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Evacuation of earthquake-triggered landslide sediment in the Nepalese Himalaya

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Rivers draining the Himalaya and feeding the Indo-Gangetic plain support around 10% of the world's population. However, these rivers are also prone to frequent and often devastating floods such as the 2008 Kosi floods which displaced more than 2.5 million people. Changes in sediment supply from the Himalaya influence the magnitude and distribution of floods. For example, an increase in sediment flux from widespread landsliding associated with large earthquakes would be expected to result in channel bed aggradation and increased rates of channel migration, and therefore higher flood risk at the Himalayan mountain front in future years. This study links flood and sediment dynamics on the Indo-Gangetic plain to sediment supply from the Himalaya using the example of the 2015 Gorkha (Nepal) earthquake. Through several field campaigns, we have collected gravel size and lithology as well as channel geometry data, and constructed a unique record of high-resolution channel cross-sections along the Kosi River (East Nepal) using an Acoustic Doppler Current Profiler (ADCP) in the years following the Gorkha earthquake. This dataset is used to estimate the river's sediment transport capacity, sediment mobility and cross-sectional channel geometry change through time. We test whether the changes are consistent with the location of sediment sources (landslides) and magnitude of the monsoon floods, and make inferences regarding the timescales and modes of migration of coarse sediment following widespread landsliding in mountains.