

## Landslides induced by the knickpoint migration in the southern and the eastern margins of the Tibetan Plateau.

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Because of the collision of Indian plate to Eurasian continent, Himalaya, which is the southern margin of the Tibetan Plateau, is uplifting very rapidly and also the eastern margin of the Tibetan Plateau is uplifting. Those mountains are the sites of uplift and also the sites of rapid erosion and mass movements. We made field survey, using PRISM image with a resolution of 5 m and 5-m ALOS AW3D in both areas. We studied gravitational slope deformation and landslide, which are the response of mountain slopes to river incision, along the Kaligandaki River in Nepal Himalaya and the Minjiang River in Sichuan and found that gigantic landslides have occurred due to the slope instability made by the upstream migration of knickpoints and undercutting of the nearby slopes.

Along the Kaligandaki River, there are two outstanding knickpoints at Kalopani and Talbagar, respectively. The knickpoint at Kalopani is located at the largest landslide dam, which is called Kalopani landslide or Lete landslide. This landslide is inferred to be preceded by buckling deformation of calc gneiss. It is located near the lower margin of the glaciated area, and the slope could have been eroded by a glacier at the foot of the slope. Downstream of the Lete landslide are aligned 4 gigantic landslides, of which the most upstream one is the Talbagar landslide. It occurred on the left bank just downstream of an outstanding knickpoint of the Kali Gandaki River. This knickpoint propagated from downstream forming a slope break 200-400 m high from the riverbed. Talbagar landslide is a rock compound slide and the other three gigantic landslides were of two mica gneiss and occurred on slopes that had been toppled above the slope break.

There are two significant knickpoints along the Minjian River upstream of the Longmenshan fault. The effects of the knickpoint propagation and inner gorge formation on slope stability are dependent on the geometrical relationships between the river and geological structures. When the geological trend is normal or highly oblique to the river axis, landslides generally do not occur, but gigantic catastrophic landslides have occurred on one side of the Minjiang valley, which can be attributed to a wedge structure consisting of bedding planes and joints with intersections dipping valleyward and tight folds with hinges plunging valleyward. Diexi landslide, the largest landslide along the Minjian River was a wedge failure induced by this knickpoint migration.

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