



The contribution of satellite SAR-derived displacement measurements in landslide risk management practices

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Landslides are common phenomena that occur worldwide and are a main cause of loss of life and damage to property. The hazards associated with landslides are a challenging concern in many countries, including Italy. With 13% of the territory prone to landslides, Italy is one of the European countries with the highest landslide hazard, and on a worldwide scale, it is second only to Japan among the technologically advanced countries. Over the last 15 years, an increasing number of applications have aimed to demonstrate the applicability of images captured by space-borne Synthetic Aperture Radar (SAR) sensors in slope instability investigations. InSAR (SAR Interferometry) is currently one of the most exploited techniques for the assessment of ground displacements, and it is becoming a consolidated tool for Civil Protection institutions in addressing landslide risk. We present a subset of the results obtained in Italy within the framework of SAR-based programmes and applications intended to test the potential application of C- and X-band satellite interferometry during different Civil Protection activities (namely, prevention, prevision, emergency response and post-emergency phases) performed to manage landslide risk. In all phases, different benefits can be derived from the use of SAR-based measurements, which were demonstrated to be effective in the field of landslide analysis. Analysis of satellite-SAR data is demonstrated to play a major role in the investigation of landslide-related events at different stages, including detection, mapping, monitoring, characterization and prediction. Interferometric approaches are widely consolidated for analysis of slow-moving slope deformations in a variety of environments, and exploitation of the amplitude data in SAR images is a somewhat natural complement for rapid-moving landslides. In addition, we discuss the limitations that still exist and must be overcome in the coming years to manage the transition of satellite SAR systems towards complete operational use in landslide risk management practices.