

Title: Full-scale test for mitigation of flowslide risk.

Proponents: Prof. Marianna Pirone (ICAR/07), Prof. Antonio Santo (GEO/05)

Type of project: PNRR_PA (DM 118 art.9)

Abstract

Flowslides are tragically known worldwide for posing a threat to human life and causing heavy damages to structures and infrastructures. They are often observed on slopes formed of partially saturated soils and are generally triggered by intense rainfalls that cause a matric suction decrease and a consequent soil shear strength reduction. Current flowslide risk mitigation strategies mainly consist of rainfall thresholds derived from empirical and statistical approaches that do not account for the hydro-mechanical slope behavior and the local factors. Physically-based rainfall thresholds based on an innovative and more reliable procedure for flowslide prediction could benefit from the integration between *in situ monitoring* of soil variables recognized as predisposing factors and *advanced numerical modelling*.

The project covers this topic and intends to cover the activities related with the *in situ-monitoring*. In particular, the project deals with a **full-scale test** that can be developed with reference to an area belonging to the Lattari Mountains (Campania Region, Italy), historically affected by several high-risk flowslides. A '*reference test site*' will be instrumented for *in situ monitoring of hydraulic and mechanical soil variables*, to track the slope behavior under weather conditions. Then, at the same site, a small zone will be safely isolated and tested under an artificial, critical rainfall event, to explore the triggering mechanism and, finally, to identify more reliable rainfall thresholds. The area chosen for the monitoring and the *full-scale test under critical artificial rainfall* has been already identified, and the permission to proceed with the activities is granted by means of an agreement stipulated between DICEA, the Civil Engineering Department of the Salerno province (Genio Civile di Salerno) and the owner of the quarry (ITALSUD Srl).

Period abroad

The design of the *monitoring layout and the advanced geotechnical soil characterization in partially saturated conditions* can take place in collaboration with prof. Alessandro Tarantino, full professor at the University of Strathclyde, Glasgow: alessandro.tarantino@strath.ac.uk. The professor Tarantino is an expert on behavior of partially saturated soils and the operation/development of sensors for measuring field hydraulic variables in partially saturated slope as evidenced by his intense scientific production on topic (<https://www.strath.ac.uk/staff/tarantinoalessandroprof/>). The PhD student can spend 6 months at University of Strathclyde under the supervision of prof. Tarantino in order to carry out the geotechnical soil characterization at unsaturated conditions and to design the full-scale test and the monitoring layout at the slope under artificial rainfall.

Period at Public Administration (PA)

The PhD student can spend 6 months at Departmental Operating Unit (DOU) 50.18.07 , Genio Civile di Salerno - Presidio Protezione Civile, under the supervision of dott. Italo Giulivo. The PhD student can carry out all the activities regarding the full-scale test foreseen within the agreement stipulated between DICEA, the Civil Engineering Department of the Salerno province (Genio Civile di Salerno) and the owner of the quarry (ITALSUD Srl). In particular, the student will take care of a remote acquisition system of field measurements representing predisposing factors to flowslides, so that the monitoring data can be consulted remotely directly by the Civil Protection.