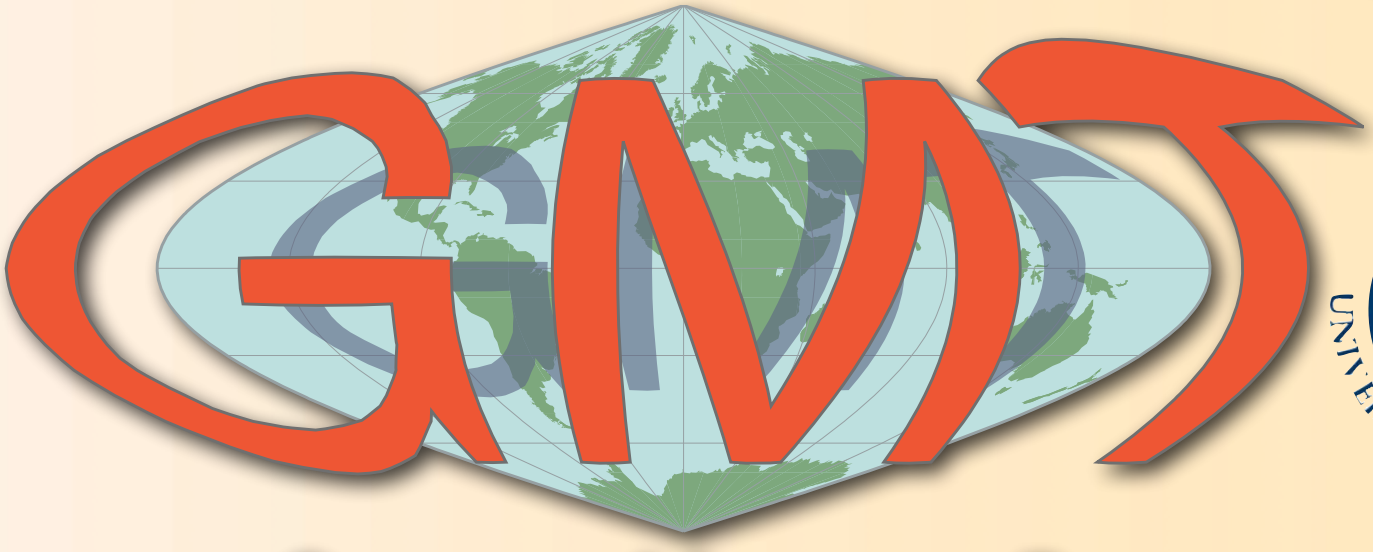
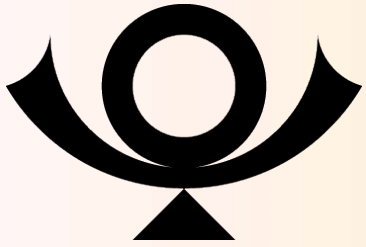
State of The Generic Mapping Tools 6

August 14, 2017



THE GENERIC MAPPING TOOLS



New things in GMT 6

PS: trunk is now GMT6

1. Remote file access
2. Global **-R***countrycode*[**+r**|**R***incs*]
3. Spherical math functions
4. Structural geological symbols
5. Auto-shaded relief images
6. Differential gmt.conf files
7. Modern mode vs classic mode

1. Remote File Access

Comes in three different schemes:

- Built-in awareness of global relief files
  - earth_relief_xxm|s.grd
  - xx = 60,30,20,15,10,06,05,04,03,02,01
- @demofile
  - @table_5.11
- Full URL to a file
  - http://some.where/mydata.grd

Files end up in ~/.gmt and ~/.gmt/cache

-R*countrycode*[**+r**|**R***incs*]

- The pscoast **-E***code* option has been incorporated by the **-R** machinery, making it available everywhere.
- E.g., **-RFR+r2** sets a region suitable for France, rounded to nearest 2 degrees.

3. Spherical math functions

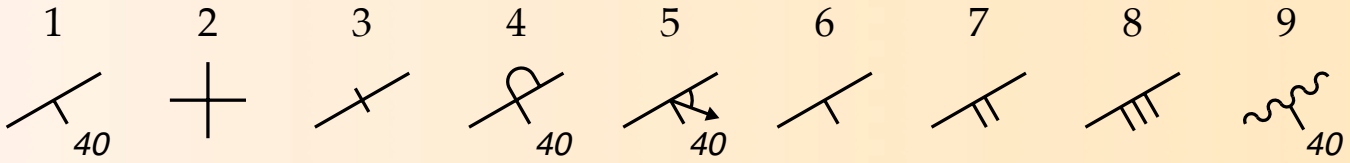
- This refers to grdmath operators MEAN, MEDIAN, MODE, LMSSCL, MAD, PQUANT, RMS, STD and VAR, which for geographic grids will compute spherically weighted results, with weights being proportional to grid cell area.
- grdinfo also reports spherical MEAN, MEDIAN, MODE, STD, LMSSCL, MAD
- grd2xyz -Wa dumps x,y,z,area

```
gmt grd2xyz earth_relief_01m.grd -Wa -o2,3 -bo2d | \
gmt pshistogram -W100 -JX6i/3i -Gblack -Baf -Z1+w -P -bi2d > hypso.ps
```

