Harmalière and Avignonet Landslides

Topic: Two major slow-moving landslides affected by different processes in the same glacio-lacustrine clays

Stakes: Vulnerability/damage to buildings and infrastructures; maintenance of a residential area/expropriation

Key words: evolutionary processes, monitoring, remote sensing, risk management

Description

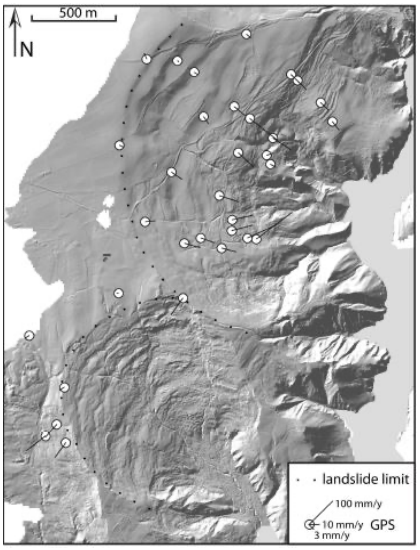
The Trièves and Beaumont areas in the French western Alps are characterized by the presence of Quaternary glacio-lacustrine clays that have been since long submitted to deep (around 40 m to 50 m) and quick landsliding (In 1850, the village of Avignonet was washed out by a landslide to the bottom of the valley). Large landslides are currently active, delimited by circular scarps up to about 1.8 km in diameter, and pose numerous problems in terms of land use and safety: the construction of the housing estate Mas d'Avignonet is interrupted in 1981, houses have been evacuated in the 2000's due to severe damage to the infrastructures. The movements are episodic and the relationship with climate is not understood.

The Harmalière landslide is 1450m long and affects an area of around 1.8 x 10^6 m² with an estimated volume of 25.10^6 m^3, with a mean slope of 9°. It is a clay compound slide in its upper part, exhibiting back-tilted blocks and horst-and-graben structures, and an earthflow with smooth morphology and a flow-like pattern in its lower part. It has a long history of activity and has undergone major retrogressions in 2016 and 2017. Short-term stakes include agricultural land use and an electrical network. In the mid-term, considering the regressive mean rate, the south of the village Sinard might be concerned with stability problems.

In contrast, the contiguous Avignonet landslide, which affects the same materials and is subjected to the same meteorological conditions, has moved little in the same period. However, a deep slide of circular type (around 40m), can represent a danger to the safety of the housing estate.

On both sites, there are lots of geophysical investigations, seismic monitoring, aerial photographs, optical satellite images, Lidar and GNSS monitoring, including permanent stations of the French National Observatory on Landslides OMIV.

View of the Harmalière landslide from the headscarp © P. Mériaux



Surface morphology (LIDAR DEM) of the 2 landslides with velocity © ISTerre/UGA

View of the Harmaliere landslide constructed using a LiDAR DEM and orthorectified photographs © ISTerre/UGA, 2016

29/01/2017, the Harmalière landslide pushed away some geophysical equipment (in the red circle) ; the scarp is 10 to 15m high © Mickael Langlais