

EPSc 353: EARTH FORCES
Plate Motions Lab

1. Using the program **Plates v2** on the computers in the lab, study the dispersal of the Gondwana continents and the opening of the Indian Ocean. Under the "file" pull down window select the "Run plate model" option and input the "allplate.mdl" data file. Then, under the "view" menu, set the projection to "Orthographic", and "View Point" on -15° latitude, 40 ° longitude (near the current position of Madagascar), and set the grid to "Global 15°". At this point you should see a map of the world with the plates in their current positions. Now move the plates back in time in 16 Ma increments ("+"), making sure to push the "Replot" button each time. Make printouts of the positions of the continents at 48 Ma, 96 Ma, and 144 Ma. As you are making the plots answer the following questions....
 - A) What was the paleolatitude of India at 128 Ma? How about southern Australia? What do you think the climate would have been like at those places at the time?
 - B) Estimate the time when Madagascar rifted away from India?
 - C) Estimate the time when Australia rifted away from Antarctica. How has the plate tectonic history of Australia affected the evolution of mammals there?
 - D) At what time period did India begin to collide with Asia? This may be a bit difficult to estimate due to the "indented" shape of Asia in the current software – assume that the southern coastline of Asia was straight east-west before India arrived. How has the collision of India with Asia affected the landscape and climate of Asia?
 - E) This particular reconstruction is done with respect to the hotspot reference frame. Which continents have moved rapidly with respect to the hotspot reference frame, and which have moved slowly?
2. Estimate the total reconstruction pole needed to restore South America to its Gondwana position at with respect to Africa (with Africa held fixed). There is a file "SA_AF.mdl" which sets up this problem. The entry for Africa indicates that it will be fixed. Using trial and error, estimate the rotation (lat, lon, and degrees) necessary to bring South America to its correct position at 144 Ma (use "Poles" under "Plates"). Make a printout of your best fitting result. Where is the pole located?

Be sure to hand in all hard copies requested above with this assignment.