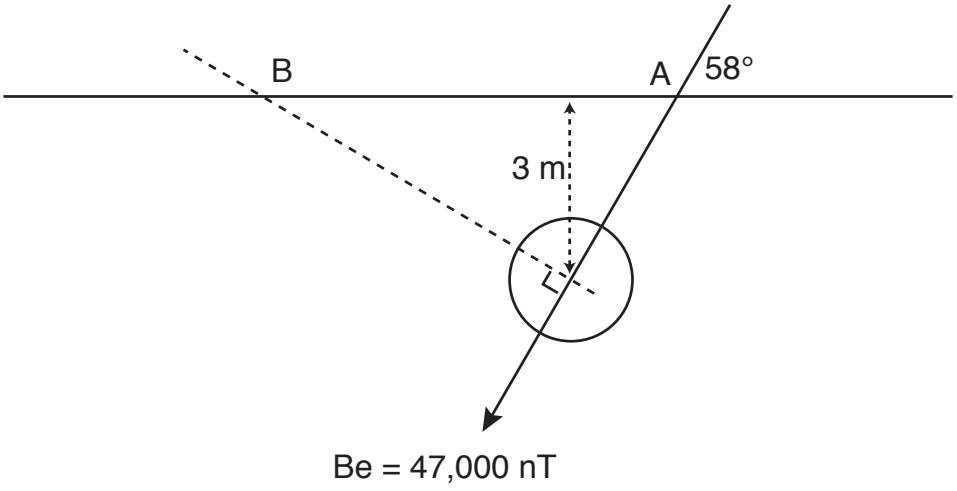
SIO 182 Assignment 4. Given 4 Feb, due 11 Feb.

1) Use an online IGRF calculator to find the magnitude, inclination, and declination of Earth's field at Scripps this year. Also do it for a year ago and look at the difference.

2) The magnetic moment of a sphere can be approximated by it's magnetization multiplied by it's volume. What is the magnitude of the dipole moment of a sphere 1 m in diameter with susceptibility of 10 (an engine block?) in the above field?

3) A sphere similar to the one in the last question (1 m in diameter with a susceptibility of 10) is buried at a depth of 3 m somewhere near Scripps. What is the magnitude of its anomaly (magnetic signature after Earth's field has been removed), assuming that it can be approximated by a dipole, at (a) where its pole intersects the surface (point A in the diagram) and (b) where its equatorial plane intersects the surface (point B in the diagram). Assume that the inclination and intensity of Earth's field is 58° and 47,000 nT. Be careful about μ_o; if you keep track of units you can work out if you need to multiply by μ_o or not.

Now add Earth's field to these values. This is a vector summation, but a simple one.



4) Download the `mdipole.m` Matlab function from the web site, and learn how to use it to compute the magnitude of the magnetic field anomaly caused by a dipole of moment A buried at depth z in an Earth field of inclination I and magnitude B, along a N-S line over the dipole.

5) Use this function it to compute and plot anomalies for buried dipoles 10m deep at the equator, the poles, and a latitude of 45°. You can use any dipole moment – I just want you to see how the shape varies.

6) Compute and plot anomalies for dipoles buried at 1m deep, 2m deep, 4m deep, 8m deep at the poles.

7) Compute the full width at half maximum for all these anomalies. Can you form a depth rule?