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An integrated ground based radar platform for the real time monitoring of a landslide involving an under construction infrastructure

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Landslides are phenomena that in some cases interact with structures and infrastructures, mainly in mountain regions. For example, where the route of an important communication road is for different reasons fixed, the design engineers should have to face with unstable slopes or slopes where there is a marginal possibility that the planned works could remobilize a preexisting landslide. In such a case a monitoring system is particularly suitable in order to guarantee the workers safety and to control the evolution of the slope during the construction phases until its running.

A so planned monitoring system must have the following specific requirements:

- continuous working under different weather and lighting conditions;

- fast data acquisition capability;

- high accuracy in movement detection;

- data available over a large area;

- remote control of data and instrumentations;

- compatibility with construction activities;

- automation capability.

Taking into account the above mentioned requirements, a ground based Radar plat-

form has been originally designed and it is at present operating for a real case in southern Italy. This platform consist of: 1) a Ground Based Differential Interferometric Synthetic Aperture Radar (GB-DInSAR) combined with, 2) a weather station, and 3) a digital camera. The instruments are located in a container in front of the monitored slope involved by a landslide and interested by important construction works at a distance ranging from 700 to 1000 m. The sensors are supplied by electricity; an UPS system has been installed in order to maintain the supply for several hours in the case of power suspension. A complete remote control and data upload/download is obtained through a satellite WEB connection which allows a daily automatic transfer of the data from the site of installation to the CERI operational centre in Rome, where the processing, interpretation and consequently decisions are performed.

The GB-DInSAR instrument collects a complete radar image of the slope every 6 minutes as well as the weather station, while the digital camera collects an optical image every 1 hour. The weather station data allows to correct the atmospheric noise of the radar data while through the optical images is possible to check at any time the evolution of the construction works in the slope in order to constrain the interpretation of the radar informations. The final data consist of 2-D maps of displacement along the line of sight (interferograms) of the entire slope observed and the time series displacement of several points with high values of coherence and signal noise ratio. This monitoring platform allows the continuous real-time control of the slope and provides also for a semi automatic or a completely automatic early warning system through the analysis of displacement time series of some previously chosen natural targets.

Details on the integrated monitoring platform, data processing, dissemination procedures and risk and warning management will be discussed based on the first results obtained.