The Sentinel-1 SBAS services on the Geohazards Exploitation Platforms

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As an ESA R&D activity of the EO ground segment, the Geohazards Exploitation Platform (GEP) is aimed to investigate the benefit of new technologies for large scale processing of EO data. GEP provides systematic processing services to address the need of the geohazards community for common information layers as well as on-demand processing services for specific user needs and, finally, permits to integrate newly developed processors for scientists and other expert users.

In this context, a crucial role is played by the recently launched Sentinel-1 (S1) constellation that, with its global acquisition policy, has literally flooded the scientific community with a huge amount of data acquired over large part of the Earth on a regular basis (down to 6-days with both Sentinel-1A and 1B passes). The Sentinel-1 data, as part of the European Copernicus program, are openly and freely accessible, thus fostering their use for the development of automated and systematic tools for Earth surface monitoring. In particular, due to their specific SAR Interferometry (InSAR) design, Sentinel-1 satellites can be exploited to build up operational services for the easy and rapid generation of advanced interferometric products that can be very useful within risk management and natural hazard monitoring scenarios.

Accordingly, in this work we present the activities carried out for the development, integration, and deployment of two SBAS Sentinel-1 services of CNR-IREA within the GEP framework, namely the Surveillance and On-demand services.

The Surveillance service consists on the systematic processing of Sentinel-1 data on selected Areas of Interest (AoI) to generate updated surface displacement time series via the SBAS-InSAR algorithm. We built up a system that is automatically triggered by every new Sentinel-1 acquisition over the AoI, once available on the S1 catalogue. Then, tacking benefit from the SBAS results generated by previous runs of the service, the system processes the new acquisitions only, thus saving storage space and computing time and finally generating an updated SBAS time series. The processing relies on the Parallel version of the SBAS (P-SBAS) chain that fully benefit from distributed computing infrastructures (e.g., cloud), by making use of both multi-core and multi-node programming techniques, and allows us to effectively perform massive, systematic and automatic analysis of S1 SAR data. Moreover, innovative algorithmic, processing and storage solutions have been implemented to allow us to reduce the computing time and the required disk space.

The same P-SBAS processor underlying the Surveillance service is also available for on-demand processing through the GEP, thus allowing users to generate S1 SBAS time series on areas not covered by the service itself.

It is worth noting that the SBAS Sentinel-1 services on GEP represent the core of the EPOSAR service, which will deliver S1 displacement time series of Earth surface for the European Plate Observing System (EPOS) Research Infrastructure community.