

Monitoring Landslides Using SAR High Resolution Image sub-pixel Correlation

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ABSTRACT:

In this study we propose the use of the radar amplitude data to construct ascending and descending correlograms following the sub-pixel correlation technique, which is today a widely used technique for retrieving ground surface deformation such as co-seismic (metric) surface displacements. Before the advent of high spatial resolution SAR imagery, the use of the correlation techniques based on SAR data on landslides was limited by the multi-metric spatial resolution of the previous generation of space-borne SAR sensors (e.g. EnviSAT/ASAR or RadarSAT 1). The spatial resolution of those SAR data put a limit on the precision of the results and hampers the possibility of covering small size landslides. Therefore, the radar amplitude correlation technique could be applied only to specific cases of landslide with important displacements over large areas. Today, with the recent launches of TerraSAR-X and Cosmo-Skymed missions offering sub-metric spatial resolutions, the situation has changed and the characteristics of the radar images in terms of resolution are equivalent to those provided by optical high resolution sensors widely used for image correlation (such as Spot 5, Quickbird, etc.). In this context, the SAR data is becoming an interesting alternative to optical data for image correlation techniques applied to ground surface deformation. This presentation describes the application of sub-pixel image correlation to Landslides located in the “Cirque de Salazie” in La Réunion Island where the cloud cover could be a limitation for optical data. We base our study on temporal series of Cosmo-Skymed and TerraSAR-X images in order to assess the annual evolution of surface displacements due to landsliding.