



Comparison of Advanced Differential Interferometric SAR methods for the retrieval of surface deformation in south-east Sicily

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The study provides a comparative analysis of Advanced Differential Interferometric SAR (A-DInSAR) methods and processing approaches. State-of-the-art A-DInSAR techniques, such as Persistent Scatterers Interferometry (PSI) or the Small BASeline (SBAS) approach are powerful geodetic tools with a large potential for an operational, cost-effective mapping of surface deformations up to an accuracy of 1 mm/y on a regional scale. Both approaches focus on different characteristics of the scatterers within a resolution cell. While PSI extracts the phase change by analyzing stable, dominant scatterers, the SBAS technique is sensitive to stable, but distributed scatterers. In order to assess the practical implications of the two approaches we processed a 8-year spanning time-series of ENVISAT ASAR data for the heterogeneous, rural environment in south-eastern Sicily, Italy and its hinterland. Different natural and anthropogenic induced deformation phenomena are present within the study area. In addition to the PSI and SBAS approach, a combined method, called Multi-Temporal Interferometry (MTI), was applied using the StaMPS software. The density of retrieved points was confronted to the different land cover classes. In addition, deviations between the different methods are presented. The results reveal the complimentary character of both approaches for the study site and suggest that the MTI approach is favorable for wide area analysis. Validation with GPS measurements from the INGV network was undertaken and the integration in the framework of the SISTEM approach, where different measurements are combined, allowed for the derivation of three-dimensional surface deformation.