

Stress interaction and the 2004/2005 Sumatran earthquakes

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Following the great 26 December Sumatra - Andaman Islands earthquake, we computed the Coulomb stress changes on other faults in the region and found that the stress had increased by up to 8 bars on both the Sunda Trench, immediately south of the 2004 rupture plane, and the Sumatra fault which runs down the center of the Island. In a paper published on 17 March, 2005, we suggested that the seismic risk on both structures had increased as a result of this stress change. On 28 March, 2005, the M=8.7 Simeulue-Nias earthquake ruptured a portion of the Sunda Trench immediately to the south of the 26 December rupture plane. Although slip in this earthquake was contiguous with the December event, the hypocentre was approximately 100 km to the south. Coulomb stresses at the earthquake hypocentre were very low, ranging between 0.07 - 0.17 bars depending upon choice of slip model. The Simeulue-Nias event, in turn, increased the stress farther south along the Sumatra Faults and on the Sunda megathrust south along the subduction zone. Paleogeodetic studies in the Mentawai island chain have shown that beneath the island of Siberut the megathrust has not ruptured since 1797 and has therefore accumulated about 10m of slip. Farther south, the megathrust has not ruptured since 1833 and an event triggered beneath Siberut could potentially propagate southward into this region resulting in an earthquake that would, again, have a large magnitude, possibly M8.0-9.0. A good model for this earthquake would be the M8.5 1833 event which generated a large and destructive tsunami.