EGU2020-16541, updated on 20 Oct 2021
https://doi.org/10.5194/egusphere-egu2020-16541
EGU General Assembly 2020

New generation of sensors for landslide observation: first results

Raphaël Chochon[1,2], **Thomas Lebourg**[1], Nicolas Martin[3], Maurin Vidal[1], Mickaël Hernandez[2], Romain Besso[1], and Yoann Drouillas[1]
[1]Université Côte d'Azur, Observatoire de la Côte d'Azur, CNRS, IRD, Geoazur UMR 7329, Valbonne, France (raphael.chochon@geoazur.unice.fr)
[2]Azur Géo Logic, Bureau d'étude, Cagnes-sur-Mer, France
[3]Université Côte d'Azur, CNRS, ESPACE, Nice, France

Rupture processes comprehension and dynamics of slope movements have been studied for several decades through surface observations of unstable objects (INSAR, LIDAR, geomorphological...) and very punctually in the slid masses (inclinometric survey). That kind of observations usually requires heavy amenities that are energy-consuming, vulnerable, and very expensive. We have developed within a public-private partnership a new generation of connected sensors. In this paper, we present a set of displacement data collected on active landslides located in the Alpes-Maritimes region of France. This is a region subject to intense climatic forcing, in areas of high vulnerability, and potentially a hotspot of climate change in the coming years. This climate, referred as North Mediterranean, is defined by intense rainfall (>100mm/day). This territory is particularly vulnerable due to its abrupt pre-Alps reliefs, which are located very close to the sea, and also constrained by strong urban pressure.

The acquisition of good-quality observational data and the installation of sensors on this type of landslide remain a difficult scientific challenge which is full of compromises in an attempt to obtain, in the long term, effective warning systems. The accessibility of the study site, its lithologic and hydrogeological complexities, and the management of the installed sensors (energy resource, location representative of the mass, cost ...) are issues to the development of these systems.

Two sites instrumented during 2019 suffered from heavy weather during autumn (cumulative rainfall of more than 800 mm over 2 months), causing an acceleration of the displacements, and allowing us to watch the transition from the latency phase to the gravitational paroxysm. This period of severe weather is part of a succession of climatic events that we call "Mediterranean events", producing cumulative rainfall in a few hours/days/weeks higher than the yearly normals.

The data set presented and discussed consists of (1) meteorological observations (with a focus on rainfall accumulation), (2) piezometric observations (subsurface ground water level and conductivity), (3) borehole inclinometer measurements, (4) GNSS displacement observations (daily solutions), (5) displacement observations between two points using laser rangefinders, and (6) surface clinometric observations.

This new generation of sensors increases the frequency of measurement, which makes it possible

to visualize the “life of the slope” and thus to refine the knowledge of the transition phases. These dormant phases, or saturation, are key moments in the transition from a stable state to an unstable state, and reveal the “breathing” of the slope.

This communication will be made in the framework of a PhD funded by the socio-economic partner Azur Géo Logic, and the Provence-Alpes-Côte d'Azur region.