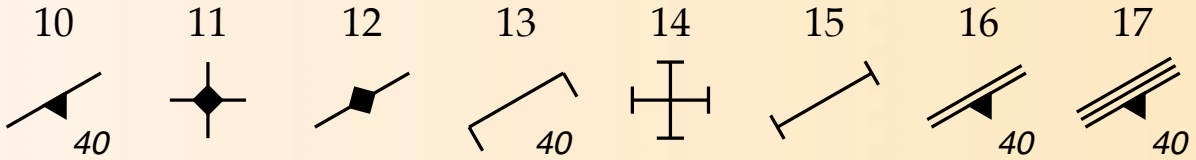
4. Structural Geology Symbols

- **These can now be plotted by psxy:**

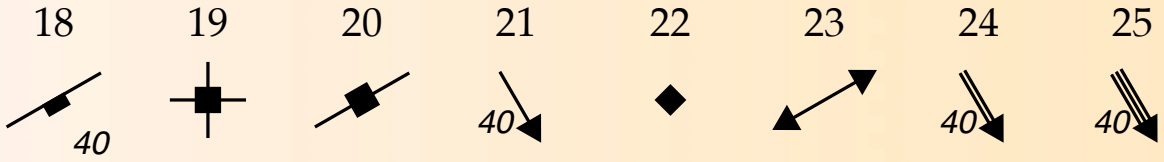
Bedding



Foliation, cleavage



Joint Lineation

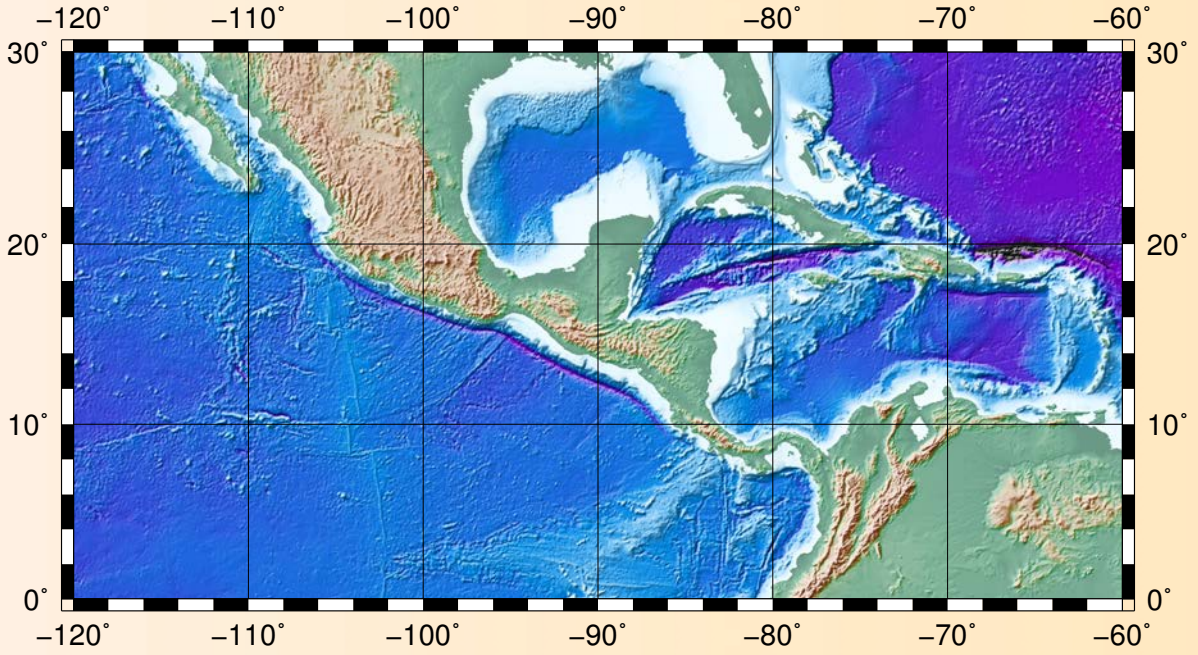


José A. Álvarez-Gómez

1 - Strike and dip of beds. 2 - Horizontal beds. 3 - Strike of vertical beds. 4 - Strike and dip of overturned beds. 5 - Strike and dip of bed with rake of lineation. 6 - Strike and dip direction of gently dipping beds. 7 - Strike and dip direction of moderatly dipping beds. 8 - Strike and dip direction of steeply dipping beds. 9 - Strike and dip of crenulated or undulated beds. 10 - Strike and dip of foliation. 11 - Horizontal foliation. 12 - Strike of vertical foliation. 13. Strike and dip of cleavage. 14 - Horizontal cleavage. 15 - Strike of vertical cleavage. 16 - Strike and dip of foliation 2. 17 - Strike and dip of foliation 3. 18 - Strike and dip of joints. 19 - Horizontal joints. 20 - Strike of vertical joints. 21 - Trend and plunge of lineation. 22 - Vertical lineation. 23 - Horizontal lineation. 24 - Trend and plunge of lineation 2. 25 - Trend and plunge of lineation 3.

5. Auto-shaded relief images

- GMT users are familiar with the grdgradient + grdimage combination
- New -I modifiers to grdimage allows grdgradient to be called indirectly




```
gmt grdimage -I+ earth_relief_02m.grd -P -R120W/60W/0/30N -JM6i  -Bafg -Xc -Cterra > t.ps
```

6. Differential gmt.conf files

- GMT used to write all ~140 defaults setting to gmt.conf
