On demand computation of InSar interferogramms using NSBAS

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Abstract

Since 2014, radar satellites of the European Sentinel-1 mission provides massive amount of SAR data freely available. With a worldwide systematic background acquisition strategy over tectonically active regions and a 6-days revisit time, the Sentinel-1 mission offers new horizons for a wider use of SAR interferometry to measures ground deformations. However, the new default mode of acquisition (TOPSAR) and the amount of data available in near real time, require new processing schemes, and significant computing and storage facilities not available to every researcher.
Providing an on-demand service for Sentinel-1 InSAR processing for researchers has been proposed as one of the first projects of ForM@Ter, the newly built Solid Earth data and services center of the French research infrastructure "Pôle Système Terre" under construction. ForM@Ter aims to facilitate access to data and contribute to the creation of new products and services by adding value to the available satellite and in-situ data. This project is done in coordination with the EU EPOS (European Plate Observatory System) project, as part of the GDM service (Ground Deformation Monitoring) proposed in the work package 12 (satellite data).

The first step of the project was to set up a demonstrator of this service that can be put into production in the near future after validation by the research community. It is implemented through a set of web services that can be driven through a web application. Each web service

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is implemented according to the OGC and INSPIRE recommendations in order to offer a normalized access to the service. The user interacts with a Web application that queries the web service, which in turn submits jobs to a dedicated HPC cluster. The service is distributed "by design", as the web application, the web services, the HPC cluster and the storage cluster are hosted at different places (Paris IPGP, Grenoble UGA, Grenoble OSUG).

Although still under development, the web interface currently allows the user to:
i) select the footprint of the input images, by defining a region of interest and the orbit direction (ascending or descending)
ii) select a range of acquisition dates, and image polarization.
iii) define some parameters of the NSBAS processing chain, as e.g. choosing whether to apply or not an atmospheric correction based on the ERA-I meteorological model.

The user can then launch the computation that will run on a dedicated cluster. There, InSAR processing is done through the NSBAS chain (Doin et al. 2011). The input data needed by the chain being automatically downloaded:
- SENTINEL-1 images are downloaded from PEPS which is the French Collaborative ground segment for Copernicus Sentinel program operated by the CNES (French Spatial agency), that provides a mirror site distributing all the Sentinel data in near real time.

- Precise orbital data from ESA

- SRTM 30-m Digital Elevation Model

- In case of atmospheric correction: Meteorological parameters of ERA-I model provided by ECMWF.

A monitoring of the process is then available to the user. At the end of the computation, a temporary URL is provided from which the results can be downloaded. The generated data will be enriched with metadata compatible for instance with the requirements of the EPOS project.

The demonstrator is currently set up to compute single interferogramm (both wrapped and unwrapped version are available geocoded and in radar geometry). However, there is no technical restriction for computing a network of coregistred interferogramms and its associated time-series of unwrapped phase, as such functionalities are already implemented both in NSBAS processing chain and in the web services.

We plan to give a demo during the General assembly of Wegener.