Active tectonic uplift in the eastern Himalayan Syntaxis: geomorphic traces of the 1950 Assam earthquake rupture

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On August 15, 1950, the M ≈ 8.7 Assam earthquake devastated the Abor and the Mishmi foothills, in Arunachal Pradesh, triggering large landslides and debris flows all around the eastern Himalayan Syntaxis and eastern Assam plain (Poddar, 1950; Tandon, 1950; Tillotson, 1951; Kingdon-Ward, 1953). No surface rupture, however, was ever documented, whether at the time of the event, or in the 6 decades since.

We present here the first evidence for a primary rupture of that event, along both the Main Himalayan Frontal Thrust (MFT) and the Mishmi Thrust. Geomorphic features indicative of tectonic surface uplift and recent active faulting were first identified in field reconnaissance surveys guided by satellite image interpretation. Topographic profiles across fault scarps crossing at high angle fluvial terrace risers were then leveled with a Total Station, to quantify the vertical offsets of uplifted, perched Quaternary alluvial terraces. Such offsets range from ≈ 2.6 to ≈ 29 m. At a few sites, the analysis of the profile shapes and slopes enables a preliminary assessment of the co-seismic throws of the 1950 earthquake and its predecessors. At Pasighat and Wakro, for instance, the minimum heights of the steepest scarps along the MFT and Mishmi Thrust are 2.6 ± 0.1 and 7.3 ± 0.1 m, respectively. We interpret them to represent the vertical co-seismic offsets of the 1950 earthquake. On the Mishmi Thrust near Wakro, our topographic profiles also show evidence for about 14 m of cumulative vertical offset - the sum of two identical 7 m throw amounts - suggestive of locally characteristic slip in the 1950 and penultimate earthquake. The differences in co-seismic throw on the MFT and Mishmi Thrust may result from large changes in dip around the eastern Syntaxis, which would be consistent with large-scale changes in the topography of the corresponding mountain ranges.

References

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