

1. Use the interactive form on the web site <http://www.ngdc.noaa.gov/geomagmodels/IGRFWMM.jsp> to calculate the expected values of the magnetic field intensity, inclination, and declination at Bombay Beach near the Salton Sea for the dates of our experiment (use March 26, 2009). Use both IGRF10 and WMM models (you can change the selection under “model”). How do the results of these models compare?
2. Use the program “gravmag” under Linux or Windows. You will model a magnetized body at a series of depths and viewed along profiles of different orientations. Follow the directions below. Print out at least one example of the magnetic anomaly profile you model, but you don’t have to print all of them. However you should look at the profiles on the screen and answer the questions in parts (f) through (j).

To set up the program:

- a) open the gravmag program. You will see a window that says “model table”.
- b) Using the top tool bar, set Units to km and SI, set window to Section, set view to remanent and induced magnetics.
- c) A cross section pane will pop up. Set it to be 10 km x 50 km (Bottom and Right settings). Click on New and add a rectangular polygon, about 3 km high and about 20 km wide. Adjust it based on the coordinate values in the Model Table pane (bottom). Make sure it only has 4 points defining it
- d) Set the latitude in the Model Table to be that of the Salton Sea. Make sure its remanent inclination is the same as the inclination of the dipole magnetic field at the Salton Sea (from problem 1). In this case you are modeling a body that was magnetized positively (in the direction of the current earth’s magnetic field).
- e) Then click on “magnetic data” and 2 more things will appear: a “magnetic data” screen (set number of points to be 100 or so) and a Cross section of calculated magnetic anomaly values.

Different things to try and questions to answer:

- f) Set the Profile Azimuth to be zero and the top of your block to be 1 km below the surface. Set the remanent intensity to be 0.1, 0.01 and 0.001 on different tries of the data set. [Click on your polygon in the bottom of the “cross section” screen each time you change anything, so that it will update the magnetic anomaly profile.] What does the magnetic anomaly look like and how does it change as the remanent intensity changes?
- g) Now keep the remanent intensity constant and move the block down relative to the surface, by dragging it with the computer mouse. How does the magnetic anomaly change?
- h) Now change the Profile Azimuth; try values of 30, 60, and 90. How does the magnetic anomaly change?

- i) Finally, model a reversely magnetized body (by changing the “remanent inclination” of the body, in the Model Table, by 180 degrees). What happens to the magnetic anomaly in this case?
- j) Could you use the magnetic observations across the San Andreas fault to tell if the fault is vertical or if it is dipping? How would the magnetic anomalies be different?