Long and short time evolution of deep seated gravitational slope deformation: contribution to knowledge of phenomena for the management of alea in the Alpine mountains

Clément Boivin
Université de Strasbourg, Institut de physique du globe de Strasbourg (IPGS), Déformation Active, France (clement.pascal.boivin@gmail.com)

"LONG AND SHORT TIME EVOLUTION OF DEEP SEATED GRAVITATIONAL SLOPE DEFORMATION: CONTRIBUTION TO KNOWLEDGE OF PHENOMENA FOR THE MANAGEMENT OF ALEA IN THE ALPINE MOUNTAINS"

C.Boivin a, J.P. Malet a, C. Bertrand b, F. Chabaux c, J. van der Woerd a, Y. Thiery d, F. Lacquement d

a Institut de Physique du Globe de Strasbourg – IPGS/DA - UMR 7516 CNRS-Unistra
b Laboratoire Chrono-Environnement – LCE / UMR 6249 CNRS – UFC
c Laboratoire d’Hydrologie et de Géochimie de Strasbourg – BISE / UMR 7517 – Unistra
d Bureau de Recherches Géologiques et Minières

The Deep Seated Gravitational Slope Deformation (DSGSD) are defined like a set of rock mass characterized by a generally slow movement and which can affect all the slopes of a valley or a mountain range (Agliardi and al., 2001, 2009; Panek and Klimes., 2016). The DSGSD is identified in many mountains (ex: Alps, Alaska, Rocky Mountains, Andes...) and it can affect both isolated low relief and very high mountain ranges (Panek and Klimes., 2016). This deep instability are identified in many case like the origin zone for important landslide like the example of La Clapière landslide in the Alpes Maritimes (Bigot-Cormier et al., 2005). The DSGSD represent an important object we must understand to anticipate catastrophic landslides.

Actually, many factors that could be at the origin or controlling the evolution of DSGSD have been identified such as for example the structural heritage, the climate or the tectonic activity (Agliardi 2000; 2009; 2013; Jomard 2006; Sanchez et al., 2009; Zorzi et al., 2013; Panek and Klimes., 2016; Ostermann and Sanders., 2017; Blondeau 2018). The long-term and short-term evolution of DSGSD is still poorly understood but represents an important point to characterize in order to
predict future major landslides. A first inventory of DSGSD began to be carried out by certain studies such as Blondeau 2018 or Crosta et al 2013 in the Alps. These same studies have also started to prioritize the factors controlling the evolution of DSGSD.

It is in order to better understand the short-term (<100 years) and long-term (> 100 years) evolution of the DSGSD of the French Alpine massifs and the link with the occurrence of landslides, that this thesis project is developed. The main objective of this project, will be proposed models of the evolution of DSGSD since the last glaciations. But also to propose key interpretations of the future evolution to locate the areas likely to initiate landslides. Two study areas in the French Alpine massifs were chosen because they represent areas of referencing and localization gaps in DSGSD: Beaufortain and Queyras. They have the advantage of having a low lithological diversity making it possible to simplify the identification of the factors influencing the evolution of DSGSD. A geomorphological analysis on satellite data and on the ground is carried out to locate the DSGSD. Several dating ($^{14}$C, $^{10}$Be or $^{36}$Cl) will be carried out to reconstruct the history of these objects and understand the factors that controlled their evolution.