Generic Mapping Tools (GMT)

An introduction to making maps and graphs using GMT

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http://gmt.soest.hawaii.edu/
What is GMT?

- Command-line tools for processing data and making maps and graphics
- Runs on Linux, MacOS X, and Windows (using Cygwin)
- Open Source
- Widely used
- Great documentation
Plan for this demo

- Look at some examples
- Run some simple examples
- Questions
Low Order Geoid
**HAWAIIAN TOPO AND GEOID**

**a)**

[Topographic map of the Hawaiian area with a color scale indicating topography in km.]

**b)**

[Geoid map of the same area with a color scale indicating geoid in meters.]
Ship and Satellite Gravity

Input Power

Coherency$^2$

Power (mGal$^2$/km)

Coherency$^2$

Wavelength (km)
HAWAIIAN RIDGE
\[ z(r) = \cos \left( \frac{2\pi r}{8} \right) \times e^{-r/10} \]
Two types of histograms

[Graph showing frequency distribution of topography]

[North, West, East, South compass points with a figure indicating a pattern or distribution]

Example 6 in Goldbeck
AGU 1991 Membership Distribution
Delaunay Triangulation
\[ z(x,y) = x \times \exp(-x^2 - y^2) \]
Gridding of Data

pscontour (triangulate)  surface (tension = 0)

surface (tension = 0.5)  triangulate → grdfilter
Clipping of Images

Example 17: We first plot the color geoid image for the entire region, followed by a gray-shaded ETOP05 image that is clipped so it is only visible inside the coastlines.
3RD INTERNATIONAL GMT CONFERENCE
Honolulu, Hawaii, April 1, 2005

SILLY USES OF GMT COLOR PATTERNS

3RD INTERNATIONAL GMT CONFERENCE
Honolulu, Hawaii, April 1, 2005
World-wide earthquake activity

77 events during 04/04/19 00:04:33 to 04/04/25 11:11:33

- Red circles: Shallow depth (0-100 km)
- Green circles: Intermediate depth (100-300 km)
- Blue circles: Very deep (> 300 km)

USGS/NEIS most recent earthquakes for the last seven days. The data were obtained automatically from the USGS Earthquake Hazards Program page at http://neic.usgs.gov. Interested users may also receive email alerts from the USGS. This script can be called daily to update the latest information.

 GMT guru @ GMTbox
Distances from Rome to the World
Main plotting programs

- pscoast – plot coastlines, rivers, etc.
- psxy – plot x,y data
- pstext – add text to maps
- pslegend – create a legend
- grdview – plot gridded data
- grdcontour – plot contour maps from gridded data
Data Selection

• gmtselect – select data based on geospatial criteria
  (For example, “select all points within 800 km of San Francisco or Seattle, and on land”)
Data processing programs

• arbitrary grid math
• spatial filtering
• mask data using coastline data
• sample gridded data along arbitrary paths
• map projection
• grid irregularly spaced data
• and more ...