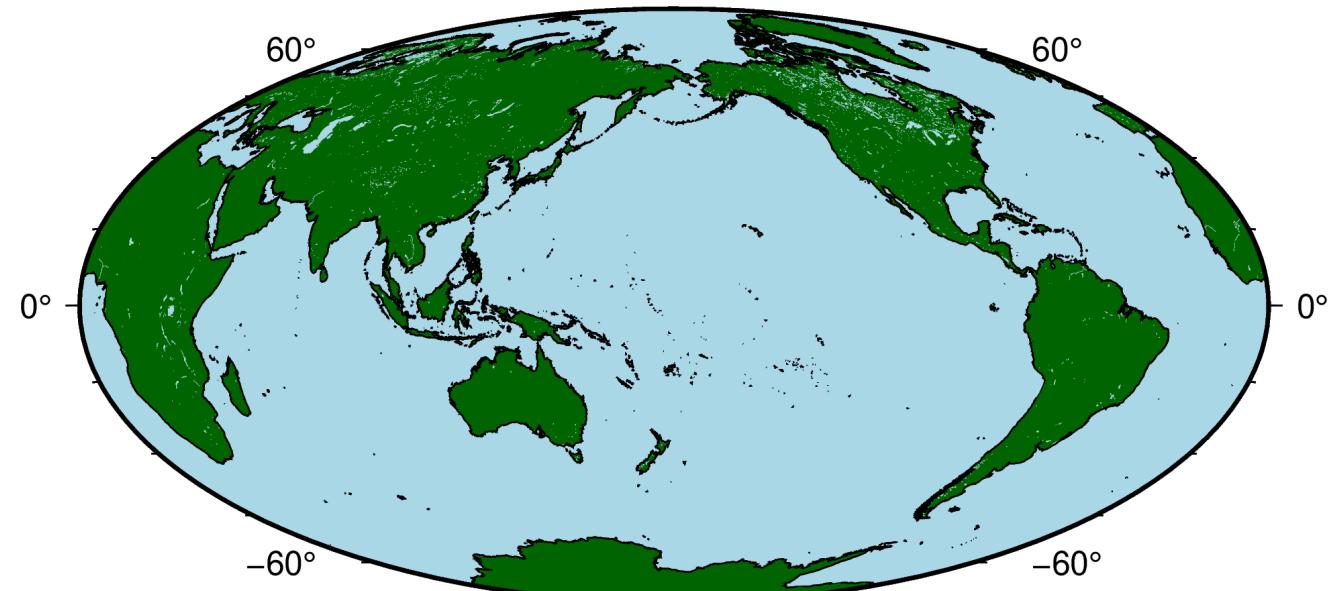
Plot continents, countries, shorelines, rivers, and borders

Synopsis

```
gmt pscoast -Jparameters -Rregion [ -Amin_area[/min_level/max_level][+a[g|i][s|S]][+l|r][+ppercent] ] [ -B[p|s]parameters ]  
[ -Cfill[+l|r] ] [ -Dresolution[+f] ] [ -Edcw ] [ -Fbox ] [ -G[fill] ] [ -Iriver[/pen] ] [ -K ] [ -Lscalebar ] [ -M ] [ -Nborder[/pen] ] [ -O ]  
[ -P ] [ -Q ] [ -S[fill] ] [ -Trose ] [ -U[stamp] ] [ -V[level] ] [ -W[level/]pen ] [ -X[a|c|f|r][xshift] ] [ -Y[a|c|f|r][yshift] ] [ -bobinary ]  
[ -pflags ] [ -ttransp ] [ --PAR=value ]
```

```
gmt pscoast -JH15c -Rg -Baf -Gdarkgreen -Slightblue -W1/0.5p > coast-2.ps
```

- -G: 陆地颜色
- -S: 海洋颜色
- -W1/0.5p:
 - ▶ 1 表示海岸线;
 - ▶ 0.5p 为线宽



grdimage 绘制二维网格文件

官方文档: <https://docs.generic-mapping-tools.org/dev/grdimage.html>

grdimage

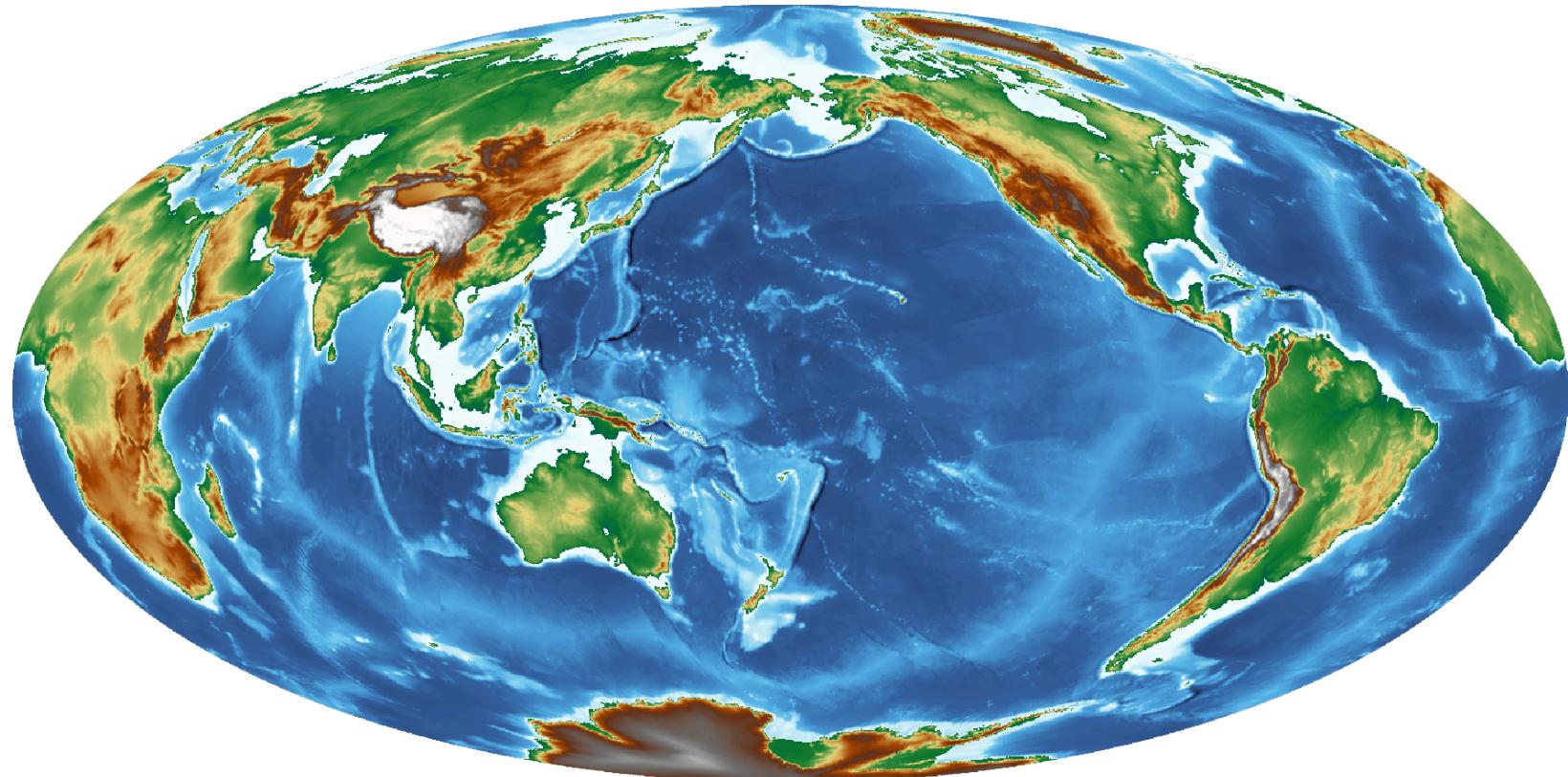
Project and plot grids or images

Synopsis

```
gmt grdimage grid | image -Jparameters [ -Aout_img[=driver] ] [ -B[p|s]parameters ] [ -C[section/]master|cpt|color1,color2,color3,...][+h[hinge]][+idz][+u|Uunit][+sfname] ] [ -D[r] ] [ -E[i|dpi] ] [ -Gcolor[+b|f] ] [ -I[file|intens|+aa|azimuth][+d][+mambient][+nargs] ] [ -M ] [ -N ] [ -Q[color][+i][+zvalue] ] [ -Rwest/east/south/north[/zmin/zmax][+r][+uunit] ] [ -T[+o[pen]][+s] ] [ -U[stamp] ] [ -V[level] ] [ -X[a|c|f|r][xshift] ] [ -Y[a|c|f|r][yshift] ] [ -fflags ] [ -nflags ] [ -pflags ] [ -ttransp ] [ -x[[-]n] ] [ -PAR=value ]
```

