

GEOL 5690  
 Homework 3, 2016  
 Due Nov 18, 2016  
 Plates and paleomag

Plate A has an apparent polar wander path (APW) specified below:

Age	Latitude	Longitude
0 Ma	90°N	0°
15 Ma	80°N	60°E
30 Ma	70°N	100°E
40 Ma	65°N	130°E

Plate B has moved with respect to Plate A over the past 40 million years according to these finite rotation poles which restore B from its present position to its former position at time  $t$  relative to A, or  $\Omega_{AB}^{0 \rightarrow t}$  in the conventions of the notes (note the convention that the rotations are positive if counterclockwise looking down along the axis of the pole):

Age ( $t$ )	Pole Latitude	Pole Longitude	Rotation Angle
0	Na	Na	0
15 Ma	0	90°E	7°
30 Ma	20°S	65°E	12°
40 Ma	30°S	60°E	17°

- 1) Determine the APW path for plate B. (hint: both plates will have the same apparent pole position once restored to their proper positions).
- 2) A terrane caught between plates A and B is at latitude 30° and longitude -10°. 40 m.y. old rocks are found to have a paleomagnetic direction of  $D=16.3$  and  $I=-12.0$ . Has this moved with plate A, plate B, or neither since this time?

You might find the equations for determining a paleomagnetic direction ( $D, I$ ) at a latitude  $\lambda$  and longitude  $\phi$  from a known paleopole at latitude  $\lambda'$  longitude  $\phi'$  helpful:

$$\cos p = \sin \lambda \sin \lambda' + \cos \lambda' \cos \lambda \cos(\phi' - \phi)$$

$$\tan I = 2 \cot p \text{ where } 0^\circ \leq p \leq 180^\circ$$

$$\cos D = \frac{\sin \lambda' - \sin \lambda \cos p}{\cos \lambda \sin p}$$

where  $0^\circ \leq D \leq 180^\circ$  for  $0^\circ \leq (\phi' - \phi) \leq 180^\circ$   
 and  $180^\circ < D < 360^\circ$  for  $180^\circ < (\phi' - \phi) < 360^\circ$