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A fully automatic P-SBAS DInSAR pipeline for Sentinel-1 processing within AWS environment

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In this work we present a cloud-computing based strategy for generating surface displacement time series and mean deformation velocity maps of very large areas by exploiting Sentinel-1 (S1) data. Our approach relies on the simultaneous exploitation of a fast access to the S1 data archives, High Performance Computing resources and external geodetic data.
The presented pipeline is based on an advanced cloud-computing implementation of the differential SAR interferometry (DInSAR) Parallel Small BAseline Subset (P-SBAS) processing chain, which allows the fully unsupervised processing of huge Interferometric Wide Swath (IWS) Sentinel-1 data volumes.
In particular, for what concerns the S1 data archives, we benefited from the NASA's Alaska Satellite Facility (ASF) Distributed Active Archive Center (DAAC), which stores and distributes S1 SAR data from Amazon Web Service (AWS) for advancing Earth science research. The ASF-DAAC allowed us to reach a very high performance level in terms of downloading time and system reliability. Moreover, we exploited the geodetic measurements provided from the Magnet + Global GPS Network Map of the Nevada Geodetic Laboratory at the University of Nevada, Reno, USA (UNR-NGL), which supply GPS measurements daily updated and continually available. The GPS measurements were used to account for regional trends and to better discriminate the low (tectonic) and high (local) frequency deformation patterns.
The presented solution is highly scalable and has been migrated to the Amazon Web Service (AWS) environment. It runs out along an automatic routine to generate the mean deformation velocity maps of the vertical and horizontal (East-West) displacement components of the whole investigated area.
The developed pipeline has been tested on ascending and descending Sentinel-1 archives acquired over a large area of Southern California (US), which extends over about 150,000 square kilometers.
The results that we will show are going to demonstrate how the cooperation of different research entities and different kind of data can be essential for both the data intensive exploration and the accuracy of the DInSAR measurements, so as to trace an innovative path in the Earth Observation field.