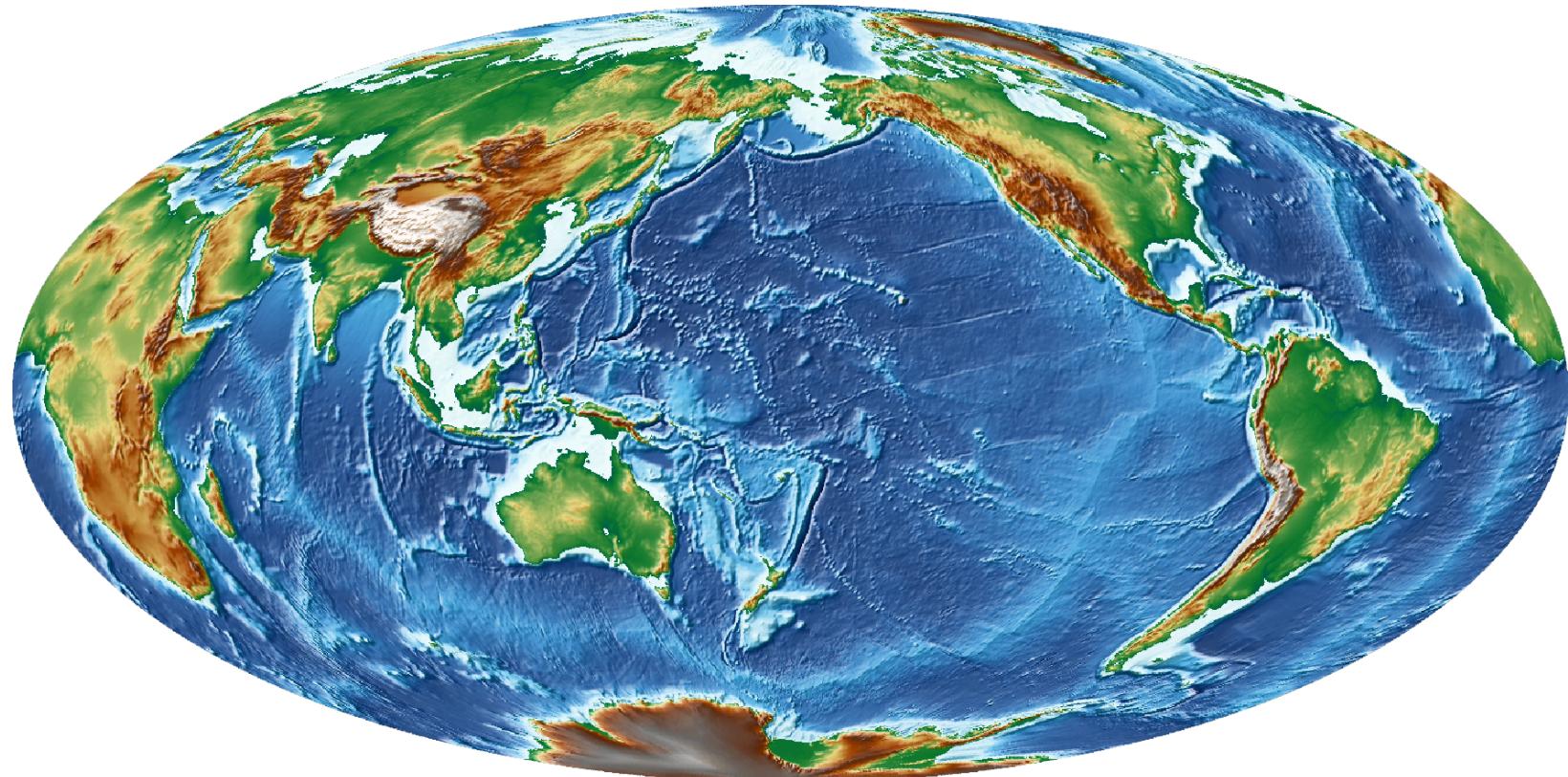
GMT 主要模块: grdimage

```
gmt grdimage @earth_relief_15m -JH15c -Rg > grdimage-1.ps
```



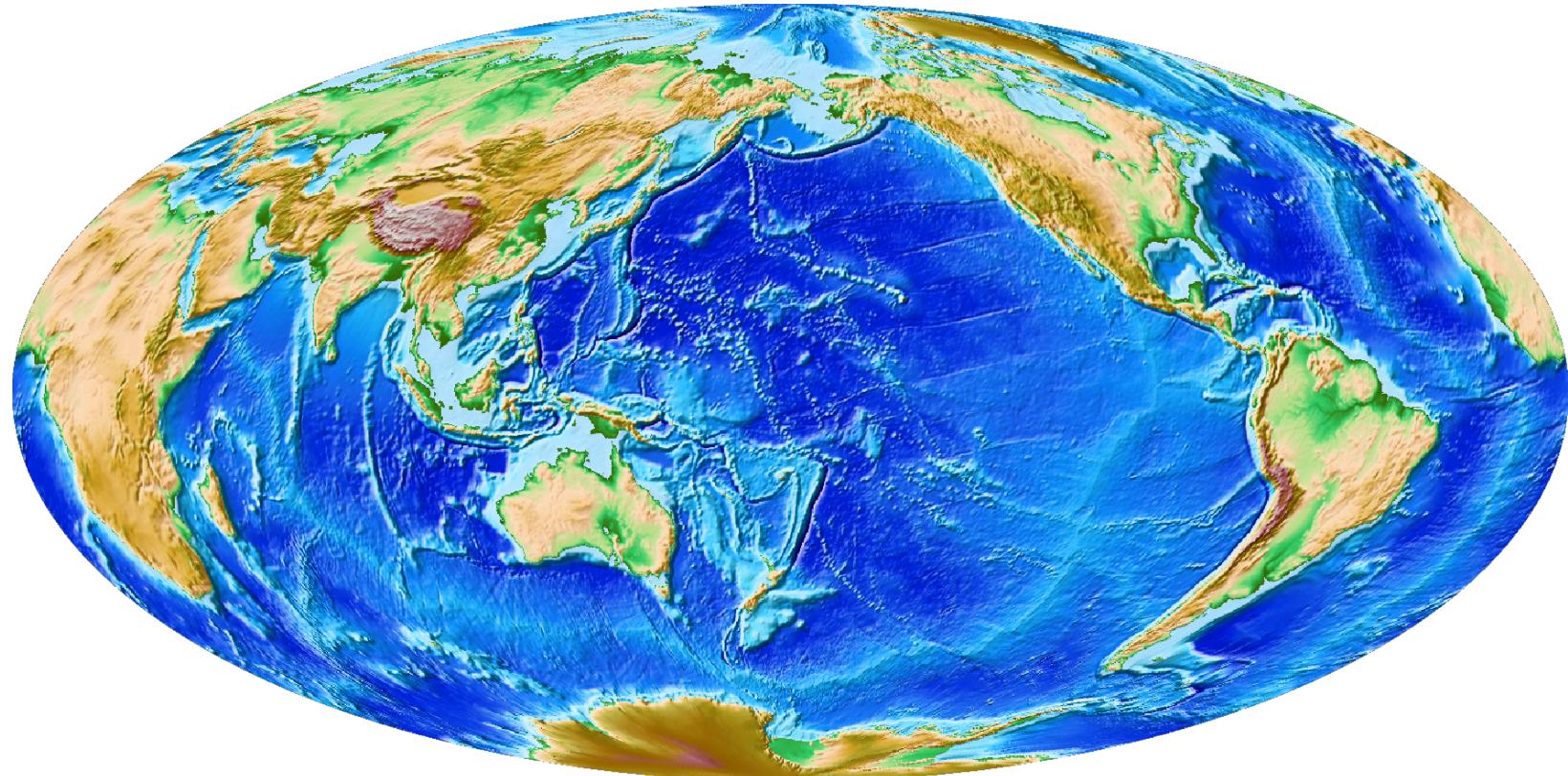
GMT 主要模块: grdimage

```
gmt grdimage @earth_relief_15m -JH15c -Rg -I+d > grdimage-2.ps
```



