

Geophysics 150: Home set due Oct. 06, 2000

3. We continue with the asteroid Vesta. We use the same values in problem 1 unless stated otherwise.

a. Liquid water existed on some asteroids though probably not Vesta. A pressure 600 N m^{-2} is needed for pure liquid water. Find the surface gravity on Vesta and the depth where this pressure existed using the surface gravity.

b. Find the gravity at the depth that you obtained above (assuming a sphere). Is it much different than the surface gravity. That is, is the approximation of using the surface gravity justified?

c. The radioactivity was 3 times the present value at 4.4 Ga. Estimate the heat flow and find how deep one needs to get liquid water $\sim 273\text{K}$ at that time. The samples in meteorites come from say 100 km depth, should we look for signs of liquid water within them? Use rock conductivity.

d. Ceres has approximately twice the diameter of Vesta. Quickly repeat part c. for it by scaling to radius. Ceres is a much better place to find water and possible life at that time.