- Now, we only write those options that differ from the GMT default settings
- This means most gmt.conf files are just a few lines
- All defaults can be dumped using the gmt defaults module

Modern Mode

"Classic mode" is all you have used so far

- Eliminates the -O -K options
- Eliminates PostScript redirection
- Eliminates unnecessary -R -J entries
- Provides figure and subplot modules
- Automatic -R setting if none given (exact or approximate)
- Default -J if none given

Modern mode scripts

Classic:

```
gmt grdgradient data.nc -S45 -Nt1 -Gi.nc
gmt grdimage -Chot -Ii.nc data.nc -JQ15c -P -K > my_map.ps
gmt pscoast -Rdata.nc -J -O -Baf -Gred -K >> my_map.ps
gmt pstext -F+f12p labels.txt -R -J -O -K >> my_map.ps
gmt psxy -W2p lines.txt -R -J -O >> my_map.ps
gmt psconvert -Tf -P -A my_map.ps
```

Modern:

```
gmt begin my_map                        Enter modern mode, label the session "my_map"
  gmt grdimage -Chot -I data.nc         Initialize plot, auto-set -R -J the first time
  gmt pscoast -B -Gred                  Overlay coastlines and map frame
  gmt pstext -F+f12p labels.txt         Place some labels
  gmt psxy -W2p lines.txt               Add some lines
gmt end                                 Produce my_map.pdf and terminate modern mode
```

Introduce figure module:

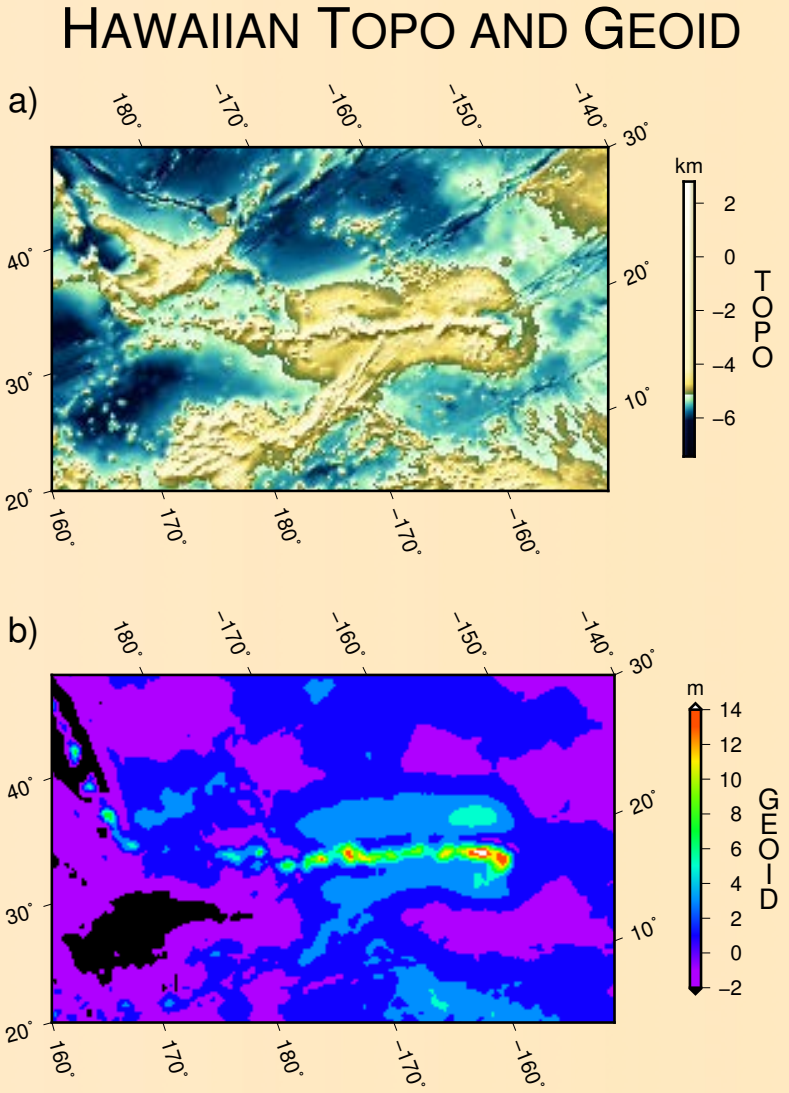
```
gmt begin
  gmt figure Norway pdf,png
  gmt pscoast -RNO+r1 -Gred -B -JM6ih -N1/thick
  gmt figure Sweden pdf
  gmt pscoast -RSE+r1 -Gred -B -N1/thick
gmt end
```