GMT 主要模块: grdimage

```
gmt grdimage @earth_relief_15m -JH15c -Rg -I+d -Cetopo1 > grdimage-3.ps
```



psxy 绘制线段、多边形和符号

官方文档: <https://docs.generic-mapping-tools.org/dev/psxy.html>

psxy

Plot lines, polygons, and symbols in 2-D

Synopsis

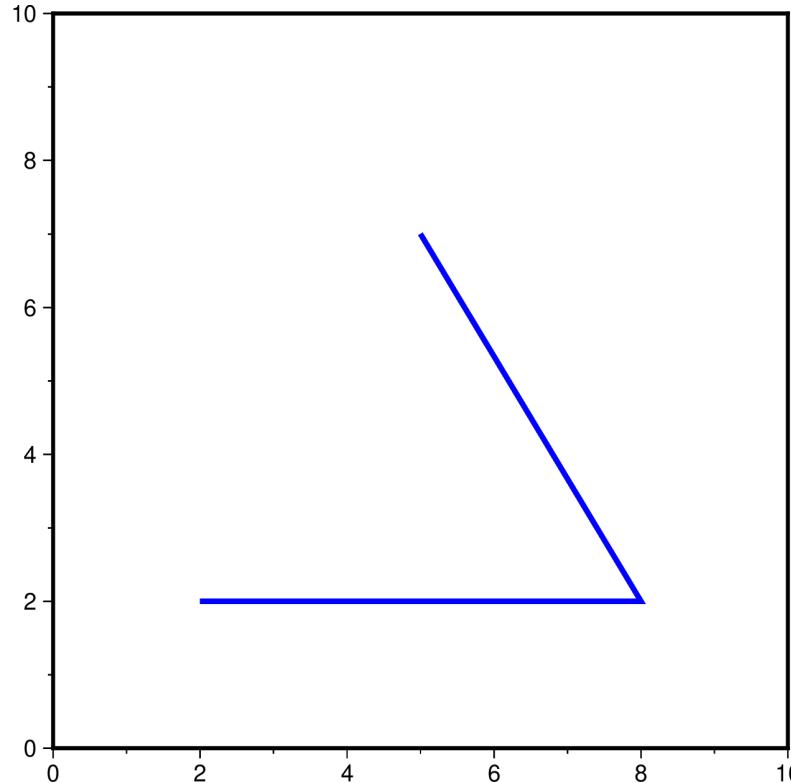
```
gmt psxy [ table ] [-Jparameters -Rwest/east/south/north[/zmin/zmax][+r][+uunit] ] [ -A[m|p|x|y|r|t] ] [ -B[p|s]parameters ] [ -Ccpt ] [ -Ddx/dy ] [ -E[x|y|X|Y][+a|A][+cl|f][+n][+wwidth[/cap]][+ppen] ] [ -F[c|n|r][a|f|s|r|refpoint] ] [ -Gfill ] [ -H[scaler] ] [ -I[intens] ] [ -K ] [ -L[+b|d|D][+xl|r|x0][+yl|r|y0][+ppen] ] [ -M[c|s][+gfill][+ppen][+rpen][+y[level]] ] [ -N[c|r] ] [ -O ] [ -P ] [ -S[symbol][size] ] [ -U[stamp] ] [ -V[level] ] [ -W[pen][attr] ] [ -X[a|c|f|r][xshift] ] [ -Y[a|c|f|r][yshift] ] [ -Zvalue[+t|T] ] [ -aflags ] [ -bibinary ] [ -dinodata[+ccol] ] [ -eregexp ] [ -fflags ] [ -ggaps ] [ -hheaders ] [ -iflags ] [ -pflags ] [ -qiflags ] [ -ttransp ] [ -wflags ] [ -:i|o ] [ --PAR=value ]
```

```
gmt psxy input.txt -R0/10/0/10 -JX10c -B -W2p,blue > map.ps
```

input.txt 文件格式为：

```
2 2  
8 2  
5 7
```

- `-W2p,blue` 宽度为 2p 的蓝色线段

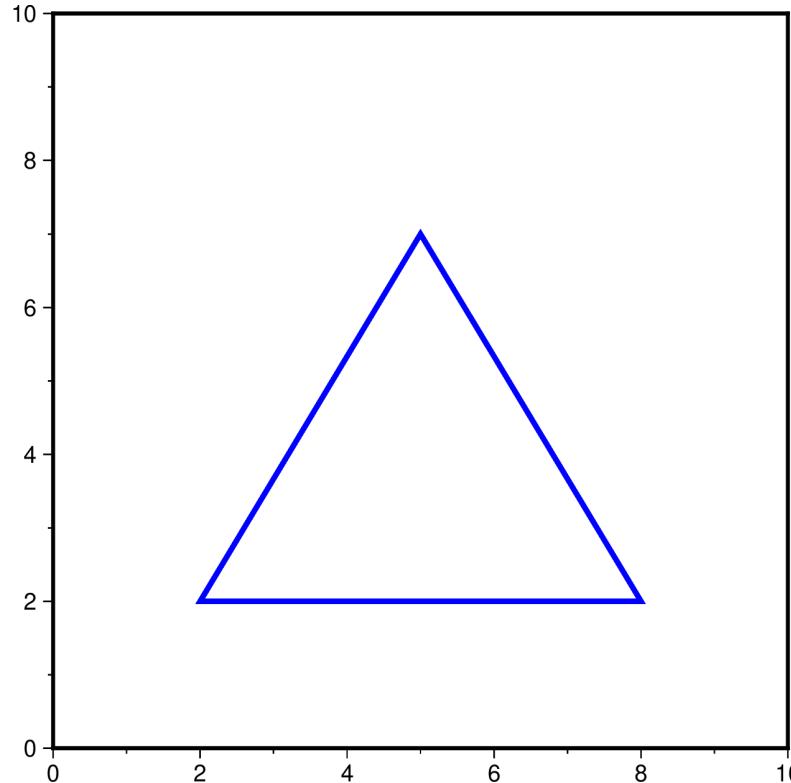


```
gmt psxy input.txt -R0/10/0/10 -JX10c -B -W2p,blue -L > map.ps
```

input.txt 文件格式为：

```
2 2  
8 2  
5 7
```

- -L 绘制闭合多边形（即首尾相连）

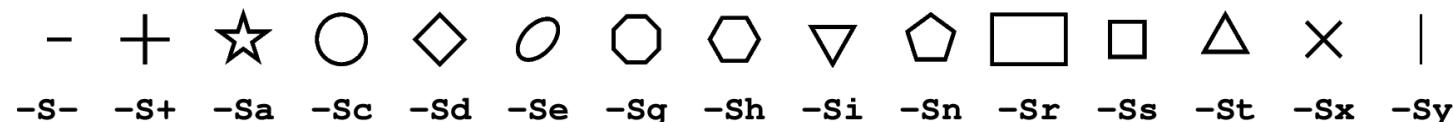
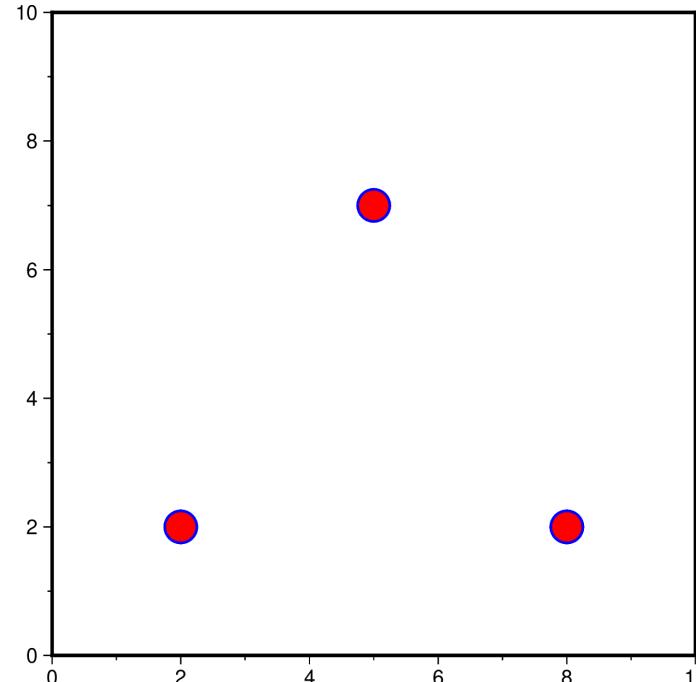


```
gmt psxy input.txt -R0/10/0/10 -JX10c -B -Sc0.5c -W1p,blue -Gred > map.ps
```

