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# The contribute of DInSAR techniques to landslide hazard evaluation in mountain and hilly regions: a case study from Agno Valley (North-Eastern Italian Alps)

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In the last twenty years, Differential Synthetic Aperture Radar Interferometry (DInSAR) techniques have been widely used to investigate geological processes, such as subsidence, earthquakes and landslides, through the evaluation of earth surface displacements caused by these processes. In the study of mass movements, contribution of interferometry can be limited due to the acquisition geometry of RADAR images and the rough morphology of mountain and hilly regions which represent typical landslide-prone areas. In this study, the advanced DInSAR techniques (i.e. Small Baseline Subset and Persistent Scatterers techniques), available in SARscape software, are used. These methods involve the use of multiple acquisitions stacks (large SAR temporal series) allowing improvements and refinements in landslide identification, characterization and hazard evaluation at the basin scale. Potential and limits of above mentioned techniques are outlined and discussed.
The study area is the Agno Valley, located in the North-Eastern sector of Italian Alps and included in the Vicenza Province (Veneto Region, Italy). This area and the entire Vicenza Province were hit by an exceptional rainfall event on November 2010 that triggered more than 500 slope instabilities. The main aim of the work is to verify if spatial information available before the rainfall event, including ERS and ENVISAT RADAR data from 1992 to 2010, were able to predict the landslides occurred in the study area, in order to implement an effectiveness forecasting model.
In the first step of the work a susceptibility analysis is carried out using landslide dataset from the IFFI project (Inventario Fenomeni Franosi in Italia, Landslide Italian Inventory) and related predisposing factors, which consist of morphometric (elevation, slope, aspect and curvature) and non-morphometric (land use, distance of roads and distance of river) factors available from the Veneto Region spatial database. Then, to test the prediction, the results of susceptibility analysis are compared with the location of landslides occurred in the study area during the November 2010 rainfall event. In the second step, results of DInSAR analysis (displacement maps over the time) are added on the prediction analysis to build up a map containing both spatial and temporal information on landslides and, as in the previous case, the prediction is tested by using November 2010 instabilities dataset. Comparison of the two tests allows to evaluate the contribution of interferometric techniques. Finally, morphometric factors and interferometric RADAR data are combined to design a preliminary analysis scheme that provide information on possible use of DInSAR techniques in landslide hazard evaluation of a given area.