**Title: Landslides in structurally complex formations: effects/influence of block-in-matrix units on slope deformation mechanisms.**

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**Co-tutor: Andrea Festa (University of Torino)**

**Proposal**

Complex formations are known for their susceptibility to large and deep-seated landslides. These formations are composed of different types of homogeneous to heterogeneous rock units, and are often pervasively disaggregated, folded and ultimately reorganized into a characteristic block-in-matrix fabric. This fabric, responsible for the mechanical anisotropy and their complex deformation behavior, can have i) tectonic (e.g. faults/shear zones), ii) sedimentary (e.g. submarine landslides) and/or iii) diapiric origin. Although there are significant differences in the internal organization as a function of the genetic process, from a geotechnical point of view, these units are often considered as relatively homogeneous materials. Variations in block/matrix ratio, scale relationships as well as internal organization are often not considered, and such materials are commonly represented through empirical links derived from physical models. Consequently, deciphering the initiation potential of a landslide and predicting its evolution in these materials is a challenging task. Recent research has highlighted the need for a geotechnical characterization based on geological constraints. In this perspective, the project aims to correlate the knowledge of the predisposing action of complex formations (on the basis of their geological characteristics) to the development and evolution of deep-seated landslides.

**Research program**

The proposed PhD research project will be aimed at contributing to a better understanding of: i) geological characteristics of structurally complex formations with block-in-matrix arrangement, after considering their genetic process, ii) geotechnical properties and potential test methods /classification for reliable parameterization and iii) potential and significant control conditions for landslide development and evolution. In this perspective, the project will use data from literature analyses, field investigations, remote sensing analyses, laboratory tests and numerical modelling.
The project will be coherently organized in several successive phases:
i) literature analysis (6 months), ii) identification of sites and case studies and reconstruction of geological models (6 months), iii) geotechnical sampling and characterization (6 months), iv) analysis of landslide development and evolution (6

months), v ) identification of geological control elements with implications on the prospective evolution of landslides (6 months), vi) PhD thesis preparation (6 months).
Potential study areas will be identified along the Southern and Northern Apennine chain of Italy. The project will take place in collaboration with the Department of Earth Sciences of the University of Turin.
The candidate's expenses for the camp and other activities related to the doctoral project will be covered by the departmental funds of the Tutors. The candidate should have a solid background in structural geology, geotechnics and a general understanding of computer science. The candidate will also complete a training/research period at a foreign institution (e.g. Terraphase).

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