input.txt 文件格式为：

```
2 2  
8 2  
5 7
```

- -Sc0.5c: 绘制直径为 0.5 cm 的圆
- -W1p,blue : 符号轮廓线宽及颜色
- -Gred : 符号填充颜色



pstext 添加文字

官方文档: <https://docs.generic-mapping-tools.org/dev/pstext.html>

pstext

Plot or typeset text

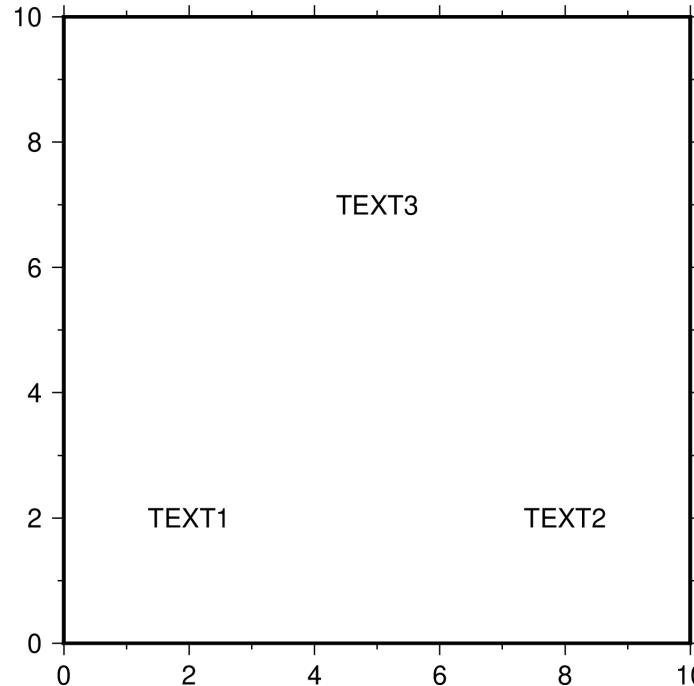
Synopsis

```
gmt pstext [ textfiles ] [-Jparameters -Rwest/east/south/north[/zmin/zmax][+r][+uunit] [ -A ] -B[p|s]parameters [ -C[idx/dy]]  
[+to|O|c|C] [ -D[j|J]dx/dy[+vpen] ] [ -F[+aangle]][+cjustify][+ffont][+jjustify][+h|l|rfirst] |ttext|zformat] ] [ -Gfill][+n]  
[ -K ] [ -L ] [ -M ] [ -N ] [ -O ] [ -P ] [ -Ql|u ] [ -S[idx/dy/][shade] ] [ -Ustamp ] [ -V[ilevel] ] [ -Wpen ] [ -X[a|c|f|r][xshift] ] [ -Y[a|c|f|r][yshift] ] [ -Z ] [ -acol=name[...] ] [ -eregexp ] [ -fflags ] [ -hheaders ] [ -itword ] [ -pfls ] [ -qiflags ] [ -ttransp ] [ -wfls ] [ -:[i|o] ] [ --PAR=value ]
```

```
gmt pstext input.txt -R0/10/0/10 -JX10c -B > pstext-1.ps
```

input.txt 文件格式为：

```
2 2 TEXT1  
8 2 TEXT2  
5 7 TEXT3
```

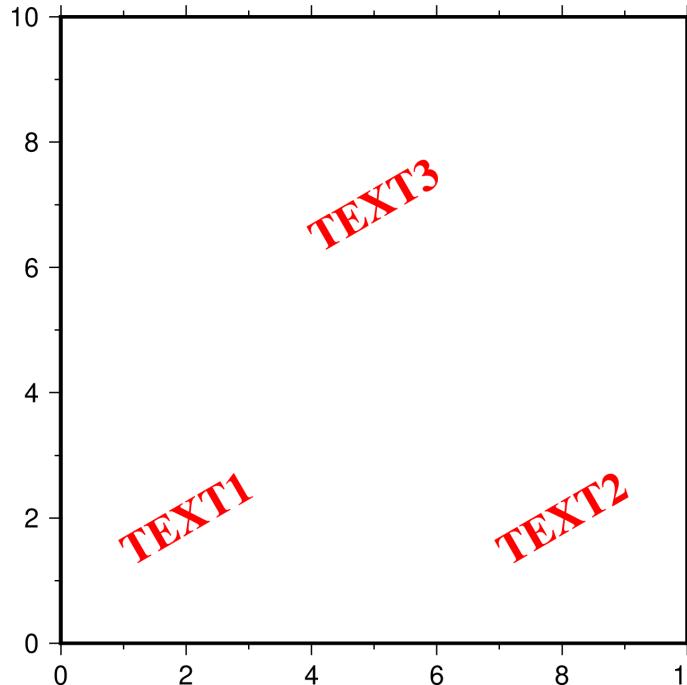


```
gmt pstext input.txt -R0/10/0/10 -JX10c -B -F+f20p,Times-Bold,red+a30 >  
pstext-2.ps
```

input.txt 文件格式为：

```
2 2 TEXT1  
8 2 TEXT2  
5 7 TEXT3
```

- +f 控制文字大小、字体和颜色
- +a 控制文字旋转角度



```
%! PS-Adobe-3.0
```

```
% Draw a rectangle
```

```
newpath
```

```
100 100 moveto
```

```
200 0 rlineto
```

```
0 100 rlineto
```

```
-200 0 rlineto
```

```
closepath
```

```
stroke
```

```
% Draw some text
```

```
/Times-Roman findfont 24 scalefont setfont
```

```
100 150 moveto
```

```
(Hello, PostScript!) show
```

```
showpage
```

```
%%Trailer
```

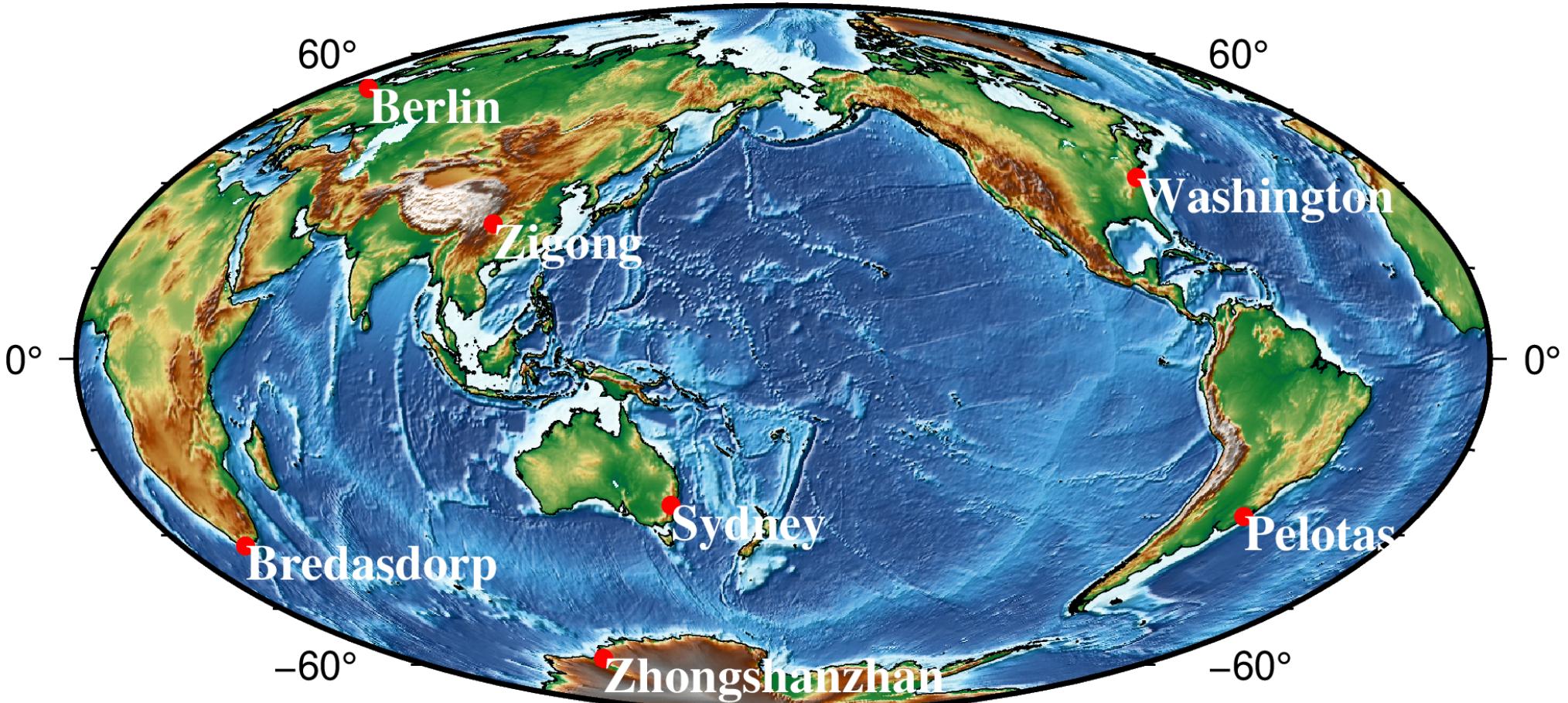
```
%%EOF
```



```
gmt grdimage @earth_relief_15m -JH15c -Rg -Baf -I+d -K > map.ps
gmt pscoast -J -R -W1/0.25p -K -O >> map.ps
gmt psxy points.txt -J -R -Sc0.2c -Gred -K -O >> map.ps
gmt pstext text.txt -J -R -F+f15p,Times-Bold,white+jTL -O >> map.ps
gmt psconvert -A -P -Tg map.ps
```

