

Reconstructing the Earthquake Recurrence Pattern in the Central Himalaya: Evidence from the Himalayan Frontal Thrust

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Considering the large and densely populated regions that are likely to be affected, reconstructing the seismic history of the Himalaya is a key issue in the seismic hazard assessment. The Himalaya plate boundary has generated three great earthquakes during last century but since the 1950 Assam earthquake (Mw 8.0) there has been quiescence and the gap in time and space is particularly noted on its central segment. Thus, the region comprising Garhwal and Kumaun provinces within India and the western parts of Nepal has been termed as a “seismic gap”. Referred to as the “Central Gap”, this region covers ~600 km length of the Himalayan arc and it arguably represents the un-ruptured segment between the devastating earthquakes to the west (1905 Kangra M 7.8) and east (1934 M 8.0 Nepal-Bihar). The long-lived deficit in seismic productivity has led many to believe that the region holds potential for more than one magnitude ≥ 8.0 earthquakes in the near future. However, the extent to which older earthquakes might have filled the gap is contested on various counts, because of uncertainties in locations and magnitudes of pre-20th century earthquakes; those 1803 and 1505 in particular. After presenting the background, we will discuss the results from the trenches that we excavated across the Himalayan frontal fault near Ramnagar located within the “central gap”. The interpretations of the structural relations on various fault strands and the dating results imply temporally clustered occurrence of 10th and 13th century earthquakes, which ruptured the frontal thrust. Our findings suggest that the current dormancy in the region can be explained by the pulses of great earthquakes followed by long period of quiescence.

Key words: Himalaya, seismic gap, earthquake recurrence