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Late Holocene Slip Rate of the Main Frontal Thrust (MFT), Far-Western Nepal Himalaya, from the analysis of deformed fluvial terraces

Boxuan Zhang (1,2), Jie Chen (2), Jinhui Yin (2), Yuehua Li (2), Jianhong Xu (2), Haoran Wang (2), and Tao Li (1)

(1) School of Earth Sciences and Engineering, Sun Yat-sen University, Zhuhai, China, (2) Institute of Geology, China Earthquake Administration, Beijing, Chian

The 2500 km Himalayan Main Frontal Thrust (MFT) zone is the longest active contractional structure in the largest active collisional orogen on Earth. The latest great earthquake in far western Nepal region happened more than 500 years ago, in 1505 AD. Given the present-day slip rate, 2cm/yr on the creeping lower MHT under the high topography and null on the same fault from the brittle–ductile transition zone up to the surface MFT, the seismic slip deficit is estimated to at least 10 m over a 80 km-wide 600 km-long stretch of the fault. The present-day seismogenic potential in this area is therefore very high and could include several cascading M8 events. However, contrary to elsewhere along the MFT where numerous seismic scarps have been documented, few studies document the past seismic ruptures and slip rate along the MFT in far western Nepal. To address this issue, we conduct geologic and geomorphologic studies to constrain late Holocene slip rates across the MFT in the far western Nepal Himalaya. Our field reconnaissance documented abrupt, localized terrace thrust faults and folds along the Krishnapur river to the NNW of Dhangadhi. We quantified the MFT slip implied by Holocene fault scarps and compared these estimates to independent measures implied by Holocene fold scarp uplift records, using dGPS survey and field mapping. We define a faulting and folding model to quantify fault slip from measures of terrace uplift and folding pattern.