

Making molehills out of mountains

Mountain belts like the Himalaya have both sustained and destroyed humans and closely affect our lives. Mountain building processes result in earthquakes and landslides which

are major hazards to the human civilisation. Major earthquakes that activate the main frontal thrust (MFT) are particularly devastating. My research group is involved in understanding the kinematics of the Himalaya that result in the these earthquakes by undertaking a detailed study of the main frontal fault zone that results in extreme pulverisation of the rocks (Fig. 1) and building of Himalayan topography (Fig. 2). We have discovered that:

- The Himalayan frontal rocks have been reduced to rock powder through earthquake activity in the past by extreme fracturing and pulverisation.
- The process has also uplifted river-bed gravels and warped them.
- Long term effect of the process is to build frontal topography and landscape in the Himalaya and extend the mountain earthquake-by-earthquake into the gangetic plains.
- Our study essentially records how earthquake processes build mountains and points to an omnipresent seismic hazard that will keep shaking and stirring humans in and around the Himalaya in the near and far future.
- In a scenario where earthquakes will occur in the future, our best bet is to build dwellings that do not collapse during large earthquakes.



Fig. 1: Earthquake-induced extreme pulverisation produces rock flour (termed gouge) in the Himalayan front. Notice the uplifted gravels from the river-bed that cap this zone and are sliding down slopes. This points to great earthquakes in the past that have been building the frontal Himalayan landscape.

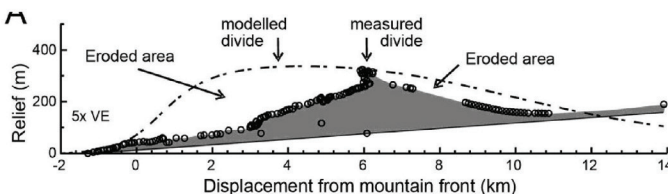


Fig. 2: A boundary-element based model to simulate earthquake induced topography building at the Himalayan front and subsequent erosion. The present day topography represented by open circles has been measured by Real Time Kinematic GPS with a resolution of 1-1.5 decimeter. This points to the relentless tussle between the earthquake related processes that keep building the Himalayan topography and the climate related process that keep eroding it at the Himalayan mountain front.