

Applied Magnetism, Problem set #1.

Definitions: A virtual geomagnetic pole (VGP) is a magnetic pole recorded or calculated for a point in time. Thus, a lava flow burying Missoula today would record a VGP from today's ambient field. Averaging sufficient VGP so that the variance of the average tends to a constant value yields a paleomagnetic pole. The angular variance of that average is an estimate of paleosecular variation.

Given five VGP:

VGP	Latitude	Longitude
1	75°	114° West
2	75°	186° West
3	75°	102° East
4	75°	30° East
5	75°	42° West

Fill out this table:

Site: Missoula, MT		
Latitude: 47° N		
Longitude: 114° W		
VGP:	Expected declination at Missoula	Expected inclination at Missoula
1		
2		
3		
4		
5		

Find, using vector averages:

- The average of the expected (D, I) values at Missoula
- The average (latitude, longitude) of the VGP. Show that this is not equal to the arithmetic average of the latitudes and longitudes.
- An estimate of the apparent secular variation given by the distribution of the VGP. A standard estimate of the angular standard deviation of VGP is :

$$\delta_{63} = \text{COS}^{-1}(R/n)$$

where R = length of the resultant vector from summing the VGP positions and n = number of samples (5).

Make enough sketches so that you understand what you are doing in terms of the magnetic elements, spherical coordinates, and lat-long coordinate systems.