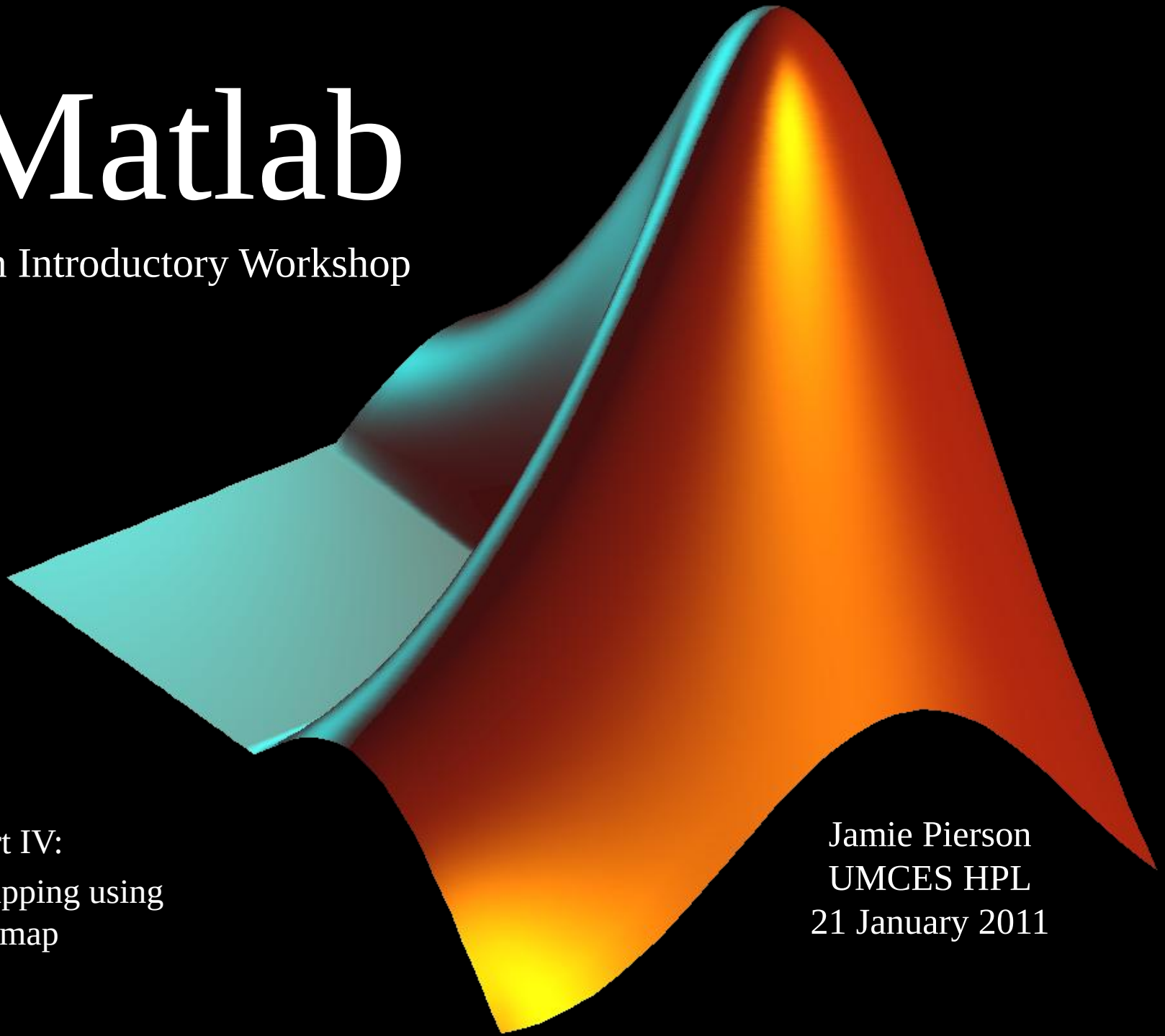
Matlab

An Introductory Workshop



Part IV:

Mapping using m_map

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M_map vs. Mapping Toolbox

3 reasons I prefer m_map to the Mathworks Mapping Toolbox:

1. m_map is free.
2. Mapping Toolbox is expensive.
3. m_map is free.

m_map

http://www.eos.ubc.ca/~rich/map.html

You have collected your data, loaded it into Matlab , analyzed everything to death, and now you want to make a simple map showing how it relates to the world.

But you can't.