New modules/commands

Name	Purpose
begin	Begins a new GMT modern session
end	Ends the modern session
clear	Clear history, settings, cache (or all)
figure	Starts a new figure and sets name and format(s)
revert	Remove last n layers from current figure
subplot	Begin, position, and end a multi-panel figure

Example of modern subplot

- Many of the GMT gallery examples are in fact natural subplots
- However, the subplots were placed manually using arbitrary changes to the current plot origin
- Figure labels like a), b) were added manually by pstext calls using trial and error
- An overall title required yet another pstext call



Classic vs Modern

CLASSIC

```
ps=example_02.ps
gmt set FONT_TITLE 30p MAP_ANNOT_OBLIQUE 0
gmt makecpt -Crainbow -T-2/14/2 > g.cpt
gmt grdimage @HI_geoid_02.nc -R160/20/220/30+r -JOc190/25.5/292/69/4.5i -E50 -K -P \
             -B10 -Cg.cpt -X1.5i -Y1.25i > $ps
gmt psscale -Cg.cpt -DJRM+o0.6i/0+e+mc -R -J -O -K -Bx2+lGEOID -By+lm >> $ps
gmt grd2cpt @HI_topo_02.nc -Crelief -Z > t.cpt
gmt grdimage @HI_topo_02.nc -I+a0 -R -J -B+t"H@#awaiian@# T@#opo and @#G@#eoid@#" \
             -B10 -E50 -O -K -Ct.cpt -Y4.5i --MAP_TITLE_OFFSET=0.5i >> $ps
gmt psscale -Ct.cpt -DJRM+o0.6i/0+mc -R -J -O -K -I0.3 -Bx2+lTOPO -By+lkm >> $ps
gmt pstext -R0/8.5/0/11 -Jx1i -F+f30p,Helvetica-Bold+jCB -O -N -Y-4.5i >> $ps << END
-0.4 7.5 a)
-0.4 3.0 b)
END
```

MODERN

```
gmt begin example_02 ps
 gmt set MAP_ANNOT_OBLIQUE 0 PS_MEDIA letter
 gmt makecpt -Crainbow -T-2/14/2 > g.cpt
 gmt grd2cpt @HI_topo_02.nc -Crelief -Z > t.cpt
 gmt subplot begin 2x1 -A+JTL+o0.1i/0 -M0.2i -LWESN -T"H@#awaiian@# T@#opo and @#G@#eoid@#"
 gmt subplot 2,1 -Ge1.1i
   gmt grdimage @HI_geoid_02.nc -R160/20/220/30+r -JOc190/25.5/292/69 -E50 -Cg.cpt
   gmt psscale -Cg.cpt -DJRM+o0.6i/0+e+mc -Bx2+lGEOID -By+lm
 gmt subplot 1,1 -Ge1.1i
   gmt grdimage @HI_topo_02.nc -I+a0 -E50 -Ct.cpt
   gmt psscale -Ct.cpt -DJRM+o0.6i/0+mc -I0.3 -Bx2+lTOPO -By+lkm
 gmt subplot end
gmt end
```

-c*row,col*

GMT6 Release

- Probably early 2018 if all goes well [but already available via trunk]
- Continue to release GMT 5.4.x until then
- GMT6 API fully compatible with GMT5 so no change for GMTSAR
- GMTSAR scripts are classic and will work as before. Changing to modern mode may depend more on interest in Python, etc.