Geophysical Research Abstracts, Vol. 7, 03517, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03517

Multidisciplinary approach for monitoring landslides through satellite, airborne and ground based surveys: application in a sector of Apennines (Northern Italy)

A. Pesci (1), P. Baldi (3), F. Doumaz (2), M. Fabris (3), F. Loddo (1), M. Moro (2), M. Saroli (4), S. Stramondo (2), C. Tolomei (2)

(1) Istituto Nazionale di Geofisica e Vulcanologia - Bologna (Italy), (2) Istituto Nazionale di Geofisica e Vulcanologia - Roma (Italy), (3) Dipartimento di Fisica, Settore Geofisica - Università di Bologna (Italy), (4) Centro Nazionale Ricerca - IGAG - Roma (Italy) (pesci@bo.ingv.it/ Fax: +39514151498)

A multitemporal/multidisciplinary approach is proposed to investigate, at different scales, terrain instability areas. GPS (static and kinematic), digital photogrammetry, laser scanning and InSAR (Interferometric Synthetic Aperture Radar) techniques are combined to detect mass movements and to evaluate superficial displacement patterns and involved volumes. The large amount of available 'historical' data, such as photogrammetric surveys and satellite observations, the scheduling of new satellite acquisitions and the capability of performing ground or aerial survey campaigns, allows the monitoring of the studied areas, using techniques characterized by high-resolution and high-accuracy capabilities. The key points of the proposal is the integrated use of ground based and remote sensing surveys.

The method involves satellite based SAR data of the main ESA platforms, ERS1 and ERS2, and the new Envisat ASAR (Advanced SAR) sensor. Satellite data are used to detect the critical areas and to evaluate surface deformation velocities by means of InSAR time series (showing centimeter/year and/or millimeter/year displacements). This approach implies the validation of space remote sensing data by means of other measurements provided by laser scanning (ground and air based), high precision photogrammetry and GPS applications. Data comparison is the procedure to validate one each other collected data, to better define their limits and potentialities.

The aim is to create an integrated system capable to detect surface instability areas at

small scale, 100x100 km^2 for instance, and suitable for precise monitoring of these zones: satellite, aerial and terrestrial surveys are used in the frame of 3 levels monitoring, characterized by different scales.

At the first level of investigation, concerning with regional scale, SAR satellite images are processed to define the dynamic evolution of displacement pattern during the last decade, pointing out the areas involved in deformation processes. Subsequently, the historical reconstruction of phenomenon is generated using the aerial photogrammetric data set available in the last fifty years. The present state of activity is obtained by high precision techniques like GPS and laser scanning methods that lead to centimetre accuracies in terrestrial applications. Surveying methods are compared and validated taking into account accuracies, applicability, costs and execution times. These techniques are applied in a sector of Apennines in the Emilia Romagna region, (Northern Apennine, Italy) where over 32000 landslides bodies have been identified: this area, which borders the southern Po Plain, is one of the more active sliding areas.