An extended GeoNode-Based Platform for Detailed Analysis of the Spatial/Temporal DInSAR Information Contents

Adele Fusco¹, Sabatino Buonanno¹, Giovanni Zeni¹, Michele Manunta¹, Maria Marsella², Paola Carrara¹, and Riccardo Lanari¹
¹CNR-IREA, Naples, Italy (fusco.a@irea.cnr.it, buonanno.s@irea.cnr.it, zeni.g@irea.cnr.it, manunta.m@irea.cnr.it, carrara.p@irea.cnr.it,lanari.r@irea.cnr.it)
²Università di Roma "La Sapienza, ROME, Italy (maria.marsella@uniroma1.it)

We present an efficient tool for managing, visualizing, analysing, and integrating with other data sources, Earth Observation (EO) data for the analysis of surface deformation phenomena. In particular, we focused on specific EO data that are those obtained by an advanced-processing of Synthetic Aperture Radar (SAR) data for monitoring wide areas of the Earth's surface. More specifically, we refer to the SAR technique called advanced differential interferometric synthetic aperture radar (DInSAR) that have demonstrated its capabilities to detect, to map and to analyse the on-going surface displacement phenomena, both spatially and temporally, with centimetre to millimetre accuracy thanks to the generation of deformation maps and time-series. Currently, the DInSAR scenario is characterized by a huge availability of SAR data acquired during the last 25 years, now with a massive and ever-increasing data flow supplied by the C-band Sentinel-1 (S1) constellation of the European Copernicus program.

Considering this big picture, the Spatial Data Infrastructures (SDI) becomes a fundamental tool to implement a framework to handle the informative content of geographic data. Indeed, an SDI represents a collection of technologies, policies, standards, human resources, and related activities permitting the acquisition, processing, distribution, use, maintenance, and preservation of spatial data.

We implemented an SDI, extending the functionalities of GeoNode, which is a web-based platform, providing an open-source framework based on the Open Geospatial Consortium (OGC) standards. OGC makes easier interoperability functionalities, that represent an extremely important aspect because allow the data producers to share geospatial information for all types of cooperative processes, avoiding duplication of efforts and costs. Our implemented GeoNode-Based Platform extends a Geographic Information System (GIS) to a web-accessible resource and adapts the SDI tools to DInSAR-related requirements.

Our efforts have been dedicated to enabling the GeoNode platform to effectively analyze and visualize the spatial/temporal characteristics of the DInSAR deformation time-series and their related products. Moreover, the implemented multi-thread based new functionalities allow us to efficiently upload and update large data volumes of the available DInSAR results into a dedicated
geodatabase. We demonstrate the high performance of implemented GeoNode-Based Platform, showing DInSAR results relevant to the acquisitions of the Sentinel-1 constellation, collected during 2015-2018 over Italy.

This work is supported by the 2019-2021 IREA CNR and Italian Civil Protection Department agreement; the H2020 EPOS-SP project (GA 871121); the I-AMICA (PONa3_00363) project; and the IREA-CNR/DGSUNMIG agreement.