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## Geomorphic response and paleohydrology of a debris flow event in the upper Ganga River basin, NW Himalaya

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Debris flow events are recognized as one of the most prominent mechanisms for landscape evolution in the Himalayan river basins. Triggered by cloud bursts, glacial and landslide lake outburst floods; debris flows can erode, transport and deposit vast amount of sediments with profound landscape changes. The Himalayan river basins frequently experience such debris flow events during the monsoon. However, only a few morphological and hydrological studies are available for such events. Hence, we studied a high-magnitude, low-frequency debris flow event in the Asiganga River basin (a headwater tributary of the Ganga River) on 3<sup>rd</sup> August 2012.

In the present study, we (i) computed landscape change during the event and (ii) calculated the paleohydrology of the event. The pre and post geomorphic mapping is carried out using satellite imageries (Google Earth), field data, and published literature to analyze landscape modification/change. The paleohydrology of the event is calculated using dimensions of 440 mobilized stream boulders at 11 locations in the Asiganga River basin. Our results suggest that the Asiganaga River's reaches encountered sediment deposition and erosion on a massive scale; especially in the lower terrace levels. Channel shifting and widening was also a dominating geomorphic response, and it occurred in different magnitude along the course of the Asiganga River. A significant alteration trend is observed in sediment bars, especially in the reaches, which were exceedingly influenced by morphological and hydraulic parameters. The peak discharge is calculated using D95, D90, D85, and D80 of the mobilized stream boulders. Overall, the calculated highest peak discharge is around 4500 m<sup>3</sup>s<sup>-1</sup>. Interestingly, the peak discharge from D90 yielded the value of 2661 m<sup>3</sup>s<sup>-1</sup>, and it corresponds with the peak discharge (i.e., 2665 m<sup>3</sup>s<sup>-1</sup>) measured using an instrument based previous study.

In the Himalayan River basins, documentation of such debris flow events is crucial. Such studies will provide a unique database to study river sensitivity towards future debris flow events.