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Combined observations of surface displacements using Differential Interferometry SAR (DInSAR), GPS and traditional monitoring techniques

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Slow–moving landslides, induced by different causes, such as earthquakes, intense rainfall, anthropogenic activities, affect wide areas, resulting in high costs for the human society and severe damage to properties and lifelines. In complex geological settings, where mass movements of different types are widespread, monitoring represents a key activity in the process of risk prevention and mitigation. In these cases, a regular and continuous monitoring is required to correctly establish a cause-effect correlation, and to predict possible reactivation phases. Starting from these considerations, the work was focused on the application of different methods of landslide monitoring, with special attention for remote sensing techniques such as the DInSAR and GPS. The latter may contribute to overcome typical limitations of traditional techniques, going from a “point-wise” to a “wide area” analysis and preserving the high accuracy of the final results. In recent years the great availability of SAR data from several satellite platforms (e.g. ERS 1 and 2, Envisat, Cosmo Sky-Med), the continuous improving of the satellites performances and the development of more reliable processing techniques as well, made space–born DInSAR techniques very attractive to the Earth Sciences’ scientific community.
To validate these techniques two sites were identified in southern Italy, on the basis of their geological, geo-morphological and geotechnical characteristics, as well as of the availability of data from previous traditional monitoring campaigns (inclinometers, piezometers and topographic measurements). In order to analyze terrain movements, trihedral corner reflectors have been manufactured and installed. Moreover, a mobile GPS network has been set up in order to complete and compare movements identified with a specific DInSAR technique, Small BAseline Subset (SBAS), which uses multiple small baseline acquisition subsets via an effective combination of all the available interferograms.
Results deriving from the research so far carried out are analyzed and critically discussed.