注意事项：

- -J 和 -R：
 - ▶ 第一个绘图命令需要指定完整的 -J 和 -R 选项
 - ▶ 其他绘图命令可以直接使用 -J -R
- -K 和 -O
 - ▶ 第一个绘图命令使用 -K 选项：不输出 PS 尾部信息，但输出 PS 头部信息
 - ▶ 中间绘图命令使用 -K -O 选项：不输出 PS 头部和尾部信息
 - ▶ 其他绘图命令使用 -O 选项：不输出 PS 头部信息，但输出尾部信息
- 输出重定向
 - ▶ 第一个绘图命令用 > 表示输出到新 PS 文件中（若存在，则覆盖）
 - ▶ 其他绘图命令使用 >> 表示输出追加到已有 PS 文件中





04

GMT 现代模式

GMT 经典模式

```
gmt grdimage @earth_relief_15m -JH15c -Rg -Baf -I+d -K > map.ps
gmt pscoast -J -R -W1/0.25p -K -O >> map.ps
gmt psxy points.txt -J -R -Sc0.2c -Gred -K -O >> map.ps
gmt pstext text.txt -J -R -F+f15p,Times-Bold,white+jTL -O >> map.ps
gmt psconvert -A -P -Tg map.ps
```

GMT 经典模式

```
gmt grdimage @earth_relief_15m -JH15c -Rg -Baf -I+d -K > map.ps  
gmt pscoast -J R -W1/0.25p -K 0 >> map.ps  
gmt psxy points.txt -J R -Sc0.2c -Gred -K 0 >> map.ps  
gmt pstext text.txt -J R -F+f15p,Times-Bold,white+jTL 0 >> map.ps  
gmt psconvert A P Tg map.ps
```

GMT 经典模式

```
gmt grdimage @earth_relief_15m -JH15c -Rg -Baf -I+d -K > map.ps  
gmt pscoast -J R -W1/0.25p -K 0 >> map.ps  
gmt psxy points.txt -J R -Sc0.2c -Gred -K 0 >> map.ps  
gmt pstext text.txt -J R -F+f15p,Times-Bold,white+jTL 0 >> map.ps  
gmt psconvert A P Tg map.ps
```

GMT 现代模式

```
gmt begin map png  
  gmt grdimage @earth_relief_15m -JH15c -Rg -Baf -I+d  
  gmt coast -W1/0.25p  
  gmt plot points.txt -Sc0.2c -Gred  
  gmt text text.txt -F+f15p,Times-Bold,white+jTL  
gmt end show
```

详情参考: <https://docs.gmt-china.org/latest/migrating/classic2modern/>

GMT 现代模式：多子图

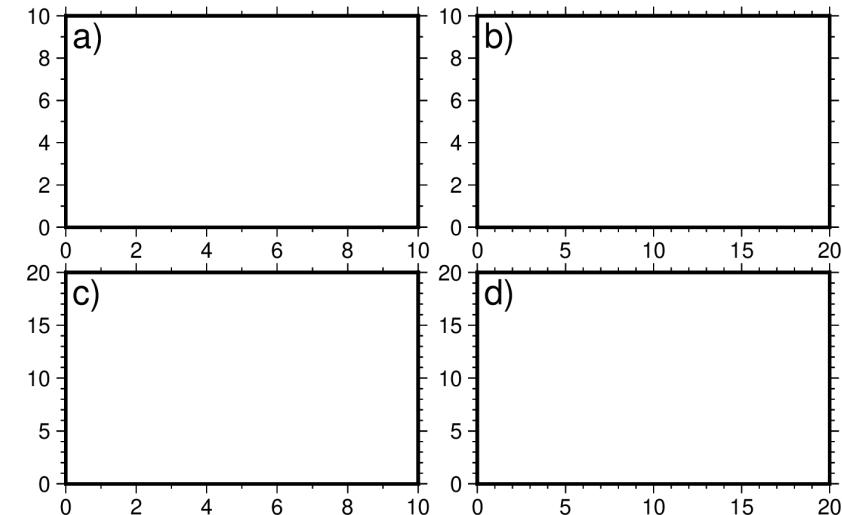
```
gmt begin map
gmt subplot begin 2x2 -Fs5c/3c -A -M0.2c/0.1c -T"My Subplot Heading"
gmt subplot set 0
gmt basemap -R0/10/0/10 -JX? -Baf -BWSen

gmt subplot set 1
gmt basemap -R0/20/0/10 -JX? -Baf -BWSen

gmt subplot set 2
gmt basemap -R0/10/0/20 -JX? -Baf -BWSen

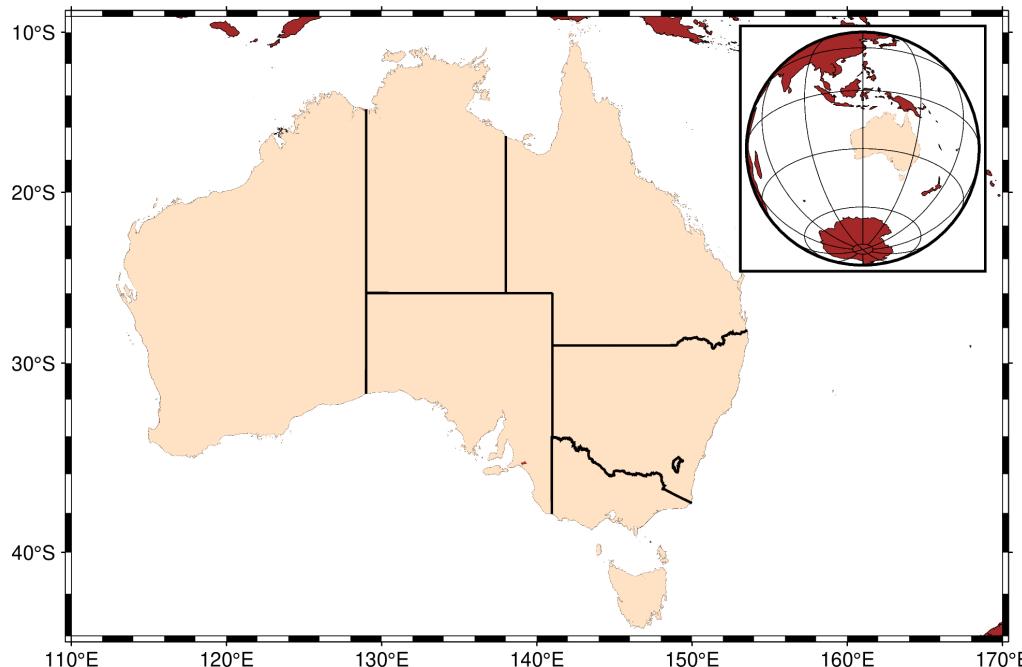
gmt subplot set 3
gmt basemap -R0/20/0/20 -JX? -Baf -BWSen
gmt subplot end
gmt end show
```

