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PyGMT: Accessing the Generic Mapping Tools from Python

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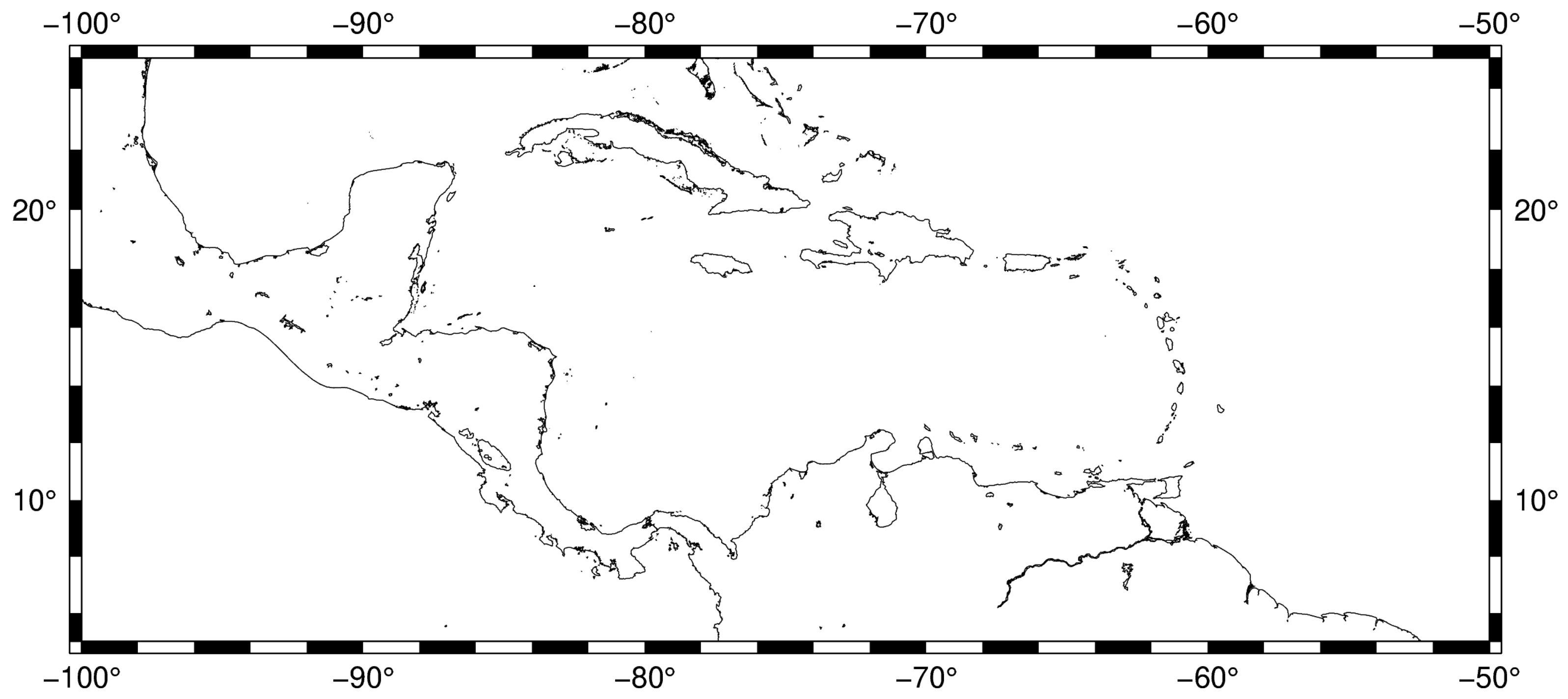
Overview

The Generic Mapping Tools (GMT) have provided the Earth, Ocean, and Planetary Sciences with an open-source toolbox for processing and visualizing spatial data. GMT 5 introduced a C Application Programming Interface (API) for accessing its core functionality. Now with GMT 6, users have access to *modern mode*, which greatly simplifies usage. We are using the GMT C API and *modern mode* to develop PyGMT, an open-source library that brings the power of GMT to Python. PyGMT is designed to integrate with the scientific Python ecosystem (numpy, pandas, xarray, and the Jupyter notebook). The following are examples of PyGMT usage, current developments, future directions, and opportunities for getting involved in the project.

