



Analysis of a high resolution LIDAR DEM over two large landslides within glaciolacustrine clays (Trieves area, French Alps)

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We present geomorphological analysis of two active landslides of the Trieves area (French Alps) from high resolution LIDAR (Light Detection and Ranging) and photography data. The Trieves area is located within the French alpine foreland 40 km south of the town of Grenoble. This 300 km² area is covered by a thick Quaternary clay layer (up to 200 m) deposited in a glacially dammed lake during the Würm period. After the glacier melting, rivers have cut deeply into the geological formations, triggering numerous landslides. LIDAR data have been acquired in November 2006 over about 8 km², covering two nearby landslides along the West shore of the Monteynard lake: The Avignonet and Harmaliere slides.

The Avignonet slide has moved slowly since that the first disturbances were observed at the end of the seventies. GPS measurements performed from 1995 have shown up surface displacement rates between 1 to 13cm/year. In contrast, the Harmaliere slide evolved into quick mudflow in March 1981, creating a head scarp of 30 m and affecting a surface of about 450,000 m² in the same material.

LIDAR data come from the helicopter-borne mapping Helimap system®, that acquired simultaneously numerical photos with a resolution of about 5cm. The height of flight was about 500 m above the ground, allowing a density measurement of 5 points by square meter in average, with a positioning accuracy of ~10 cm both in horizontal

and vertical. After filtering houses and trees from the LIDAR point cloud, a Digital Elevation Model (DEM) of 2 m resolution was produced.

The DEM enlightens several landslide indicators. It clearly displays the crescent-shaped front scarp of the Avignonet landslide, which intersects the Harmalière one to the South and another minor one to the North. Numerous secondary scarps previously unmapped have been identified in particular in forested area. Scarps height and frequency show interesting correlation with the geology, which could give information about the physical mechanism driving the slides.