My Subplot Heading

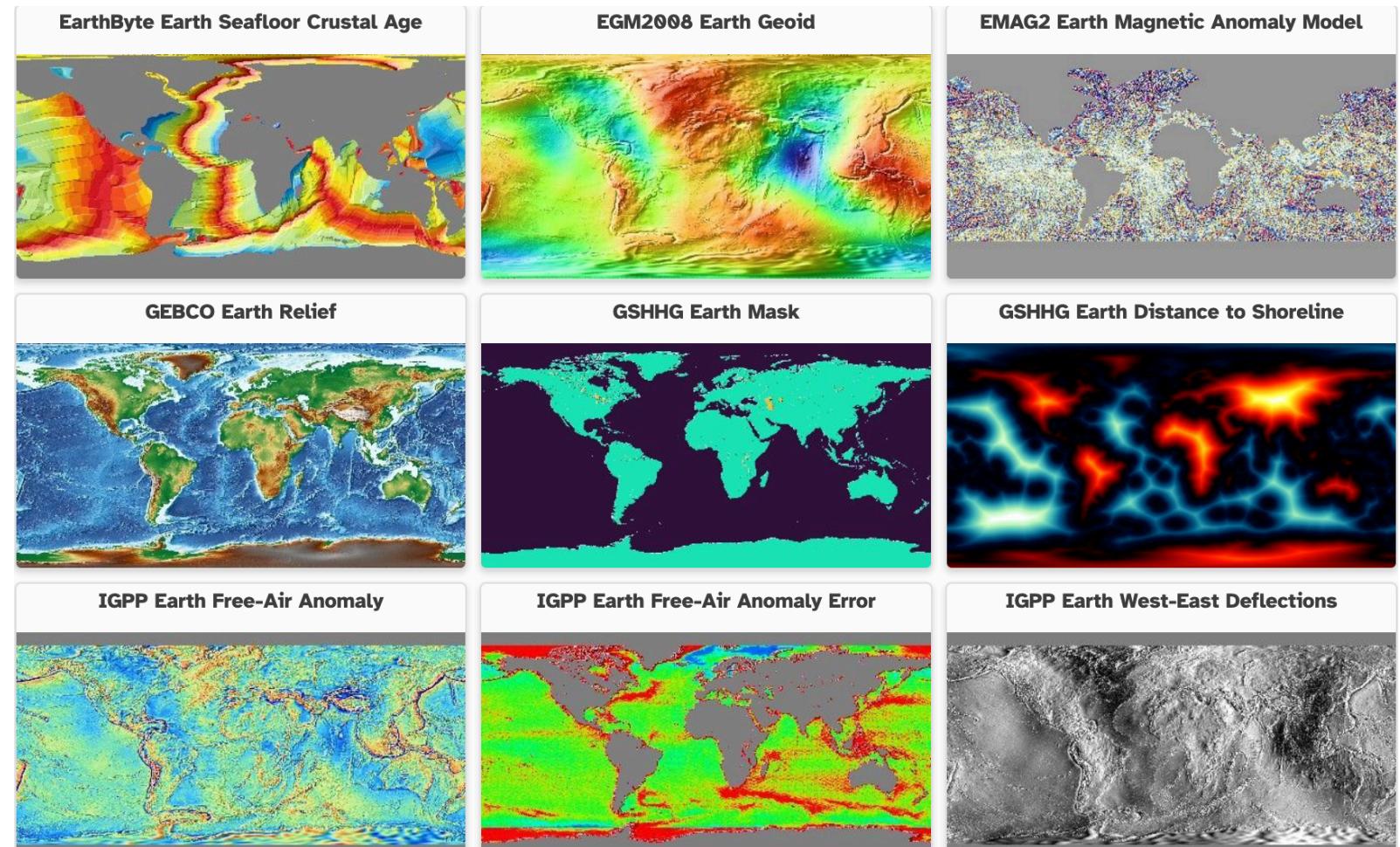


GMT 现代模式：区位图

```
gmt begin inset-example
gmt coast -R110E/170E/44S/9S -JM6i -B -BWSne -Wfaint -N2/1p -Gbrown -EAU+gbisque
gmt inset begin -DjTR+w1.5i+o0.15i/0.1i -F+gwhite+p1p+c0.1c
    gmt coast -JG120/30S/? -Rg -Bg -Wfaint -Gbrown -EAU+gbisque -A5000
gmt inset end
gmt end show
```



- 地球地形起伏
- 地球洋壳年龄
- 地磁异常
- 行星地形（月球、火星、水星、金星、冥王星）
-

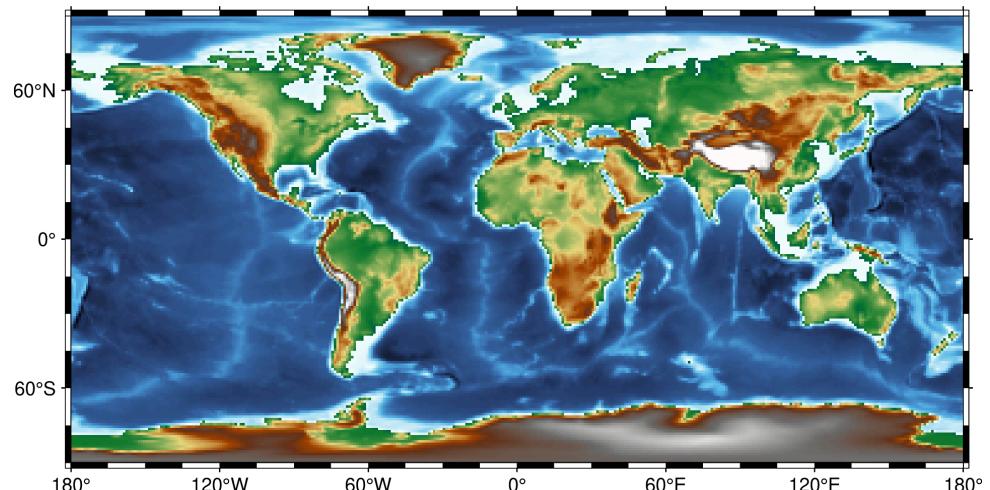


语法: @earth_relief_15m_g

- earth_relief: 数据名称
- 15m: 数据分辨率 01d, 30m, ..., 01m, 30s,..., 01s
- g: 数据配准方式 g or p [可省略]

```
gmt begin map
gmt set GMT_DATA_SERVER china
gmt grdimage @earth_relief_01d -Baf
gmt end show
```

中国镜像要求 GMT >= 6.5





05

Python/Julia/Matlab

The screenshot shows the PyGMT documentation website. The left sidebar has a blue header with the PyGMT logo and a dropdown menu showing 'dev (v0.12.1.dev81+g97a6f30c)'. Below it are sections for 'GETTING STARTED' (Overview, Installing, Intro to PyGMT), 'USER GUIDE' (Tutorials, Gallery, Projections, External Resources), and 'REFERENCE DOCUMENTATION' (API Reference). The main content area has a large 'PyGMT' title, a subtitle 'A Python interface for the Generic Mapping Tools', and a section titled 'Why PyGMT?'. It encourages users to play with it online on Binder and provides links to Tutorials, Gallery, and external examples.

PyGMT

dev (v0.12.1.dev81+g97a6f30c)

Search docs

GETTING STARTED

- Overview
- Installing
- Intro to PyGMT

USER GUIDE

- Tutorials
- Gallery
- Projections
- External Resources

REFERENCE DOCUMENTATION

- API Reference

Home

Improve this page

PyGMT

A Python interface for the Generic Mapping Tools

Why PyGMT?

A beautiful map is worth a thousand words. To truly understand how powerful PyGMT is, play with it online on [Binder](#)! For a quicker introduction, check out our [3 minute overview](#)!

Afterwards, feel free to look at our [Tutorials](#), visit the [Gallery](#), and check out some [external PyGMT examples](#)!

