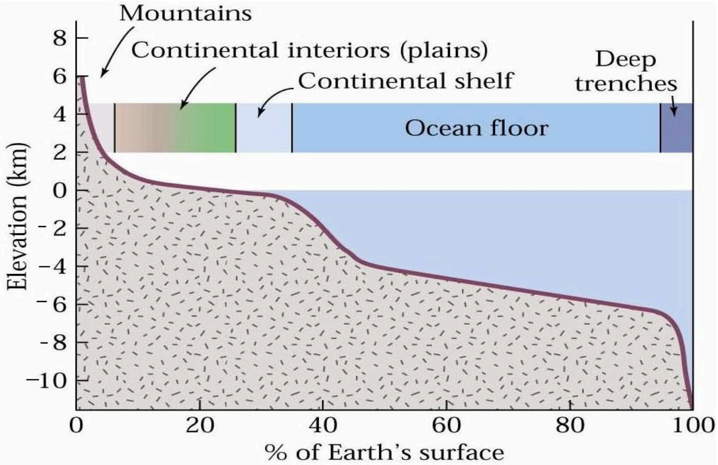
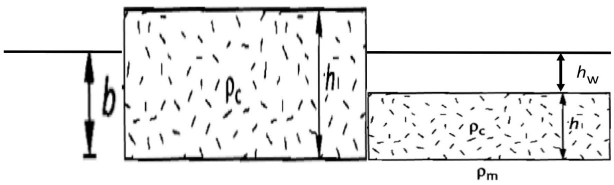
ESC3332 Global Dynamics WEEK 2

The hypsometric curve illustrates the distribution of topography and bathymetry on Earth. It is provided as an external data file, measured in Area (in MKm^2).



Plot the following:
1) The curve in the three domains Continental, Oceanic and Trenches in %. Separate using find()
2) A histogram representing the mode (the value mostly represented). Use hist()

Then, calculate the following:
1) Calculate the (continental) crust thickness sustaining the maximum, mean and minimum continental topography/bathymetry. Note that for topography use Eq. (1), yet the minimum elevation is below the sea level, on the continental margin, Eq. (2) is appropriate.



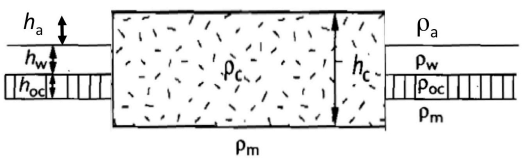
$b\rho_m \mathbf{g} = h\,\rho_c\,\mathbf{g}$ (1.1)

$h = (h - b)/(1 - \rho_c/\rho_m)$ (1.2)

$b\rho_m \mathbf{g} = h\,\rho_c\,\mathbf{g} + h_w\,\rho_w\,\mathbf{g}$ (2.1)

$h = h_w\,(\rho_m - \rho_w)\,/\,(\rho_m - \rho_c)$ (2.2)

2) Calculate the (oceanic) crust thickness sustaining the mean oceanic plain topography in equilibrium with the mean continental elevation (Eq. 3)
3) Calculate the (oceanic) crust thickness beneath the deepest oceanic trench under the same equilibrium assumption (Eq. 3)



$h_c\,\rho_c\,\mathbf{g} = h_a\rho_a\,\mathbf{g} + h_w\rho_w\,\mathbf{g} + h_{oc}\rho_{oc}\,\mathbf{g} + (h_c - h_a - h_w - h_{oc})\,\rho_m\,\mathbf{g}$ (3.1)

$h_{oc} = [h_c(\rho_m - \rho_c) + h_a(\rho_m - \rho_a) + h_w(\rho_m - \rho_w)]\,/\,(\rho_m - \rho_{oc})$ (3.2)

[illegible] $\rho_c = 2700\ kg/m^3$, $\rho_m = 3300\ kg/m^3$, $\rho_w = 1000\ kg/m^3$, $\rho_{oc} = 2950\ kg/m^3$, $\rho_a = 0\ kg/m^3$

Discuss the following:
4) Which one of these three areas is likely or unlikely to be under the isostatic assumption (hint: some areas request unrealistic crust thicknesses…)