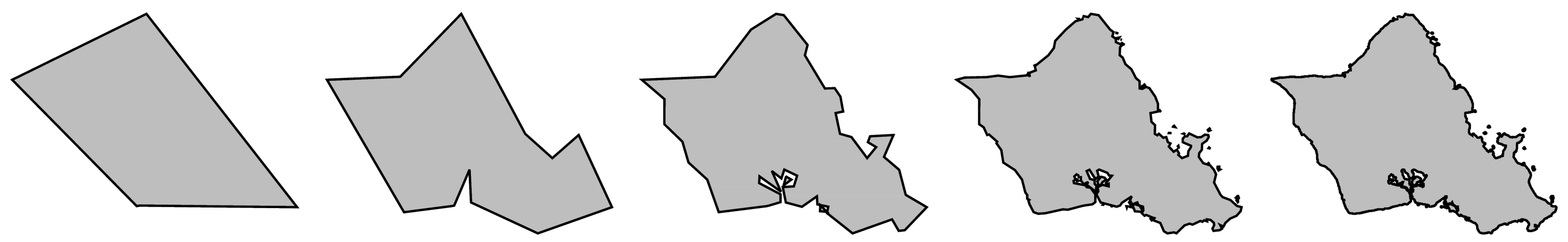
The pygmt.Figure

```
import pygmt
# The Figure controls all plotting
fig = pygmt.Figure()
fig.basemap(region=[-100, -50, 5, 25], frame=True,
            projection="M20c")
fig.coast(shorelines=True)
# savefig is the same as matplotlib
fig.savefig("central-america.png")
# Display the figure
fig.show()
```



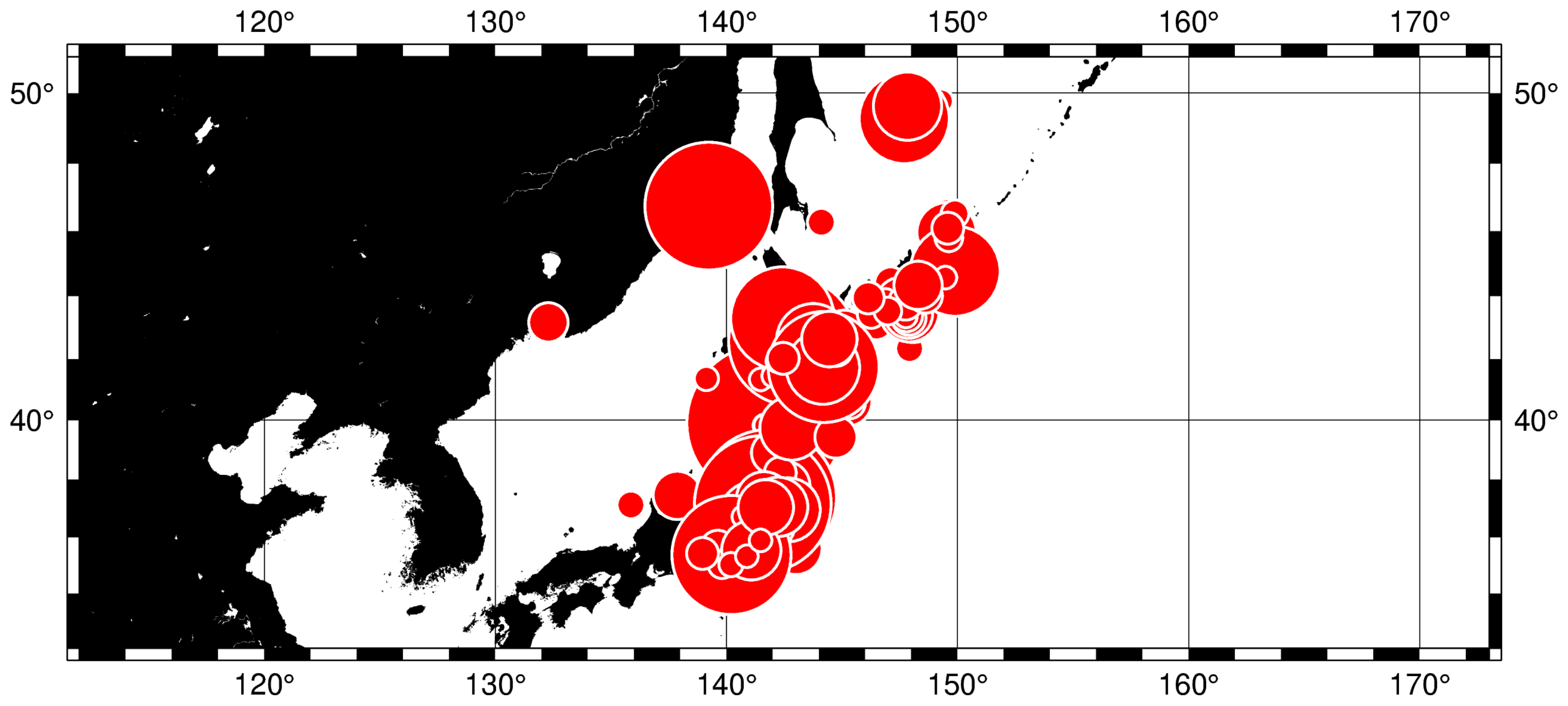
Coastlines

```
oahu = [-158.3, -157.6, 21.2, 21.8]
fig = pygmt.Figure()
for r in ["c", "l", "i", "h", "f"]:
    fig.coast(region=oahu, resolution=r, land="grey",
              shorelines="2p", projection="M10c")
    fig.shift_origin(xshift="10c")
fig.show()
```



