



Surface rupture of the 1950 Assam earthquake: active faults and recurrence interval along the Eastern Himalayan Syntaxis

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The great Assam earthquake (08/15/1950, Mw.8.7) shook border regions between northeastern Indian, Tibet, and China for several minutes, triggering large landslides and numerous aftershocks over a wide area in the Abor and Mishmi Hills. Using morpho-tectonic field observations and high-resolution satellite images analysis we show that the earthquake produced a >200 km-long surface rupture along the Eastern Himalayan Syntaxis. It ruptured both the Main Himalayan Frontal Thrust (MFT) and the Mishmi Thrust (MST) all the way to the surface, producing clear tectonic scarps cutting Quaternary alluvial terrace risers at high angle. We analyse the geometry, height, shape, and slopes of these scarps with high-resolution topographic profiles levelled using Total Station and kinematic GPS, to document 1950 co-seismic and older cumulative surface uplifts. The co-seismic vertical throws differ between the two thrusts from ≈ 7 m and ≈ 3 m, along the MST and MFT, respectively. We stack series of parallel topographic profiles extracted from high-resolution data (eg. ALOS and Pleiades) to document the morphology of uplifted Quaternary alluvial terraces in order to identify past earthquakes. Our results show occurrence of 2 and 6 past earthquakes, along the MST and the MFT, respectively. We combine these results with radiocarbon and cosmogenic dating to assess the ages of these uplifted surfaces and constrain uplift rates of 3 ± 1 mm/yr on both thrusts and a recurrence interval of 1500 ± 300 yr between large events along the Eastern Himalayan Syntaxis. We discuss the possibility that our results suggest characteristic slip along both thrusts through Quaternary time scale.