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Improvement of multi-temporal interferometry combining Sentinel-1A/B for monitoring two active landslides in the Italian and Austrian Alps

Mehdi Darvishi (1,2), Giovanni Cuozzo (1), Romy Schlögel (1), Christian Kofler (1), Stefan Steger (1), Thomas Zieher (3), Isabella Toschi (4), Martin Rutzinger (3), Fabio Remondino (4), and Lorenzo Bruzzone (2)

(1) Institute for Earth Observation, Eurac Research, Bolzano-Bozen 39100, Italy, (2) Department of Information Engineering and Computer Science, University of Trento, Italy, (3) Institute of Interdisciplinary Mountain Research, Austrian Academy of Sciences, 6020 - Innsbruck, Austria, (4) 3D Optical Metrology Unit, Bruno Kessler Foundation, 38123 - Povo-Trento, Italy

Landslides considered as common geohazards in mountainous regions could affect residents, roads and urban infrastructure. In the recent decades, many efforts have been dedicated to improve the accuracy of ground movement measurements. These attempts included satellite-based (e.g., radar interferometry) as well as ground-based (e.g., Global Navigation Satellite Systems (GNSS)) techniques. Both approaches have advantages and limitations in terms of precision, coverage, temporal and spatial coverages. In previous studies on the Corvara landslide (Italian Alps), temporal decorrelation caused by vegetation and non-linearity of landslide movement affected Differential Synthetic Aperture Radar Interferometry (InSAR) results. In such circumstances, applying a non-predefined model DInSAR technique using data with shorter temporal baselines in combination with additional artificial Corner Reflectors (CR) would improve the monitoring performances.
The objectives of this study are (1) to assess the role of additional Sentinel-1B data in mitigating the decorrelation in vegetated conditions, (2) to investigate the performance of model-based and non-model based DInSAR algorithms to detect non-linearity behaviors of the landslide movement and, (3) to test the reliability of C-band CRs.
The displacements are estimated on two active landslides: Corvara, mainly covered by vegetation situated in the Val Badia (South Tirol, Italy) and Reissenschuh, partly covered by vegetation located in the Schmirn valley (Tyrol, Austria). Sentinel-1A/B images covering the snow free period in 2017 were processed using both Permanent Scattering Interferometry (PSI) and Small BAseline Subset (SBAS) DInSAR techniques. The predefined models (i.e. linear, quadratic, cubic) as well as a non-predefined model (i.e. filter-based) were analyzed by applying SBAS algorithm. For the Corvara site, 6 newly installed artificial C-band CRs are helping the PSI processing. For the Reissenschuh site, the PSI processing relied on the natural PSs (i.e. rocks). On-site GNSS measurements were collected on both landslides and covered the satellite image time series. Finally, in the accuracy assessment step, PSI and SBAS results were correlated with the GNSS measurements and compared regarding their performance.

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