Geophysical Research Abstracts
Vol. 18, EGU2016-16523, 2016
EGU General Assembly 2016

A NRT Sentinel-1 processing paradigm towards the implementation of a Persistent Scatterers Journal

Charalampos Kontoes, Ioannis Papoutsis, Themistocles Herekakis, Christina Psychogiou, Nikos Svigkas, and Maria Kaskara

National Observatory of Athens, Institute of Astronomy & Astrophysics, Space Applications & Remote Sensing, Athens, Greece (kontoes@noa.gr)

The arrival of Sentinel-1, operated by the European Space Agency, has been a game changer for large scale interferometric applications. The systematic Sentinel-1 observation scenario, with the nominal use of Interferometric Wide Swath Mode using the Terrain Observation by Progressive Scans (TOPS) mode over land masses, the quality of the Sentinel-1 mission operations in achieving burst synchronization, the tight mission orbit control and phase-preservation processing, coupled with the online data availability through the Collaborative Ground Segments, has upscaled the potential for the development of new applications.

One such potential application is the Sentinel-1 Persistent Scatterers Journal initiative, aiming at setting up a long-term operational Persistent Scatterer Interferometry (PSI) framework in cooperation with ESA's geographically distributed Collaborative Ground Segments. The implementation, validation and qualification of such a service will be performed with an outlook for integration to the Copernicus Programme. Such aspiration calls for major innovations, one of which is the effective handling of the big amounts of data associated with the TOPS mode. Indicatively, one year of S1-A and S1-B acquisitions at a global level account for about one Petabyte of SAR data.

BEYOND Center of Excellence, established and operated within the National Observatory of Athens (NOA), has accumulated over the years technical expertise in processing diverse and multi-modal SAR data for geohazard monitoring. Extending in the major tectonic and volcanic zones of Greece, several events have been studied and monitored, such as the 2011 unrest of the Santorini volcano, the recent Cephalonia and Lefkada earthquakes, the diachronic subsidence of big plane areas (e.g. the Messara valley in Crete, and the Kalochori planes in northern Greece), as well as landslides in western Greece. This activity is being sustained through the engagement of BEYOND in the CEOS Seismic Pilot and the operations of the Collaborative GS facility, the so-called Mirror Site hosted at NOA.

In this context BEYOND has been developing a near-real time (NRT) processing chain to automatically ingest Sentinel-1 acquisitions from the Mirror Site, and apply large scale PSI techniques to generate ground velocities. The key in this effort is to relieve the practitioner from the heavy workload traditionally involved in manual PSI processing, and automate the entire end-to-end process.

The implementation is based on open source software components for the key interferometric modules, while the integration is being done using Python. Sentinel-1 interferograms are generated using ESA's SentiNel Application Platform (SNAP), and the PSI processing is done with the StaMPS software package. Modifications to optimize processing times and cope with the big data volumes are applied by adopting the StaMPS variant of the Geohazards Thematic Exploitation Platform (GEP), which allows the parallelization of critical processing steps. This variant runs in NOA's server cluster.

Currently the development is under way, and we are performing validation tests using various KPIs. The planned next step is the consolidation of the dynamic ingestion of new Sentinel-1 acquisitions to dynamically update velocities that have been produced using static imagery stacks.