- M_Map is a set of mapping tools written for Matlab v5 and later. These include: Routines to project data in 19 different spherical projections (and determine inverse mappings)
- A grid generation routine to make nice axes with limits either in lat/long terms or in planar X/Y terms.
- A coastline database (with 1/4 degree resolution)
- A global elevation database (1 degree resolution)
- Hooks into freely available high-resolution coastline and bathymetry databases

m_map Basics

- Start by specifying projection and domain

```
m_proj('miller','lat',82);
m_proj('lambert','lon',[-10 20],'lat',[33 48]);
```

- Then specify data to plot

```
m_coast('color',[0 .6 0]);
m_tbase('contourf');
```

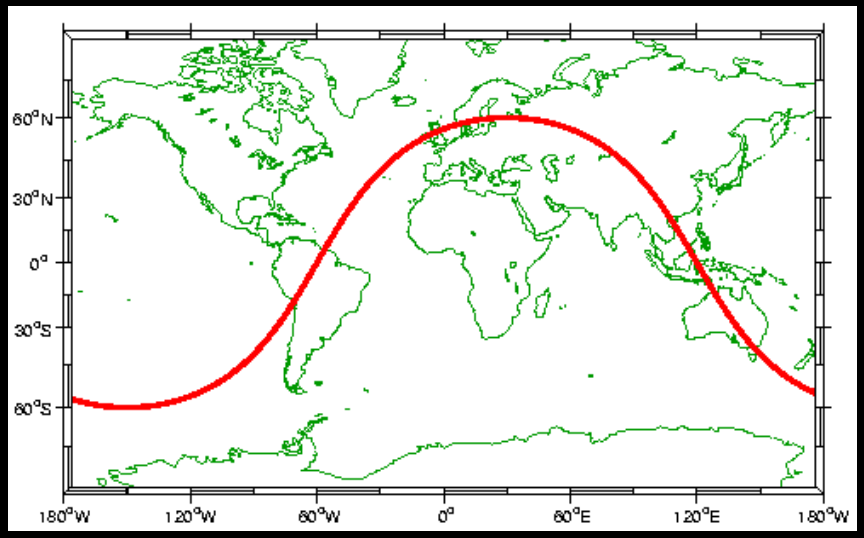
- Then make it pretty

```
m_grid('linestyle','none','box','fancy','tickdir','out');
m_grid('linestyle','none','tickdir','out','linewidth',3);
```

http://www.eos.ubc.ca/~rich/map.html

Examples

```
lon=[-180:180];
lat=atan(tan(60*pi/180)*cos((lon-30)*pi/180))*180/pi;
m_proj('miller','lat',82);
m_coast('color',[0 .6 0]);
m_line(lon,lat,'linewi',3,'color','r');
m_grid('linestyle','none','box','fancy','tickdir','out')
```

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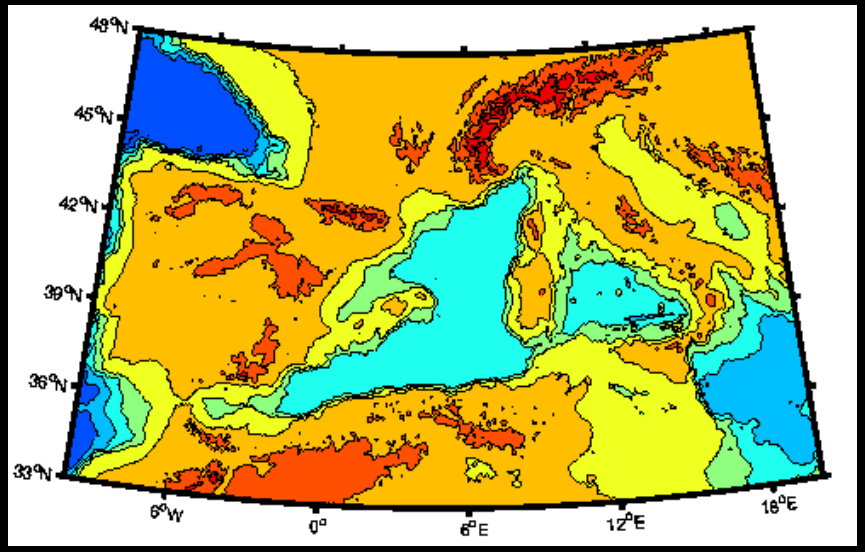

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Why would I use m_map?

