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Emerging solutions for natural hazard assessment: the role of PhotoMonitoringTM in landslide monitoring

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Landslides are one of the most diffused natural hazards, which cause every year significant losses in terms of lives, economy and society. Remote sensing techniques are becoming in the last decades a key tool, able to provide qualitative and quantitative information suitable for landslide investigation and monitoring and natural hazard assessment applications. Ground displacement measurement, for example, is one of the most useful information for assessment and characterization of slope instabilities. The evolution of traditional technologies (e.g., GNSS, Laser Scanner) and the development of emerging technologies (e.g. Satellite & Terrestrial radar technologies and PhotoMonitoringTM) are currently offering a wide spectrum of applications, providing effective monitoring solutions, specifically in landslide risk assessment.

PhotoMonitoringTM is one of the most innovative Remote Sensing solutions for geomorphological, geological and geotechnical monitoring with the unusual capability of providing information also about the past. PhotoMonitoringTM is born in response to the growing development of land detection solutions. It takes advantage from the extensive database of images at different resolutions collected in the last decades by aerial and satellite Earth Observation (EO) missions, and from the increasing number of satellite, airborne and ground-based sensors available today. Ranging from very high resolution optical and/or multispectral cameras to low-cost sensors, today an incredible amount of source of information is available, thus making PhotoMonitoringTM an effective tool. Different techniques and methodologies, such as Digital Image Correlation (DIC), Change Detection (CD) and 3D Photogrammetry, are becoming always more suitable for analysing the available imagery dataset, thus tracking terrain changes and displacements caused by natural and/or human-induced landslide.
All the PhotoMonitoringTM techniques are fully integrable and complementary with other remote sensing technologies in landslide monitoring activities, such as satellite and terrestrial interferometry, aerial or terrestrial laser scanning and infrared thermography. The high versatility, reliability and flexibility make the PhotoMonitoringTM techniques suitable for different kinds of application in different contexts, thus achieving results from different kinds of data, collected by using a wide range of sensors and platforms. By its peculiar features, PhotoMonitoringTM is also effective at different scales (from the single crack to the several sqkms scale) and can be used for tracking long term past changes up to real time control. Furthermore, the increasing development of sensors able to collect images out of the optical wavelength is expected to open new perspectives.

An overview of some of the most challenging projects carried out using PhotoMonitoringTM in landslide monitoring activities will be presented.