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Satellite DInSAR monitoring of Landslides in mountainous areas

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The potential of satellite-based interferometry for landslides activity definition is well known. Many applications have demonstrated that this technique represents a strong supporting tool for landslide risk assessment and monitoring, at both local and regional scale. The ESA' Sentinel-1 (S1) constellation acquires with high revisit-time in a conflict-free operational mode, timely distributing data without costs or restrictions. All these characteristics allow relying upon S1 service for a long-term operational and sustainable use, as a support of both disaster risk reduction and response. For this reason, more and more research projects are based on the use of S1 in geohazards monitoring and early warning. The aim of this work is to present the results achieved in the framework of the European Project (ECHO) U-Geohaz regarding landslides monitoring and early warning supporting tools based on S1. The study area of the project is the Valle d'Aosta region (VDA) that is widely affected by landslide process of different size and typology. Specifically, the Deep-Seated Gravitational Slope Deformations (DSGSDs) are the most representative in terms of area coverage. The study of the state of activity and evolution of these phenomena is very important because DSGSDs affect entire valley flanks and several villages have been built on them or nearby. The use of S1-based interferometry can potentially give a near-real time information on their activity over the whole region supporting decision makers and early warning systems. At the same time, VDA presents challenging characteristics for what concerns the radar response and thus the obtainable results. The main limiting factor is the snow coverage, which is also strongly related to the topography. The topographic relief is highly variable, ranging from 300 m a.s.l. to peaks higher than 4000 m a.s.l. with steep slopes. The regional climate is characterized by wide range of temperatures varying a lot from the mountainous zone to the bottom of the valleys, implying also a strong variation in snow precipitations. This strong variation, in space and time, affects the DInSAR results in terms of coherence and spatial coverage. In this context, a strong effort has been done to develop a processing approach to improve the spatial and temporal sampling, without losing the quality of the results. Moreover, a method that extracts the most significant Active Deformation Areas (ADA) in a semi-automatic way has been adapted and applied. The main results will be exposed.