Large areas, especially overlapping the dateline and prime meridian

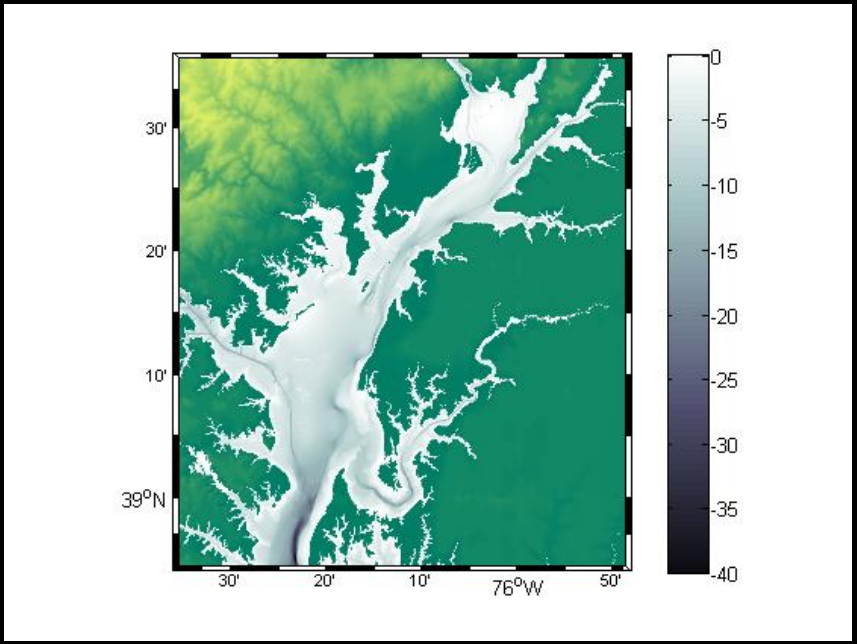
Special projections

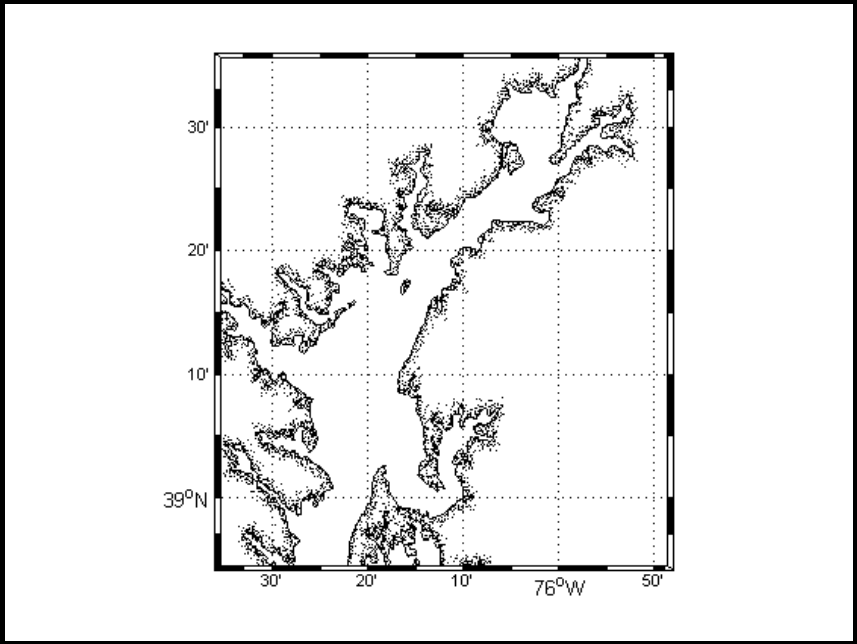
Pretty maps

Problems with m_map

- Included or available bathymetry is too coarse for Chesapeake Bay or other small areas, so import bathymetry
  - This can be complicated so follow the m_map instructions.
- No 3D plotting functions
- Difficult to plot map and other data in the same figure

Examples of upper CB data plotted in m_map





What about not using m_map?

Download bathymetry and coastline from NOAA:

http://www.ngdc.noaa.gov/mgg/gdas/gd_designagrid.html
http://www.ngdc.noaa.gov/mgg/shorelines/shorelines.html

OR

Set the aspect ratio for an appropriate projection.
E.g. for Mercator use axis property ‘dataaspectratio’:

```
set(gca,'dataaspectratio',...
    [1 cos(mean(latitude)) 1])
```

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X Y Z

3D Maps (not m_map)

A little more complicated but possible.

5 elements here:

1. Surface plot of bathymetry
2. 3D contour lines for certain bathymetric bounds
3. 3D line plot of coastline
4. Data “curtains”
5. Pretty it up.