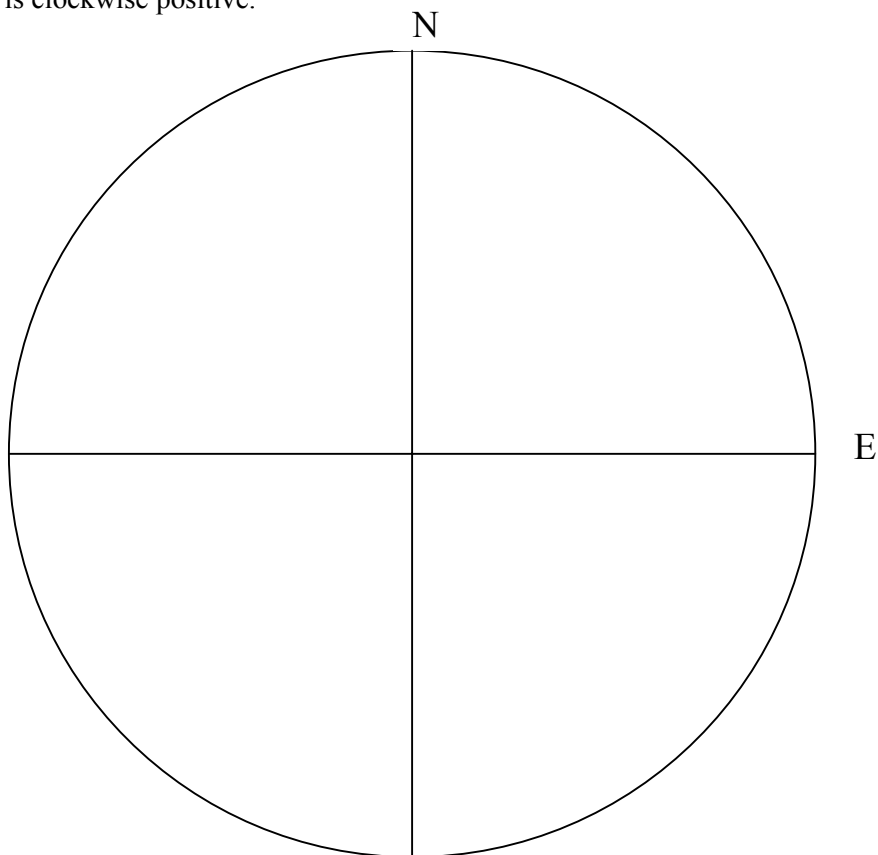


Geology 437 – problems due November 14th

1. Here are some measurements of declination and inclination from a paleomagnetic sample. Find their x, y, and z components and make plots of x vs y (horizontal projection), x vs z, y vs z, and $\sqrt{x^2 + y^2}$ vs z. Explain what you see, and why, for components of magnetization and magnetic minerals.

DEC	INC	J (A/m)	Demag deg C
15	72	2.0E+00	0
90	80	1.6E+00	50
135	70	1.4E+00	100
150	55	1.3E+00	200
155	42	1.2E+00	300
160	24	1.2E+00	400
165	0	1.1E+00	450
168	-2	9.4E-01	500
168	-3	8.0E-01	540
168	-5	6.8E-01	560
170	-6	4.1E-01	570
169	-8	3.7E-01	580
160	-30	3.3E-01	600
145	-42	3.0E-01	640
126	-55	2.7E-01	660
104	-55	2.4E-01	680
100	-45	1.2E-01	700

2. Plot the above directions on the stereonet below (or another of your choice). Remember, the perimeter is 0° inclination, the center is 90° inclination, inclination increases linearly from the edge to center, upper hemisphere (negative inclinations) are open circles, lower hemisphere (positive inclinations) are solid circles, and declination is clockwise positive.



3. Virtual geomagnetic poles (VGP) are locations of the magnetic pole at a point in time. A lava flow that cools, say over weeks or months, rapidly records a VGP. VGP need to be averaged (20-30 spot measurements) over 10^6 to 10^7 years to get a good estimate of a paleopole position (like anything else you need sufficient sampling to get a good, average estimate of standard deviation). This averaging assures that the paleosecular variation is averaged to a constant value.

- a. Suppose a VGP is at latitude 72°N , Longitude 62.5°W . Assuming that Earth's field is that of a uniformly magnetized sphere and follows the geocentric axial dipole hypothesis, what is the declination and inclination at Missoula (46.9°N , 114°W)?
- b. Suppose a 2001AD lava flow in Missoula records Declination = -27° , Inclination = 69° . Where is the VGP?
- c. What is the average position of the two VGPs from a & b? (Find the x, y, z components of each, average them, then invert back to latitude and longitude – watch your quadrants!)