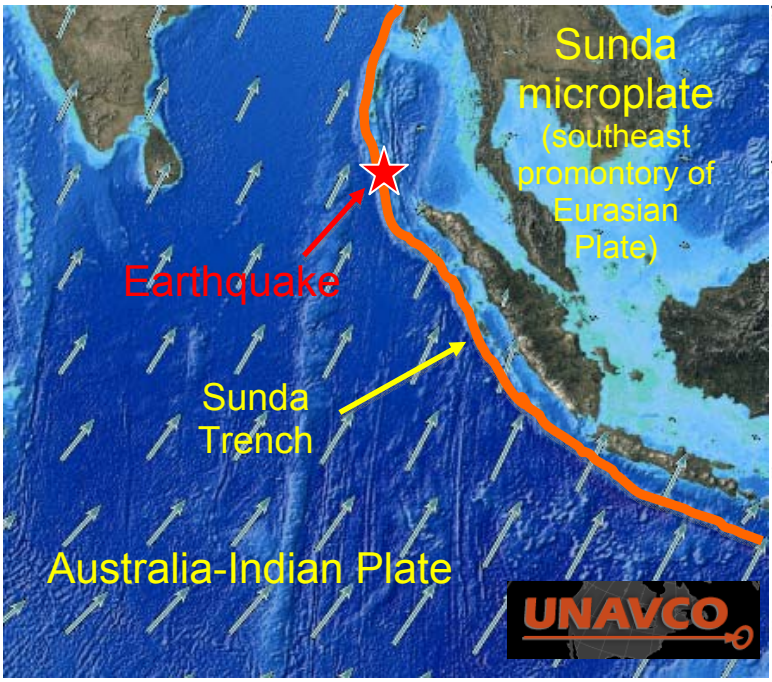
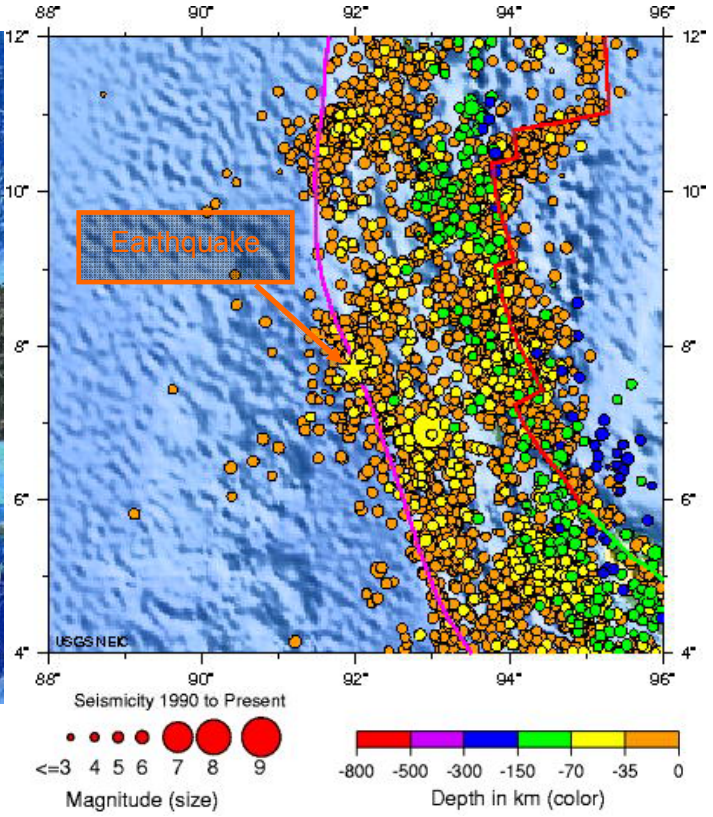
Magnitude 7.5 Nicobar Islands Region of Indian Ocean
Saturday, June 12, 2010 at 19:26:50 UTC
12:26:50 PM Pacific Daylight Time
Epicenter: Latitude 7.702°N, 91.975°E. Depth: 35 kilometers.

As determined by the US Geological Survey National Earthquake Information Center (NEIC), a major earthquake occurred Saturday afternoon Pacific Daylight Time 155 km (95 miles) west of Mohean in the Nicobar Islands region north-northwest of northern Sumatra. Light ground shaking was reported in Sumatra, the Andaman Islands, on Sri Lanka, and across the east coast of India. The epicenter of the earthquake is indicated by the red star on left-side map below. The orange line on this map is the surface trace of the plate boundary where the Australia – Indian Plate subducts below the Sunda microplate (= southeast promontory of the Eurasian Plate) at a rate of 60 mm/yr (6 cm/yr). Earthquake depths increase from southwest to northeast across this plate boundary. The June 12, 2010 earthquake may have occurred on the interface between the Australia – Indian Plate and the Sunda microplate or within the Australia – Indian Plate very near the plate boundary.

The map on the right below shows historic earthquake activity near the epicenter (yellow star) from 1990 to present. This region has seen much earthquake activity over the past six years beginning with the great M9.1 earthquake of December 26, 2004 that generated the devastating Indian Ocean tsunami. That 2004 great earthquake ruptured along the boundary between the Australia – Indian Plate and the Sunda microplate for a distance of >1000 km, including the patch of the subduction zone where the June 12, 2010 earthquake occurred. Early this year, the plate boundary to the south of the June 12 2010 event experienced two major earthquakes (M7.7 on April 6 and M7.2 event on May 9). According to the Pacific Tsunami Warning Center, a regional tsunami watch was initially issued for all areas of the Indian Ocean. However, when the initial magnitude estimate of 7.7 was revised downward to 7.5, the area of the tsunami watch was reduced to only India. No reports of damage, deaths, or injuries are available at this time.





The record of the June 12, 2010 Nicobar Islands earthquake on the University of Portland seismometer is illustrated below. Portland is about 13,155 km (~8174 miles) from the location of this earthquake. Body waves travel through Earth's mantle from the earthquake to a distant station along paths that curve upwards because the velocity of seismic waves generally increase with depth in the mantle. However, direct P and S waves cannot travel to stations more than epicentral distance $\Delta > 103°$ because of the large decrease in wave velocities across the boundary between the mantle and the liquid outer core. (Epicentral distance, Δ, is the angle formed by the intersection of the line from the earthquake to Earth's center with the line from the observing point to the Earth's center.) While no direct P wave energy arrives to this station, the first energy to arrive is a diffracted P wave (Pdiff) that diffracted on the core mantle boundary. It took 15 minutes 3 seconds for the Pdiff wave to travel from the earthquake to Portland. The largest amplitude arrival is actually a PP wave, which is a pressure wave that traveled through Earth's mantle and bounced midway between the epicenter and Portland. It took about 20 minutes for the PP wave to travel from the earthquake to the station in Portland. SS is a shear wave that also bounced midway between the epicenter and Portland. It took 36 minutes 17 seconds for the SS waves to travel from the earthquake to Portland. The (Love and Rayleigh) surface waves traveled from the earthquake to Portland around the perimeter of the Earth. Because the distance around the perimeter is longer than the distance through Earth's mantle and the speed of surface waves is slower than body waves, surface waves did not arrive in Portland until over 50 minutes after the earthquake occurred.