

Surface ruptures of great ($M > 8$) earthquakes in Eastern Himalayas: characteristic slip over the last 9ky

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The great 1950 Assam earthquake of magnitude $M_w 8.7$, which triggered devastating landslides and numerous aftershocks in the Abor and Mishmi mountain ranges, emphasizes the potential high earthquake hazard in Eastern Himalayas. However, active faults of the Eastern Himalayan Syntaxis are poorly mapped and seismic history is unknown. By combining morpho-tectonic field observations, satellite imagery analyses, and high-resolution topographic datasets, we document the recent 1950 surface break as well as past surface ruptures associated with 5 historical earthquakes along the mountain front. We analyse the height and shape of tectonic escarpments to separate recent co-seismic from cumulative surface deformation. We stack topographic profiles across sets of uplifted alluvial surfaces to quantify individual co-seismic vertical throw for each earthquake. We show that they are similar to the recent 1950 vertical throw at each investigated site. These throws differ between the Main Himalayan Frontal Thrust (MFT) and the Mishmi Thrust (MST) from 4 ± 1 m, to 7.3 ± 0.3 m and 11.5 ± 0.5 , respectively. This suggests characteristic slip for the last 6 successive earthquakes, likely of similar size, producing a surface rupture over at least 200 km along the MFT and the MST. By combining these results with cosmogenic dating of uplifted surfaces, we estimate a return time between these great ($M > 8$) earthquakes of about 1800 yrs on both thrusts over the last 9ky.

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