The Generic Mapping Tools (GMT)

Paul Wessel\textsuperscript{1}, Walter H.F. Smith\textsuperscript{2}, Remko Scharroo\textsuperscript{3}, Joaquim Luis\textsuperscript{4}, Florian Wobbe\textsuperscript{5}

\textsuperscript{1}SOEST, University of Hawaii at Mānoa, \textsuperscript{2}Laboratory for Satellite Altimetry, NOAA/NESDIS, \textsuperscript{3}EUMETSAT, Darmstadt, Germany, \textsuperscript{4}Universidade do Algarve, Faro, Portugal, \textsuperscript{5}Sea & Sun Technology GmbH, Germany
GMT Podcasts

 GMT – The Generic Mapping Tools

 by Prof. Paul Wessel

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 Description

 GMT is an open source collection of about 80 command-line tools for manipulating geographic and Cartesian data sets (including filtering, trend fitting, gridding, projecting, etc.) and producing PostScript illustrations ranging from simple x-y plots via contour maps to artificially illuminated surfaces and 3D perspective views; the GMT supplements add another 40 more specialized and discipline-specific tools. GMT supports over 30 map projections and transformations and comes with support data such as GSHHG coastlines, rivers, and political boundaries. GMT is developed and maintained by Paul Wessel, Walter H. F. Smith, Remko Scharroo, Joaquim Luís and Florian Wobbe, with help from a global set of volunteers, and is supported by the National Science Foundation. It is released under the GNU Lesser General Public License version 3 or any later version. These podcasts discusses the basics of GMT and come from a Spring 2014 course in GMT offered by the University of Hawaii at Manoa.
Becoming a GMT Guru

- Use a flexible shell on a UNIX-like system
- Think like a programmer
  - Automate, abstract away things, write functions for repetitive tasks
- Read documentation
- Work through tutorial
- Register and participate in the GMT Forums
GMT Versatility

- GMT has been called the “Swiss Army Knife” of mapping tools
- Combines a wide array of data manipulation tools
- Infinitely configurable via user scripting
- It is possible to cut your fingers if not careful
The GMT Octopus

PUBLISHED
- Matlab Scripts
  - Matlab/Octave API
- GMT5SAR
- FORTRAN Progs
- C/C++ Programs
- gmt
- shell script

ONGOING
- Python Scripts
  - Python API
- Julia Scripts
  - Julia API

BETA
- Custom API
  - USER MODULES
  - GMT Suppl API
    - GMT Suppl Modules
      - Low-level MGD77
      - Low-level X2SYS

Required
- NetCDF
- GDAL
- LAPACK
- PCRE
- FFTW

Optional
- Low-level GMT

Public
- PSLIB

Developer
- The GMT Octopus shell script
- PUBLISHED
- ONGOING
- BETA
Upcoming Plans

- Current Release is GMT 5.4.2 (June 2017)
- Team is working on GMT 6 (trunk)
  - Will introduce Modern Mode which is considerably easier to learn and use
- Developing a GMT/Python API. If you are a Python user you can contribute on https://github.com/GenericMappingTools
Making a map with `grdimage`

- “Quick-and-dirty map” [grdimage]
- More control with colors [makecpt]
- Add artificial illumination [grdimage -I]
- Add color bar [psscale]
- Get a DEM [SRTM1] subset from http://topex.ucsd.edu/gmatsar/demgen
Quick and Dirty Maps

- GMT can access global relief files
  - `earth_relief_xx|s.grd`
  - `xx = 60,30,20,15,10,06,05,04,03,02,01`

```bash
gmt grdimage earth_relief_02m.grd -P -JM6i -R-120W/60W/0/30N > map.ps
```
More control over colors

- **makecpt** manipulates color scales
- Extract subsets of scales and stretch them to your data range
- Many scales have dynamic hinges

![Color scale diagram]

New CPT v1

Master CPT

New CPT v2

Scale a subset (via \(-G\))

Scale entire range
Artificial Illumination

- Simple illumination set via `grdimage -l` option
  - `-l+` gives default (i.e., `-l+a-45+nt1`)
  - Append modifiers for other shadings
  - Use `grdgradient` separately for complex shading

```
gmt grdimage -I+ earth_relief_02m.grd -P -R-120W/60W/0/30N -JM6i -Bafg -Xc -Cterra > t.ps
```
Adding a color bar

• Use `psscale` to place the color bar
• Use `-DJ` or `-Dj` to auto-adjust placement
• Simplest to place bar along one side
grdimage + psscale

gmt grdimage -I+ earth_relief_02m.grd -P \ 
-R120W/60W/0/30N -JM6i -Bafg -Xc -Cterra -BWSne -K > map.ps
gmt psscale -Cterra -DJRM -O -R -J -Baf >> map.ps
“The last part of this exercise is to make a map of the area where you live using topography data from the following web site.

http://topex.ucsd.edu/gmtsxar/demgen/

Use this on-line tool to extract a 1-degree grid of elevations for the area where you live. Use GMT5 to make a shaded relief map and send the resulting postscript file. This same tool will be used to prepare digital elevation models for InSAR processing. We will show all the relief maps during the short course.”
Hiroki Arai
Chi-Hung Chang

Elevation of Houston
Richard Czikhardt

Topography of Central Slovakia

19°30' 19°40' 19°50' 20°00' 20°10' 20°20'
David Gómez Palacios
Bill Hammond
Topography Around Bill’s Home
James Hollingsworth
Austin Madson
Danial Mariampillai

Institute of Ocean Sciences, Sidney BC Canada
Hebert Martinez Barcena
Ana Resendiz
Francesca Silverii
Leonardo Uieda