

Geology 437 – Magnetism and Seismology 2002; due 12/11

1. Here's a 2D relative velocity vector problem, use the sketch:

$A^vB = 5 \text{ km/my due west}$

$A^vD = 5 \text{ km/my due east}$

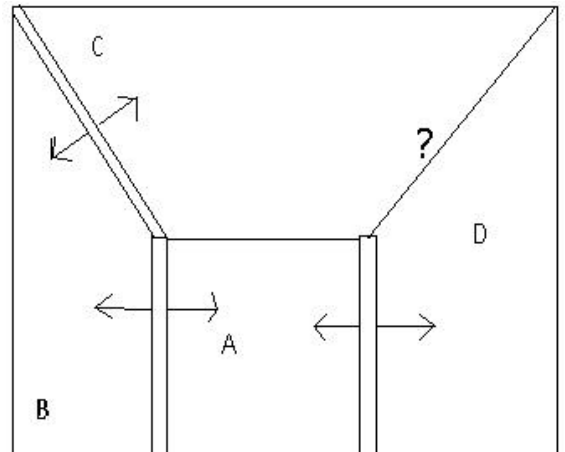
$B^vC = 5 \text{ km/my due northeast}$

a. What is A^vC and the nature of that boundary?

Magnitude = _____ Direction = _____

b. What is C^vD and the nature of that boundary?

Magnitude = _____ Direction = _____



2. Here are some spreading velocities observed at a fictitious, simple spreading center. Your job is to figure out the latitude, longitude and rate of angular rotation (**in radians/year**) for their Euler pole. If you are moving away from an Euler pole on a sphere, the instantaneous spreading velocity will increase as the sine of the angular distance from the Euler pole.

Latitude	Longitude	Spreading rate (cm/year)
50N	-45	1.8
25N	-45	3.4
3N	-45	4.3
50S	-45	3.8
67S	-45	2.9
75S	-45	2.4

3. A good estimate for North America's apparent pole position for the Eocene - Oligocene boundary (~40 ma) is at 84° north, 168° east. The Goble volcanics of southwestern Washington (46° north, 237.5° east) are about the same age. Calculate the magnetic direction you would expect for the area at (46° N, 237.5° E) from the Eocene pole at 84° N, 168° E; this is known as the expected direction.

Beck and Burr (1979 - *Geology* v 7, p 175-179) determined that the mean primary magnetization for the volcanic field, after cleaning, averaging, statistics, etc., was declination = 18.5°, inclination = 57.5°. Use the expected direction you calculated and, assuming Beck and Burr's field work was good, interpret the results in terms of rotation and transport of the terrane carrying the Goble volcanic rocks. Write a short, explanatory paragraph discussing your tectonic interpretation of their results.

4. Construct a T-delta diagram for the phases P, S, PcP, ScS, R, L, and PkP, for the planet below. Use minutes for time, degrees (0° to 180°) for delta.

For this planet:

- Radius = 6,000 kilometers
- Mantle thickness is 3,000 kilometers
- V_p in the mantle is 8 km/sec
- V_s in the mantle is 6 km/s
- V_p in the core is 4 km/s
- V_s in the core is 0.