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Co-seismic displacement maps automatically generated via unsupervised Sentinel-1 processing

Fernando Monterroso (1,2), Manuela Bonano (2,3), Claudio de Luca (2), De Novellis Vincenzo (2), Riccardo Lanari (2), Michelle Manunta (2), Mariarosaria Manzo (2), Giovanni Onorato (2), Emanuela Valerio (2), Ivana Zinno (2), and Francesco Casu (2)

(1) University of Naples Parthenope, Italy, (2) IREA-CNR, Italy (monterroso.f@irea.cnr.it), (3) IMAA-CNR , Italy

During the last decades, the availability of Synthetic Aperture Radar (SAR) satellite missions, such as the ERS-1/2 and ENVISAT ones operating at C-band who have worked since 1992 to 2011, as well as the X-band COSMO-SkyMed and TerraSAR-X constellations, up to the brand new Sentinel-1 mission, have strongly contributed to SAR data diffusion and popularity in the generation of different studies at different scales and in different research fields.
One of the most popular SAR technique is the one referred to as Differential SAR Interferometry (DInSAR), which allows measuring with centimeter accuracy the Earth's surface deformation entity related to both natural and man-made hazards.
Nowadays, with the increasing of SAR data availability provided by Sentinel-1 constellation of Copernicus European Program, which is composed by two twin satellites operating in C-band since 2014 and 2016, with a repeat pass of 6 days and with a global (i.e. worldwide) data acquisition policy, the SAR EO scenario is becoming more and more operational, thus mainly providing support for natural hazards monitoring. This allows, in theory, and disposing of sufficient computing power, the EO community to monitor, for instance, the deformation of every volcano or to obtain co-seismic displacement maps in a short time frame and anywhere in the world.
Accordingly, in this work, we present a fully automatic and fast processing service for the generation of co-seismic displacement maps by using Sentinel-1 data. The implemented system is completely unsupervised and is triggered by the all significant (i.e. larger than a defined magnitude) seismic event registered by the online catalog as those provided by the United States Geological Survey (USGS) and the National Institute of Geophysics and Volcanology of Italy (INGV). The service has been specifically designed to operate for Civil Protection purposes.
The generated DInSAR measurements are made available to the geoscience community through the EPOS Research Infrastructure and they will contribute to the creation of a global database of co-seismic displacement maps.
Finally, it is worth noting that the developed system relies on widely common IT methods and protocols and is not specifically tied to a defined computing architecture, thus implying its portability, in view also of the European Commission Data and Information Access Services (DIAS) where satellite data (mainly Sentinel) and processing facilities are co-located to reduce the data transfer time during their processing.

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