International Conference
Analysis and Management of Changing Risks for Natural Hazards
18-19 November 2014 l Padua, Italy

AP16

Structural control on the dynamics of the deep-seated La Clapière Landslide (Tinée Valley, French Alps) from DInSAR and ground-based observations

R. Schlögel [1], J.-P. Malet[1], C. Doubre[1], T. Lebourg[2]

[1] Institut de Physique du Globe de Strasbourg, CNRS UMR 7516, Université de Strasbourg, 5 rue R. Descartes, Strasbourg, France, (schlogel@unistra.fr)
[2] Géosciences Azur, CNRS UMR 6526, Université de Nice-Sophia Antipolis, 250 Avenue A. Einstein, Valbonne, France

Abstract:

Located in the Argentera-Mercantour Massif in South-Eastern France, the La Clapière landslide is one of the largest mass movement in Europe with a volume of ca. 65 million m3. The landslide represents an important threat because a major failure could potentially block the Tinée river and create a landslide dam.
Displacement measurements are acquired since 1982 with EDM technology. The surface displacement rates are on average of about 1 cm.day-1. In 1987 and 1997, acceleration with displacement rates up to periods 10 cm.day-1 have been observed. In the last years, the measured displacement rates are less than 1 cm.day-1. Spatially, the displacement rate are heterogéneous, with larger displacements observed in the upper North-East slope. The lithology consists of different metamorphic units (granodiorite and weathered mica gneisses) highly affected by normal faults and a single over-thrusting fault. Three fault orientations can be distinguished (N010°E-N030°E, N080°E-090°E and N110°E-N140°E) with a dip angle close to 90° near the scarp and decreasing downslope. Rotational movements are observed in the upper slope with a depth of the failure surface comprising between 100 and 200 m.
In this work, a set of L-band ALOS/PALSAR interferograms combined to field survey (EDM measurements) covering the period 2007-2010 is analysed to understand the landslide kinematics. Decorrelation due to the mountainous topography, vegetation coverage, changing meteorological conditions and high sliding velocity induces difficulties to interpret the DInSAR results. After a selection of the InSAR deformation maps (small temporal and perpendicular baselines), the method considers InSAR coherence maps and slope gradient maps to filter the interpretable results. Phase unwrapping is realized by integrating daily displacement measurements on a serie of 50 benchmarks located on both stable and unstable slopes. The results highlight several sliding compartments closely linked to the inherited tectonic features. Morpho-stuctural features such as ridges, depressions, scarps, counterscarps and gullies delimit several kinematic compartments in line with the InSAR deformation maps.