

**Surface Features of the Mw 7.6, 8 October 2005 Kashmir Earthquake, Northern Himalaya,
Pakistan: Implications for the Himalayan Front**

Robert S. Yeats, Dept. of Geosciences, Oregon State University, Corvallis, OR 97331

Ahmad Hussain, Geological Survey of Pakistan, Peshawar, Pakistan

The largest historical earthquake on the Indus-Kohistan Seismic Zone (IKSZ) in Pakistan was accompanied by rupture on the 65-km-long Balakot-Bagh (B-B) reverse fault, locally reactivating the Murree (Main Boundary) thrust (MBT) in the opposite sense. The B-B fault dips NE and, near Muzaffarabad, separates Precambrian limestone and shale on the NE from Miocene Murree Formation on the SW. Farther SE, along the Jhelum River, the fault is entirely in Murree. Large landslides were most severe on the hanging-wall side of the fault. Heavy damage extended NW from Balakot where the B-B fault may be blind NW to the Allai Valley south of Besham. ENVISAT range offsets from the COMET website suggest uplift of the hanging wall, consistent with field observations. Coulomb stress changes show increased stress to the NW near the Indus River, location of the 1974 M_w 6.2 Pattan earthquake, and to the SE into Indian-held Kashmir, site of a possible seismic gap between this earthquake and the 1905 M_w 7.8 Kangra earthquake.

Stress modeling shows a decrease in stress toward Islamabad-Rawalpindi and the Salt Range thrust. In India and Nepal, great Himalayan earthquakes were assumed to nucleate on the zone of moderate seismicity that is the SE continuation of the IKSZ marked by a sharp topographic gradient between the Lesser and Greater Himalaya beneath the Main Central thrust (MCT). These earthquakes then propagated to the Himalayan front. In Pakistan, the MCT (Panjal thrust) and MBT are folded into the inactive Hazara syntaxis. The IKSZ cuts across this syntaxis to a modern syntaxis west of the Indus River. Wallace et al. (2005) found that the 1905 rupture did not extend SW to the Himalayan front. Large surface ruptures on the Himalayan Front thrust around 1100 AD in SE Nepal (Lavé et al., 2005) and questionably 1404-22 AD in Garhwal and Kumaon, India (Kumar et al., in press) did not accompany earthquakes that were recorded historically, although the Indian rupture might be the 1505 earthquake. These ruptures might not be analogous to the 1905 and 2005 earthquakes. Were they slow earthquakes?