



Gigantic landslides aligned along the Kaligandaki River, Nepal Himalaya

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Himalaya is uplifting rapidly and have been modified by glacial and fluvial erosion and landslides. We investigated the geological and topographic characteristics of landslides aligned along the Kali Gandaki River, one of the largest rivers that flow from Tibet to India through High Himalaya. We made field survey, using PRISM image with a resolution of 5 m and 5-m ALOS AW3D. From the upstream to downstream, there are Dhampu, Talbagar, Kopchepani, Gadkhan, and Gadpar rockslides.

The Dhampu rockslide is the largest with a volume of 3 km³ (Fort, 2000), of which deposits is represented by a mound on the left bank of the Kali Gandaki River and have been argued about its origin, moraine or landslide deposits. We found bedrock-like gneiss in the lower portion of the mound, which has irregularly shaped fractures with openings and jig-saw-fit rock fragments in the massive rock body. This strongly suggests that the mound is rockslide deposits. The structures within the deposits like the alignment of rock fragments and minor faults suggests that the deposits came from south or southwest. To the south of the deposits is an E-W-trending ridge, which is 1,000-m to 2,000-m high from the riverbed of the Kali Gandaki and has linear ridge-top depressions. The northern face of this ridge is a poorly-vegetated dip slope of gneiss, on which we see many bulges by gravitational buckling deformation. These facts suggest that the mound at Dhampu is the deposits of the landslide that occurred on the dip slope in the south and preceded by gravitational slope deformation of buckling type. This landslide once blocked the Kali Gandaki River and drastically changed the landscape upstream.

Talbagar landslide occurred on the left bank just downstream of an outstanding knickpoint of the Kali Gandaki River, which knickpoint propagated from downstream forming a slope break and undercutting the nearby slopes. Talbagar landslide with a volume of 10 million m³ (Fort et al., 2010) is a rock compound slide with a rupture surface consisting of gneissosity that trends WNW-ESE and dips to N and high angle joints trending N-S. Talbagar landslide slid to WNW slightly diagonal to the strike of the gneissosity on a slope that had been undercut by the knickpoint propagation.

Kopchepani, Gadkhan, and Gadpar landslide occurred on the left bank of the Kali Gandaki River, where the slopes are mostly infacing slopes while the right bank slopes are dip slopes. The bedrock is two mica gneiss trending WNW-ESE and dipping NNE 45° to 60°. The knickpoint propagation described before made a slope break 200-400-m high above the riverbed. We found that the beds above the slope break toppled valleyward while the beds below it were not deformed. Kopchepani, Gadkhan, and Gadpar landslide occurred in the toppled rock mass above the break probably by earthquake shaking. On the contrary, the slopes on the right bank suffered from gravitational slope deformation and are rather smooth with hummocky surface.