Detecting Slow Deformation Signals Preceding Dynamic Failure: A New Strategy For The Mitigation Of Natural Hazards (SAFER)

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We propose a new strategy based on an interdisciplinary unitary and integrated approach aimed to monitor and detect small signals of impending failures and mitigate natural hazards, by:

1) quantification of critical damage thresholds triggering dynamic failure, throughout the 'In situ' identification of characteristic slow deformation signals and accelerating patterns before impending 'large scale' failure events;
2) setting up of early warning models for forecasting the time of rupture with application to natural hazards;
3) transferring of knowledge between multiscale signs of slow deformation before dynamic failure from the laboratory to field.
In detail, we propose to develop innovative strategies for forecasting dynamic ruptures by monitoring an unstable patch of the Gollone landslide on the Italian Western Alps, prone to the development of rock falls and repeated failure episodes, preceded by neat and long lasting episodes of slow deformation. In order to do so, we aim to identify the characteristic signs of impending failure, by installing a "site specific" microseismic monitoring (1-200kHz) system for acoustic emission/microseismic (AE/MS), integrated with a conventional monitoring for seismic detection (1-10Hz) and ground deformation monitoring (strainmeters, geophones and accelerometers).
The installation of the monitoring network will be accompanied by a detailed geophysical characterization of the test site in order to establish the best nodes position and internal characteristics of the monitored landslide. Rock physical and mechanical characterization along with rock deformation laboratory experiments during which the evolution of related physical parameters under simulated conditions of stress and fluid content will be studied and theoretical modelling will allow to come up with a full hazard assessment and test new methodologies for a much wider scale of applications within EU.