- 主页：<https://www.pygmt.org/>
- 源码：<https://github.com/GenericMappingTools/pygmt>

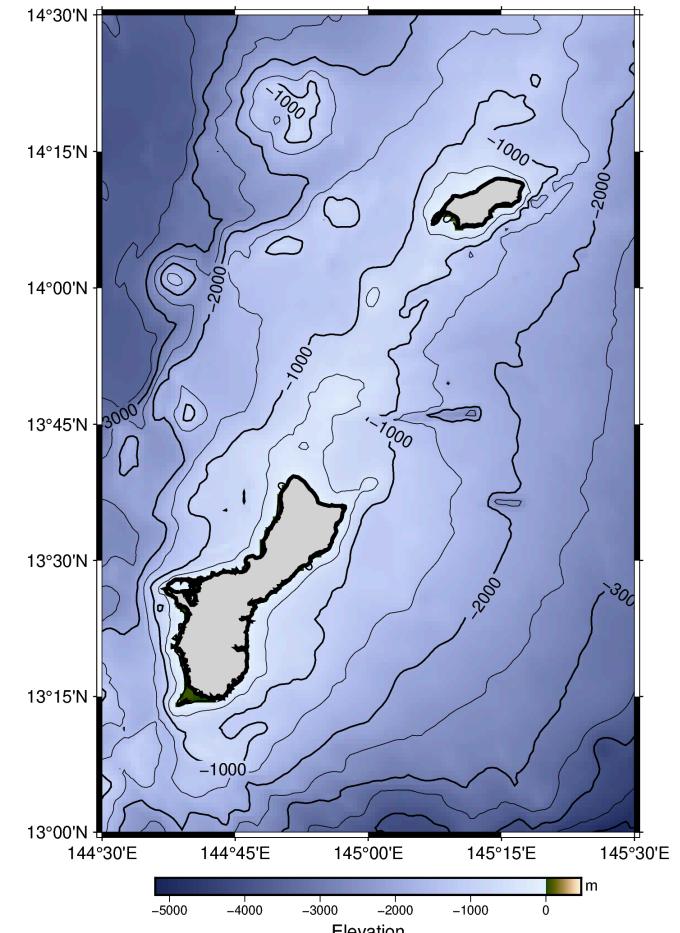
```
import pygmt
from pygmt.datasets import load_earth_relief

grid = load_earth_relief(
    resolution="30s",
    region=[144.5, 145.5, 13, 14.5]
)

fig = pygmt.Figure()
fig.grdimage(grid=grid, frame="a", projection="M10c", cmap="oleron")
fig.grdcontour(grid=grid, levels=500, annotation=1000)
fig.coast(shorelines="2p", land="lightgray")
fig.colorbar(frame=["a1000", "x+lElevation", "y+lm"])
fig.show()
```

主要特点：

- 更易读的参数名
- 参数名自动补全
- 支持 Jupyter Notebook
- 支持 NumPy、Pandas、GeoPandas、Xarray

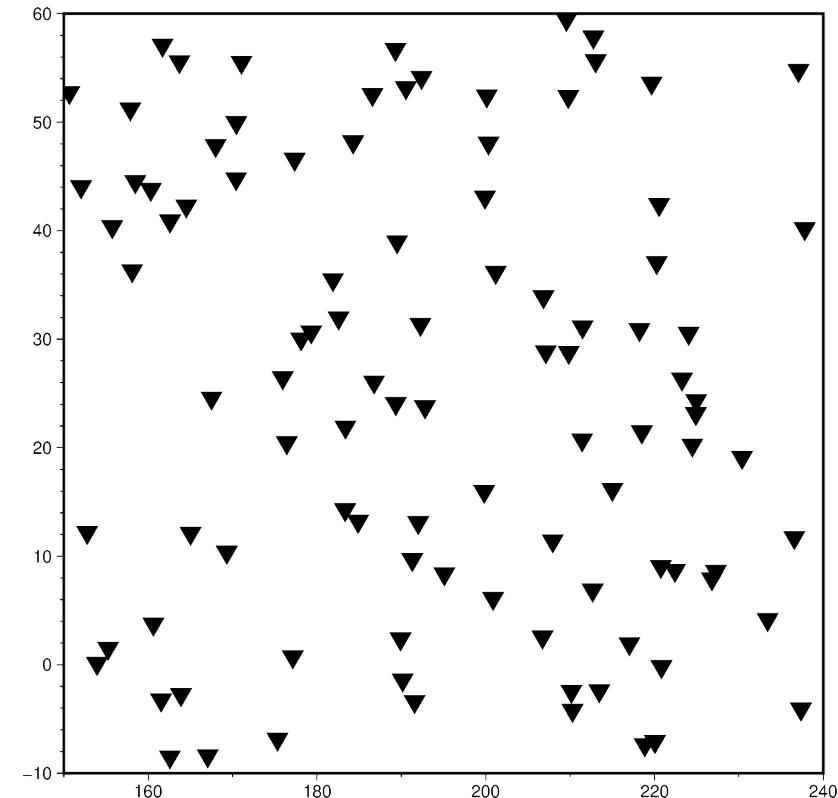


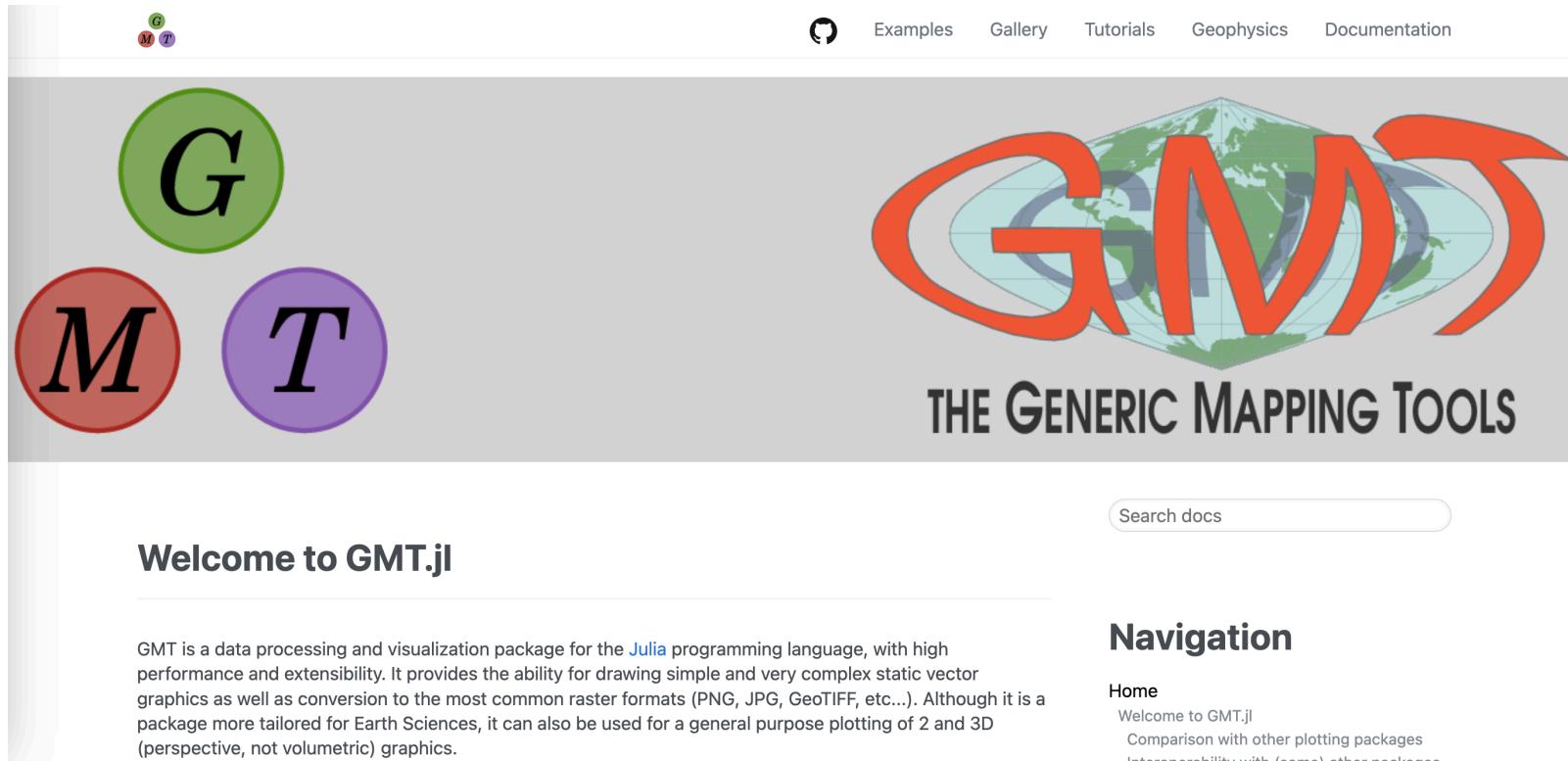
NumPy + Pandas + GeoPandas + Xarray

```
import numpy as np
import pygmt

rng = np.random.default_rng(seed=42)
region = [150, 240, -10, 60]
x = rng.uniform(low=region[0], high=region[1], size=100)
y = rng.uniform(low=region[2], high=region[3], size=100)

fig = pygmt.Figure()
fig.basemap(region=region, projection="X15c", frame=True)
fig.plot(x=x, y=y, style="i0.5c", fill="black")
fig.show()
```





