

Brief Report on “So Bhir” Landslide on 13/08/2016 near the Mantam village, North Sikkim - Analysis using Cartosat-2B image

1. Introduction

A massive landslide occurred near the village of Mantam (opposite to the Passingdang-Mantam Road) in Sikkim at around 13:30 hrs (IST) on 13th of August, 2016 (Figure 1). As per the news reports formation of the lake and consequent rise in water level submerged the Kanka bridge and washed away about 300 metres of road. Five houses in the Mantam village have been submerged. The villages of Tingvong, Lingdem, Laven , Kayeem, Lingzya , Bay , Sakyong Pentong and Ruklu Kayeem are cut-off due to the damage to the connecting road. There are no human casualties reported from the incident.



Figure 1: Photograph of the Mantam landslide (Source: Social media).

2. Landslide analysis

The landslide generated a huge cloud of dust engulfing the nearby settlements (Figure 2a). From the field photograph it appears that it is a rock avalanche and the dust cloud was formed due to rapid downslope movement of dry rockmass resulting in airblast. The debris from the landslide is believed to have blocked the flow of the Kanaka river/Ringpai Chu, which is one of the main tributaries to the Teesta River.

An analysis was carried using very high resolution Cartosat-2B (80 cm) image acquired on 15 August 2016. The water impoundment has resulted in the formation of artificial lake of 2.2 km length and 209 m width at the lake head, north of the Mantam (Figure 2b). The width of the landslide is 530 m in the middle and length is 790 m. The landslide is rectangular in shape. The crown of the landslide is on the ridge line (Figure 3). Debris deposits are clearly observed on either side of the ridge line. Joints exposed after the landsliding suggest a wedge type failure near the crown of the landslide followed by translational type of failure in the main body of the landslide.

This area is near to Main Central Thrust (MCT), which takes a convex turn to the north and also has a tectonic window known as Rangit window. Due to the presence of MCT, high grade central Himalayan crystalline rocks (e.g. quartzites and granite gneisses) exposed in this area were subjected to shearing which is evident from the density of joints in the landslide scarp region. Area around Sakkyong in the upstream part of the Kanka river also witnessed severe landslide occurrences during the Sikkim earthquake on 18 September 2011. Groundwater seepages from the exposed joint planes are clearly visible in the Cartosat-2B image. Therefore, the role of aquifer induced pore pressure (due to earlier monsoon rains) and escarpment stress condition as evident from the presence of an old landslide could be probable causative factors for the landslide occurrence on 13 August 2016.

The water impoundment may have presented a serious threat to settlements downstream and installations like the Teesta Low Dam Project V of NHPC. However, as seen from the Cartosat 2B image, the river water has overtopped the debris dam and now flowing along its natural course in the form of a turbulent rapid, without any lateral breaching. As a consequence of this, the lake is draining out through the narrow outlet and there is no eminent water level rise. Nevertheless, it is important to monitor the water spread and the volume of the lake over the next few weeks, as a sudden even of high rainfall in the upstream areas, can lead to rapid water level rise and submergence of the habitations beside the lake.



Figure 2a: Dust cloud from the landslide; 2b: Artificial lake formation due to the landslide (Source: Social media)

Landslide on 13-08-2016 near Mantam village in North Sikkim

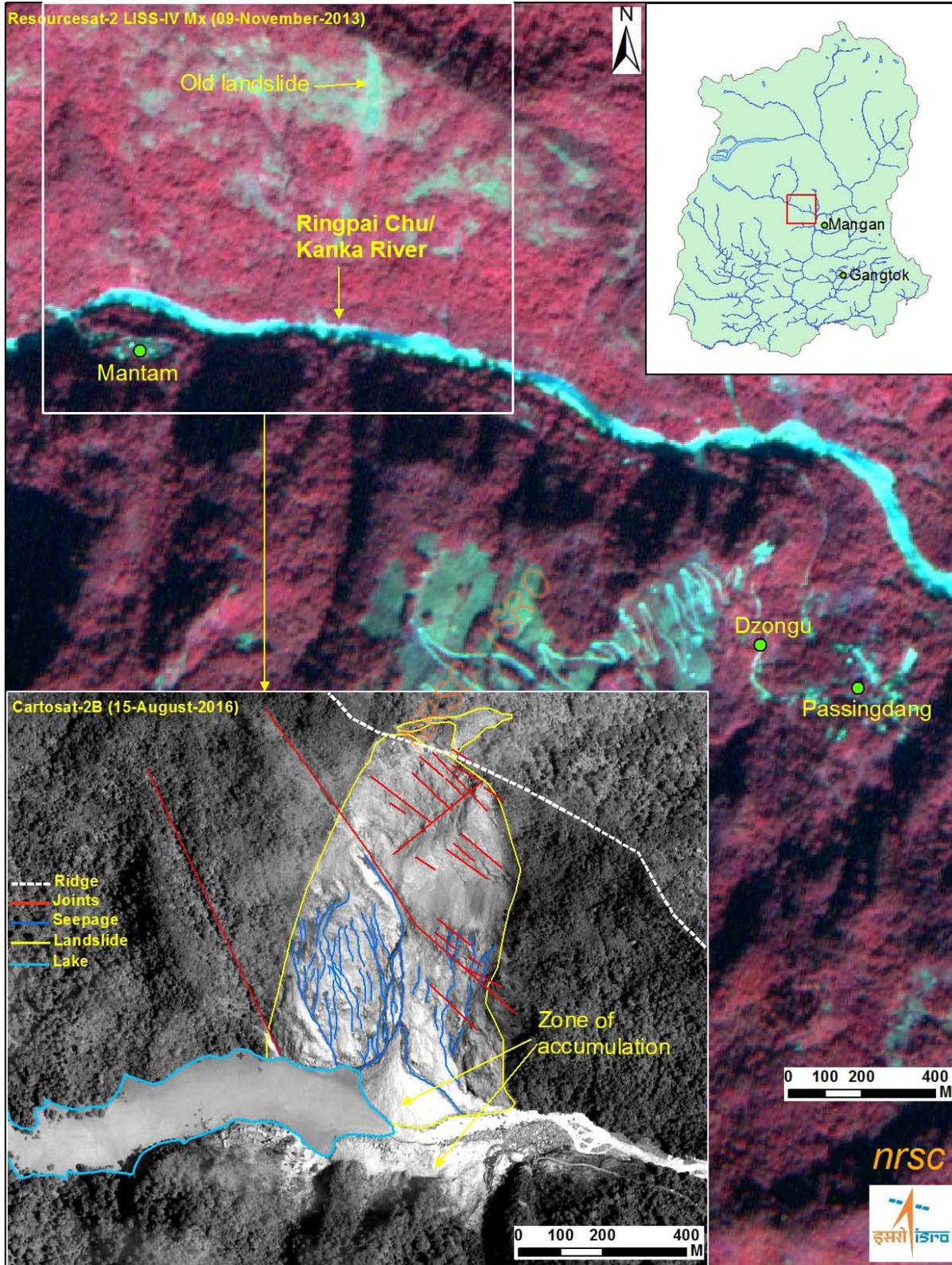


Figure 3. Analysis of Mantam landslide using Cartosat-2B image.