Geophysics 150: Home set due Nov. 17, 2000

1. Dunite is a rock made up mainly of the magnesian silicate olivine. Parts of the mantle are believed to be made up of this rock. The question arises on large dunite outcrops as to whther they extend down to the mantle or are thin sheets thrust over the surface. A map a dunite body is attached. [Original is Figure 1 of: Thompson, G. A., and R. Robinson, Gravity and magnetic investigation of the Twin Sisters Dunite, northern Washington, Geol. Soc. Am. Bull., 86, 1413-1422, 1975.]

a. Contruct a gravity profile (A-A') across the dunite body. What is the contrast in gravity.

b. Use the slab formula to guess the body©s thickness. Dunite has a density of 3.3 gm/cc and the surrounding rocks have a denisity of 2.7 gm/cc.

c. Use the gradient of the gravity (arctan formula) to fit one side of the anomaly with a buried sheet. This will give you the depth to the center of the sheet. Compare with the sheet thickness that you got above.

d. Use 2-D form of Gauss's law to find excess gravity in cross section. Find excess mass per length of cross section. Estimate average thickness of body.