Biomedical Engineering

Pixel Graphics and Ocean Volume

This lab has two parts. In the first part, we work with data topography and bathymetry data file 'topography_180x360_grid.txt' that you already know. *In the second part, we will compute the area of the state of California. First please download all files for this lab*

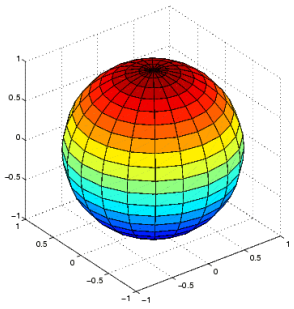
Part I

(1) Load and display the topography and bathymetry data file with the following commands:

```
import matplotlib.pyplot as plt
import numpy as np
H = np.loadtxt('topography_180x360_grid.txt')
plt.imshow(H)
plt.show()
```

(2) Write a pair of nested for loops that print the geographic latitude and longitude as well as the elevation for every data point.

(3) Determine the size of the patch that corresponds to every data point. Sum them all up and test if you approximately reproduce the analytical value $A=4\pi R^2$. This picture may help you determining the patch size:



(4) Now we actually want to compute the fraction of the Earth's surface that is covered by water. This requires an *if* statement because we only want to add those areas where the elevation is below zero.

(5) Now compute the volume of the oceans by adding height times area for all patches where there is water.