Sentinel-1 and ground-based sensors for a continuous monitoring of the Corvara landslide kinematic (South Tirol, Italy)

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Sentinel-1 mission allows us to have Synthetic Aperture Radar (SAR) acquisitions over large areas every 6 days with spatial resolution of 20 m. This new open-source generation of satellites has enhanced the capabilities for continuously studying earth surface changes. Over the past two decades, several studies have demonstrated the potential of Differential Synthetic Aperture Radar Interferometry (DInSAR) for detecting and quantifying land surface deformation. DInSAR limitations and challenges are linked to the SAR properties and the field conditions (especially in Alpine environments) leading to spatial and temporal decorrelation of the SAR signal. High temporal decorrelation can be caused by changes in vegetation (particularly in non-urban areas), atmospheric conditions or high ground surface velocity. In this study, kinematics of the complex and vegetated Corvara landslide, situated in Val Badia (South Tirol, Italy), are monitored by a network of 3 permanent and 13 monthly Differential Global Positioning System (DGPS) stations. The slope displacement rates are found to be highly unsteady and reach several meters a year. This analysis focuses on evaluating the limitations of Sentinel-1 imagery processed with Small Baseline Subset (SBAS) technique in comparison to ground-based measurements for assessing the landslide kinematic linked to meteorological conditions. Selecting some particular acquisitions, coherence thresholds and unwrapping processes gives various results in terms of reliability and accuracy supporting the understanding of the landslide velocity field. The evolution of the coherence and phase signals are studied according to the changing field conditions and the monitored ground-based displacements. DInSAR deformation maps and residual topographic heights are finally compared with difference of high resolution Digital Elevation Models at local scale.