

Drivers for the development of an alluvial fan in a high-altitude glaciated catchment

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Alluvial fans have channelization and deposition dynamics that are not entirely understood but can have considerable impact on the local hydrological regime. Especially in high-altitude and glaciated catchments they are rather rarely investigated.

During glaciological field work between 2012 and 2015 in the Langtang catchment in the Nepalese Himalaya, such an alluvial fan of ca. 0.35 km² (4000 m a.s.l.) at the end of a very small glaciated subcatchment (~9km²) was observed. The subcatchment is the site of one of the presumed largest landslides in earth's history, that likely happened 40 000 years ago with a volume of approximately 1010 m³ and land surface erosion is well visible. During the recent Gorkha earthquake in April 2015 (M=7.8), additional sediments were mobilized along the steep valley slopes.

From 6 sets of concurrent high-resolution satellite images and DEMs between 2006 and 2015 and an additional image from 1974 we derive the evolution in space and volume of this fan and identify main sources of sediment supply. Precipitation data from a nearby Automatic Weather Station provides insight into strong rainfall events. We can compare the growth of the fan in the period without significant earthquakes until April 2014 to the change after the seismic event (image from May 2015) and after the following Monsoon season (image from October 2015) and determine dominant drivers of erosion.