



PSI Wide Area Product (WAP) for measuring Ground Surface Displacements at regional level for multi-hazards studies

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The Wide Area Product (WAP) is a new interferometric product developed to provide measurement over large regions. Persistent Scatterers Interferometry (PSI) has largely proved their robust and precise performance in measuring ground surface deformation in different application domains.

In this context, however, the accurate displacement estimation over large-scale areas (more than 10.000 km²) characterized by low magnitude motion gradients (3-5 mm/year), such as the ones induced by inter-seismic or Earth tidal effects, still remains an open issue. The main reason for that is the inclusion of low quality and more distant persistent scatterers in order to bridge low-quality areas, such as water bodies, crop areas and forested regions. This fact yields to spatial propagation errors on PSI integration process, poor estimation and compensation of the Atmospheric Phase Screen (APS) and the difficult to face residual long-wavelength phase patterns originated by orbit state vectors inaccuracies.

Research work for generating a Wide Area Product of ground motion in preparation for the Sentinel-1 mission has been conducted in the last stages of TerraFirma as well as in other research programs. These developments propose technological updates for keeping the precision over large scale PSI analysis. Some of the updates are based on the use of external information, like meteorological models, and the employment of GNSS data for an improved calibration of large measurements.

Usually, covering wide regions implies the processing over areas with a land use which is chiefly focused on livestock, horticulture, urbanization and forest. This represents an important challenge for providing continuous InSAR measurements and the application of advanced phase filtering strategies to enhance the coherence. The advanced PSI processing has been performed out over several areas, allowing a large scale analysis of tectonic patterns, and motion caused by multi-hazards as volcanic, landslide and flood.

Several examples of the application of the PSI WAP to wide regions for measuring ground displacements related to different types of hazards, natural and human induced will be presented. The InSAR processing approach to measure accurate movements at local and large scales for allowing multi-hazard interpretation studies will also be discussed. The test areas will show deformations related to active faults systems, landslides in mountains slopes, ground compaction over underneath aquifers and movements in volcanic areas.