EAS 4305/6305 Physics and Chemistry of the Oceans
Homework #5: **Due October 4th**

Mapping dynamic topography

In this exercise, we visualize ocean dynamic topography using MATLAB and m_map package.

Download and de-compress the m_map package. Start MATLAB and include the m_map in your path (where the computer will look up necessary files).

```
>> addpath m_map
```

Download the temperature and salinity data from the class website (TS_world_ocean_atlas_2009.mat). Also, download the sample script, week5_exercise.m (available from github). Use this as a reference. Make sure this script works in your computer. If not, please ask for help.

1. Calculate the specific volume anomaly using provided data. Specific volume anomaly is defined as follows:

$$\alpha' = \frac{1}{\rho(S,T,p)} - \frac{1}{\rho(35,0,p)}$$

   The MATLAB function for the seawater equation of state is available from the github site (swdens.m). **Make a global map of specific volume anomaly at 200 dbar level using Robinson projection.**

2. **Dynamic height, Z,** is the height of the pressure surfaces and is termed as "dynamic height" or "dynamic topography". It can be defined as follows.

$$\frac{\partial Z'}{\partial p} = -\frac{\alpha'}{g}$$

   Numerically integrate the above equation, and calculate the dynamic topography with respect to the 2000 dbar reference level, and **generate 4 global maps of dynamic topography at 0, 200, 600 and 1,000 dbar levels.**

3. Briefly explain similarities and differences between the four maps from 2.