



Testing the potential of Sentinel-1 TOPS interferometry for the detection and monitoring of landslides at local scale

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The recent Sentinel-1 mission, started by ESA in April 2014, provides to the scientific community new capabilities for the continuous monitoring of the Earth. In particular, the Terrain Observation by Progressive Scans (TOPS) imaging technique used in the Interferometric Wide swath (IW) acquisition mode, allow us to acquire data over very wide areas (250 km swath) at 20m spatial resolution, with 12 days revisit time, making it suitable for ground displacement monitoring applications. With more than one year of SAR images available, it is now possible to carry out monitoring activities of slow moving phenomena such as landslides at both regional and local scales. In this work, we test the potential of Sentinel-1 InSAR for the monitoring of shallow landslides occurring in a densely vegetated area in the North-Eastern Italian Pre-Alps. The test area of about 25km², is located in the Province of Vicenza (Veneto Region, NE Italy) and is characterized by elevations up to 700m a.s.l., low slope angles, and the outcropping of volcanic deposits (lavas, pyroclastites and ignimbrites) overlaid by eluvial and colluvial deposits. The entire area is affected by a large number of different instabilities, such as shallow soil slips, flows and rotational/translational slides that mainly occur after heavy rain. The landslides are damaging the buildings and the infrastructure, in particular the road network, causing high economic loss for the Municipality. The landslides monitoring activity is performed exploiting the available Sentinel-1 SAR images using both Small Baseline Subset (SBAS) and Persistent Scatterer (PS) techniques. Furthermore, we use the same techniques to process another SAR dataset made of 22 COSMO-SkyMed (CSK) X-band images acquired over the study area in the period March 2011 - September 2012. A first comparison of the results is performed in order to assess the landslides detection capabilities of the Sentinel-1 C-band in respect to the CSK X-band. Finally, the Sentinel-1 results are cross-validated with the ERS-1/2 and ENVISAT PSI database available from "Portale Geografico Nazionale" allowing us to assess the quality of the obtained results in terms of data density and accuracy. The presented work shows the potential of the new Sentinel-1 TOPS mode interferometry in the monitoring of local scale ground instabilities in low urbanized territories pointing out what strengths and weaknesses emerged during the study activity.