Advances in geo-hazards risk knowledge and evaluation for future resilience, management and sustainability

(*Proposer: Prof. Mario Floris*)

The generic meaning of resilience refers to the capacity to recover quickly from difficulties. In the case of geo-hazards, such capacity depends on the actions performed before and after the occurrence of instability phenomena, such as landslides and subsidence. Before the event, an effective prediction of the expected number of live lost, people injured, damage to property and disruption of economic activity (Risk) should be performed. Risk is estimated by the product of Hazard and Vulnerability. Hazard is the the likelihood of a potentially damaging geological phenomena occurring within a given area in a given time. Vulnerability is the degree of lost suffered by the elements at risk after the occurrence of the event. The first depends on the intensity and probability of occurrence of the phenomena, the second on the intrinsic characteristics of the elements at risk. After the event, the actual damage suffered by human structures and infrastructures has to be rapidly detected and quantified for an effective resilience, management and sustainability.

The main aim of the project is to test the effectiveness of the most recent remote sensing techniques applied to RADAR and optical space-borne data in the pre- and post-event analysis. The large archive of interferometric data acquired from 1992 by ERS, ENVISAT, COSMO-SkyMed and Sentinel missions and the growing availability of new acquisitions (e.g., COSMO-SkyMed Second Generation data) as well as the continuous acquisition of optical satellite data, can allow the characterization and near real time monitoring of dangerous geological processes before, during and after their occurrence. The results derived by remote sensing analyses (i.e., ground velocity maps, displacement time series and land cover change) can be used to calibrate physically-based modelling of the phenomena which allows the detection and quantification of the causes and, consequently, the implementation of the best mitigation strategies. In the post event phase, the use of new method and techniques (e.g., Artificial Intelligence) applied to the processing and post-processing of remote sensing data can allow to rapidly detect the effects of dangerous phenomena helping in the risk resilience, management and sustainability. During the project, pre-event or post-event analyses, or both, can be stressed to contribute in the advances of geo-hazard risk knowledge and evaluation. One of the main tasks to be addressed regards the spatial and temporal evaluation of the Hazard, which is the crucial step towards an effective Risk assessment.

The research will be carried out with the collaboration of:

• Earth System Analysis Department, faculty of Geo-information Science and Earth Observation (ITC), Twente University, the Netherlands;

• Centre Tecnològic de Telecomunicacions de Catalunya (CTTC);

• Dept. of Civil, Architectural and Environmental Engineering, University of Padua, Italy;

• Earth Sciences Dept., University of Florence, Italy;

• SARmap sa, Caslano, Switzerland.

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