- 主页：https://www.generic-mapping-tools.org/GMTjl_doc/
- GitHub：<https://github.com/GenericMappingTools/GMT.jl>



Geochemistry, Geophysics, Geosystems

TECHNICAL REPORTS: METHODS

10.1002/2016GC006723

Key Points:

- Toolbox allows complete access to all GMT modules from MATLAB or Octave
- Improves interoperability between GMT and MATLAB/Octave
- Encourages development of user-friendly front ends to GMT

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Citation:

Wessel, P., and J. F. Luis (2017), The GMT/MATLAB Toolbox, *Geochem. Geophys. Geosyst.*, 18, 811–823, doi:10.1002/2016GC006723.

The GMT/MATLAB Toolbox

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Abstract The GMT/MATLAB toolbox is a basic interface between MATLAB® (or Octave) and GMT, the Generic Mapping Tools, which allows MATLAB users full access to all GMT modules. Data may be passed between the two programs using intermediate MATLAB structures that organize the metadata needed; these are produced when GMT modules are run. In addition, standard MATLAB matrix data can be used directly as input to GMT modules. The toolbox improves interoperability between two widely used tools in the geosciences and extends the capability of both tools: GMT gains access to the powerful computational capabilities of MATLAB while the latter gains the ability to access specialized gridding algorithms and can produce publication-quality PostScript-based illustrations. The toolbox is available on all platforms and may be downloaded from the GMT website.



06

GMT 学习资源

1. 官方文档

The screenshot shows the official GMT documentation website. The top navigation bar includes a logo, a "latest (6.5.0)" dropdown, and a search bar. The main content area features the title "The Generic Mapping Tools Documentation" and a welcome message. A "Quick Links" section contains a grid of links. Below this are two boxes: "Getting started" and "Reference documentation".

Quick Links

- [Common Options](#)
- [Projections Specifications](#)
- [Default Settings \(gmt.conf\)](#)
- [Colors](#)
- [Color Picker](#)
- [35 Postscript Fonts](#)
- [Using LaTeX in text](#)
- [Built-in CPTs](#)
- [Built-in patterns](#)
- [Octal Codes of Characters](#)
- [Character Escape Sequences](#)
- [Pen Syntax](#)
- [Fill Syntax](#)
- [Grid Format Specifications](#)
- [GMT Themes](#)

Getting started

- [Installing GMT](#)
- [Illustration Gallery](#)
- [Animation Gallery](#)
- [Tutorials](#)

Reference documentation

- [Modules](#)
- [Technical Reference](#)
- [Datasets](#)
- [Modules \(Classic Mode\)](#)

2. 中文社区文档

GMT 中文手册

latest (6.5) ▾

搜索文档

GMT 入门

- 简介
- 安装
- 入门教程
- 进阶教程

GMT 实例

- 社区绘图实例
- 外部绘图实例

GMT 进阶

- 基础知识
- 表数据
- 网格文件
- 颜色表 CPT
- 标准选项
- 地图投影
- 配置参数

快速链接

/ GMT 中文手册

编辑本页

GMT 中文手册



THE GENERIC MAPPING TOOLS

欢迎来到 Generic Mapping Tools (GMT) 的世界。GMT 是地球科学使用最广泛的制图软件之一。

本文档是由 [GMT中文社区](#) 维护整理的 GMT 中文手册。手册详尽地介绍了 GMT 的用法并提供了大量的实用示例。其既可以作为初学者的入门读物，也可以作为日常使用的参考书。

手册学习指南

本手册主要包含如下三个部分：

1. **GMT 入门**: 介绍 GMT 的历史、版本以及安装方法等，并为初学者提供了 GMT 入门和进阶教程。初学者应完整阅读“GMT 入门”，也可观看配套的《[GMT6 初学者视频教程](#)》，并通过练习掌握 GMT 的基本用法。
2. **GMT 实例**: 包含丰富的 GMT 实用脚本，可以作为日常科研绘图参考。
3. **GMT 进阶**: 详细介绍 GMT 中的全部细节和用法，可以作为参考书查阅。

3. GMT6 初学者视频教程 Bilibili

The screenshot shows a Bilibili video page for a GMT6 beginner tutorial. The video has 5.7万 views and was uploaded on 2021-04-23 at 09:23:48. It features a world map background with a blue callout over China labeled "GMT/China". The title is "GMT6初学者教程" and the subtitle is "Generic Mapping Tools V6 for beginners". A play button icon is visible on the right. At the bottom, it says "本课程是以GMT6为基础". The Bilibili header includes a search bar, user info (奶茶小肥仔), and navigation links like Home, Drama, Live Broadcast, Game Center, Member Purchase, Comics, Events, and Download Client.

GMT6初学者教程

5.7万 152 2021-04-23 09:23:48 未经作者授权，禁止转载

GMT6初学者教程

Generic Mapping Tools V6 for beginners

本课程是以GMT6为基础

1人正在看, 已装填 4 条弹幕

发个友善的弹幕见证当下

弹幕礼仪 > 发送

zxgcfs + 关注 2105

弹幕列表

回归搜索的本质! 没有广告, 直达结果!

点击进入网站

视频选集 (1/16) 自动连播

- P1 【GMT6教程】01. GMT介绍 02:15
- P2 【GMT6教程】02. window下安装配置 13:11
- P3 【GMT6教程】02.5 中文配置出现乱码应... 03:01
- P4 【GMT6教程】03. Linux与MacOS下安装... 16:43
- P5 【GMT6教程】04. 绘图基础与coast命令 16:12
- P6 【GMT6教程】05. plot画符 07:06
- P7 【GMT6教程】06. plot画线与text添加文字 18:56
- P8 【GMT6教程】07. grdimage画地形图 22:37

4. 官方论坛

The screenshot shows the GMT Community Forum homepage. The left sidebar contains navigation links such as Topics, My Posts, Review, Admin, More, Categories, Announcements, Q&A, Lounge, Showcase, Site Feedback, All categories, Configure defaults, Tags, gmt, cpt, and color. The main content area has tabs for all categories, all tags, Categories (which is selected), Latest, and Top. Below these are sections for Announcements, Q&A, Lounge, Showcase, and Site Feedback. The right side shows a list of recent posts under the Latest tab.

Category	Topics	Latest
Announcements	47	D Focal mechanisms offset ② Q&A
Q&A	2.1k	The 'schema' argument is not supported with the 'pyogrio' engine PyGMT Q&A
Lounge	55	Frame all wonky with specified region in lambert conic projection (GMT.jl) GMT.jl Q&A
Showcase	44	How to draw the terrain of a specified area Q&A gmt
Site Feedback	17	Is there a way to access GMT data directly as lat,long? PyGMT Q&A

5. 2000 人 QQ 群：



群名称:地学GMT中文社区1群
群号:218905582



群名称:地学GMT中文社区2群
群号:791856541



07

Final Words



Paul Wessel (1959-2024)

“I do hope that among the thousands of GMT users there will be a small subset who feel perhaps they should give back by involving themselves at some level in the GMT community and thus ensure GMT will not disappear overnight when I do.”

— Paul Wessel

Wessel, P. (2024). The Origins of the Generic Mapping Tools: From Table Tennis to Geoscience. *Perspectives of Earth and Space Scientists*, 5(1), e2023CN000231.