INTEGRATED MONITORING SYSTEM OF VALORIA LANDSLISE (MODENA, ITALY)

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ABSTRACT:

The research deals with the integration of different technologies for surface monitoring of Valoria Landslide (Northern Appennines, Italy). Due to the complexity of the phenomenon and to the hydrogeological risk associated with it, an integrated system for continuous monitoring has been running, since 2008. It consists of an automated total station (TCA 2003 Leica), GPS instrumentation and a bidirectional clinometer (Nivel 220 Leica). This system, being tested and developed, has been the subject of detailed study due to the type of the object and the conditions in which the instruments work. The morphology of the area and shape of the landslide, made it necessary first to integrate GPS and total station and then highlighted the need to integrate measures on time-shift with those of the whole surface. That is, during the 2009, measurement campaigns were conducted with terrestrial long-range laser scanners and with interferometric terrestrial radar. At the same time were also carried out topographical continuous measures with a new-generation automated total station (Leica TM30), to verify the functionality of the instrument in measuring boundary conditions in terms of distances (prisms at about 3000 m). The laser scanner measures taken in different periods, with different technology (Optech and Riegl), have lead to the construction of DTM (Digital Terrain Model) for comparison with previously achieved DTM (2006, 2007 and 2009) realized with various methods (airborne lidar, interferometric terrestrial radar).

In this work results of testing of radar interferometric (IBIS-L) are presented in order to deterrmine the potential of the instrumentation in comparison with the integrated system in continuous monitoring.

Given to the extent of the landslide (about 1.6 km2) it is proposed to focus the attention to the crown zone which is the most active and for which is more interesting to establish the scale of the masses and volumes moved and surface displacements; but, without neglecting the rest of the body of the landslide in order to observe its movements and behavior.

Thanks to the integrated continuous monitoring system it is possible to establish a ”way” of pre-alerting, which reduces the risk related to the landslide, based on the theory on the model forecast on the dynamic displacement and deformation, formulated on the basis of long time series data. Moreover, thanks to a two-way clinometer and to the master GPS station that are operating for over a year, there are conditions to establish whether the point chosen to place the tools of measurement is geologically stable, as originally suggested, or whether the magnitude of movement which is suffering.

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