

Geology 437, gravity problems; due 12/9/98

1. Here's a situation like the Tibetan plateau: assume 5km of elevation above sea level (2670 kg/m^3), 55 km of 2670 kg/m^3 crust, 15 km of 2819 kg/m^3 lower crust, and mantle (3200 kg/m^3) down to a compensation level 125 km below sea level. Assume 100% Airy compensation and calculate how much erosion will be needed to erode the surface to sea level.

Now, what was the pressure at the base of the eroded section (before erosion and now exposed at the surface)? Remember pressure is:

$$Pressure = \int_0^z r_c * g * dz$$

Here are two problems to do using **GRAVCADW**, an MS-Windows gravity modeling program on the MS/Intel computers in SC 305. If your plots print funny it is my fault – the print routine is still a little funky; don't worry about it.

1. **GRAVCADW** has a built in demo data set - mess with that for a bit to figure out how the program works. Then select File/New Model off the Menu Bar to start the next problems.
2. Imagine you are working in a groundwater system where the general depth to bedrock (2.8 g/cm^3) is 200 meters. The average density of the sediments in the basin is 2.2 g/cm^3 . Suppose a divide in groundwater flow causes you to suspect a local bedrock high in the basin. The bedrock high is 500 meters wide, very long, and sticks up into the sediments. How deep is the top of the bedrock at the high when the amplitude of the Bouguer anomaly is minus three milligals?
3. The Mission Mountain fault separates Precambrian Belt Supergroup (2.95 g/cm^3) from Tertiary valley fill (2.2 g/cm^3). The fault dips west at about 60° near the surface. Suppose there is some question about the subsurface dip of the fault. Can you use a gravity survey to distinguish between a dip at depth of 30° versus 60° ? Use GravcadW to present your case.

The map below is of Bouguer gravity over a region with at least three faults. I want you to turn in:

- a) a map (same size) of the regional gravity.
 - b) a map of the residual which makes the faults obvious.
 - c) an interpretation of the residual showing which side is up/down on the faults.
- Assume that a higher density layer underlies the surface layer.