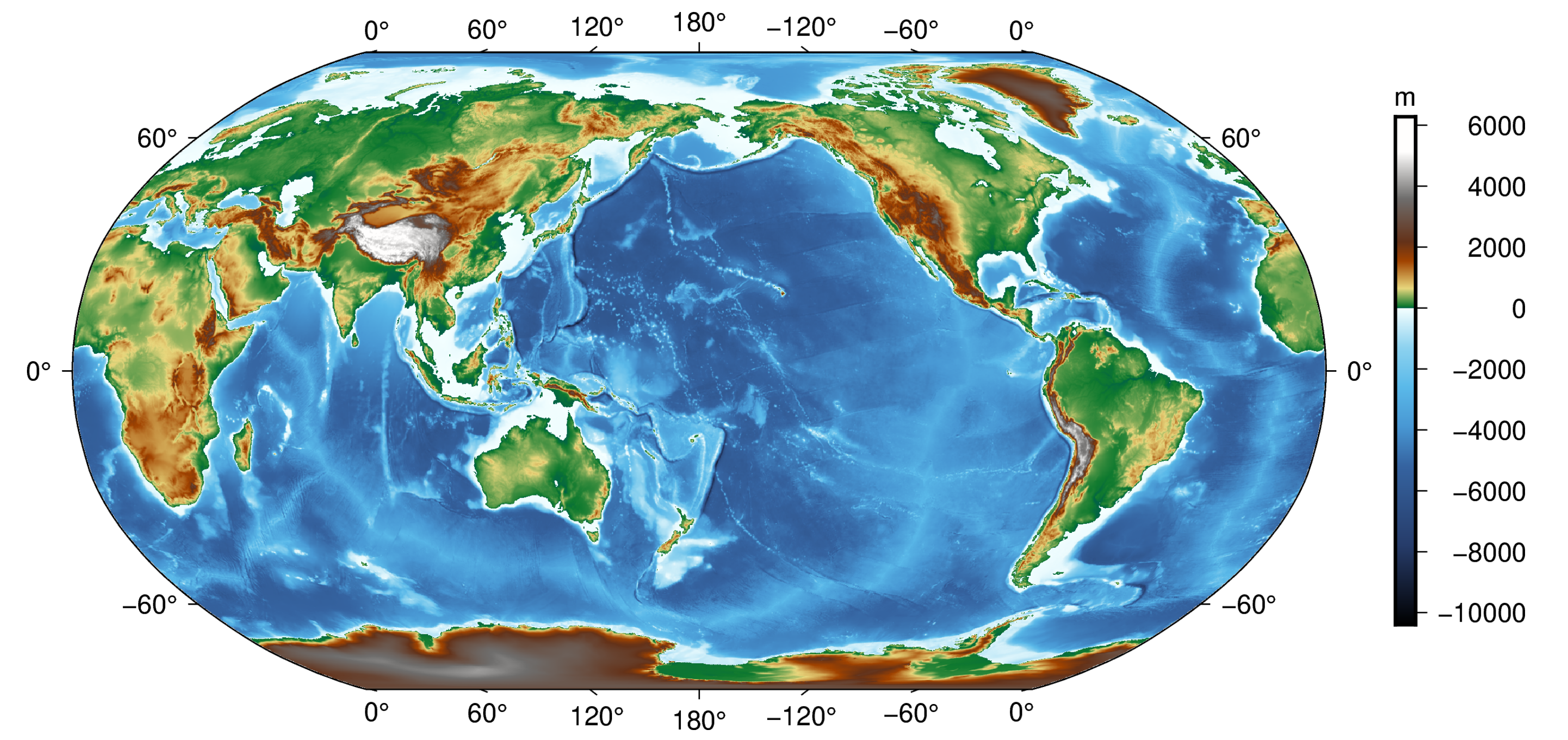
Plotting points

```
# Load GMT example data to a pandas.DataFrame
data = pygmt.datasets.load_japan_quakes()
region = [115, 170, 32, 51]
fig = pygmt.Figure()
fig.coast(region=region, projection="M20c",
          frame="afg", land="black")
fig.plot(x=data.longitude, y=data.latitude,
         color="red", sizes=0.02*2**data.magnitude,
         pen="1p,white", style="cc")
fig.show()
```



Grids and Earth relief data

```
# Load GMT Earth relief data in a xarray.DataArray
topo = pygmt.datasets.load_earth_relief("10m")
fig = pygmt.Figure()
fig.basemap(region="g", projection="N20c", frame="a")
fig.grdimage(topo, cmap="geo")
fig.colorbar(position="JCR+v",
             frame=["x2000", "y+lm"])
fig.show()
```



What we're working on

Projection classes (projection=Robinson() instead of projection="N").
Windows support (difficult to debug crashes compiling with Python libs).
Better display mechanism and integration with the Jupyter notebook.
Refactoring the low-level wrapper code and argument parsing.

How you can help

Join the community: **forum.generic-mapping-tools.org**
Try it out and let us know what fails: **www.pygmt.org**
Help with development: **github.com/GenericMappingTools/pygmt**

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Feel free to photograph or share this poster.

Download the poster:
doi.org/10.6084/m9.figshare.11320280

Run the code online:
github.com/leouieda/agu2019

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