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# Cross-validation of Persistent Scatterer Interferometry Results over Lumnez Landslide

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The Northern-Western slope of the Val Lumnez is one of the most active landslides in urbanized areas of the Swiss territory. The Swiss Federal Office for Environment and the Canton Graubünden spent many investigations on this landslide affecting some 18 km2. On the toe of the landslide the river Glenner is eroding frontal parts. Many debris flows were initiated by this landslide activity and the damage downstream is considerable. For these reasons several projects of countermeasures have been realized since the 19th century. Inside the unstable area seven villages are affected by the displacements and open cracks in houses and walls are frequent. In the 20th century the Cantonal Authority planned to relocate the village of Peiden, because the movements were very fast, sometimes reaching several decimeters per year. Efforts undertaken to improve the drainage of the entire slope were partially successful in reducing the movement rates.

As part of the ESA Terrafirma Project Gamma Remote Sensing conducted an interferometric point target analysis (IPTA) to monitor the Lumnez landslide. For this South-East oriented slope ascending orbit ERS and ENVISAT ASAR images were selected for the monitoring. Winter data and ERS-2 data with strongly different Doppler Centroids were not included because of the effects of snow for the former and the much higher phase noise for the latter. The area of interest included significant topography. To optimize the performance of the interferometric technique the terrain topography was accounted for in the co-registration of the scenes. Furthermore, a terrain height dependent atmospheric phase correction was applied. The main interferometric results consist of the average line-of-sight deformation rates and the deformation histories for the selected points. The observed deformation rates reach values up to several centimeters per year.

In addition to the presentation of the SAR interferometric technique used over the Lumnez landslide, we report on a cross-validation experiment conducted. In this experiment SAR data stacks acquired over the Lumnez landslide in adjacent tracks were individually processed. For the two results both the data acquisition times and the points for which deformation rates and histories could be measured differ slightly. Overall the spatial and temporal coverage is quite similar, though, permitting cross-comparing the two results. Such a comparison is found very useful for the assessment of the reliability of persistent scatterer interferometry results, because reference data are often not available or not adequate for a direct validation and the qualification of a result based on deformation, sensor, data, and processing characteristics is quite difficult.