

**PERSISTENT SCATTERER INTERFEROMETRY
ON THE ENTIRE ERS/ENVISAT ARCHIVE OVER THE ITALIAN TERRITORY:
THE PST-A/2 PROJECT**

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ABSTRACT

During the last few years, Persistent Scatterer Interferometry (PSI) has been successfully validated and applied to detect and monitor slow ground movements due to subsidence, landslides, seismic and volcanic phenomena using satellite synthetic aperture radar (SAR) observations. However, so far no project has been financed to create a PS database at a national scale.

In May 2008, the Italian Ministry of the Environment, in the framework of a programme called “Special Plan of Remote Sensing,” awarded a contract to an industrial team led by Telespazio to provide the Italian Government with the first interferometric database for surface deformation analysis at a national level. The database will be provided to geologists and geophysicists for:

- Identification of slow landslides possibly triggering faster phenomena
- Confirmation of the activation status of known landslides
- Mapping of new risk areas, not previously identified
- Quantitative analysis of other deformation phenomena like subsidence/compaction or seismic fault creeping
- Generation of a reference database for future investigations carried out using high-resolution sensors (e.g. COSMO SkyMed).

Information will be made available to the Italian Regional Governments through the national cartographic portal via WebGIS technology.

This project, referred to as PST-A/2, represents a pioneering service for mapping and preventing geohazards. Within this project, Telespazio and TRE are in charge of the processing of the whole ERS and Envisat archives of SAR images acquired over Italy (>300,000 km²) from 1992 up to 2008 (about 15,000 images). This set of InSAR measurements should represent the first step towards a regular monitoring service, upgradable with future SAR acquisitions.

PST-A/2 is the largest InSAR project ever funded, and a confirmation of the leading role of radar interferometry for mapping geo-hazards in Italy. Given this ambitious objective, it was mandatory for Telespazio and TRE to rely on the most advanced PSI processing chains and develop suitable procedures to manage thousands of SAR images and hundreds of interferometric data-stacks. The two companies count on robust and parallel PSI processing algorithms, capable of minimizing both user interaction (e.g. need for visual quality control) and processing time. Moreover, suitable techniques are being used to allow data calibration (possibly using prior information), to meet quality standards set by the Ministry and to guarantee the homogeneity of the results, properly mosaicking PS data in overlapping areas.

The PSI processing of the whole ERS/Envisat SAR image archives over Italy is currently in progress: a first set of results over the center of Italy has been already successfully delivered. Results are extremely promising, as already allowed the detection of both regional and local displacement phenomena. The end of the project is scheduled for May 2010.

In this paper we will describe the overall project, the main challenges/problems (and relative solutions) related to such an ambitious objective, and the results already obtained. Finally, it will be shown how important training users will be, in order to properly use and interpret this huge database.