Results of the analyses carried out with Sentinel-1 radar data of the Copernicus Programme through the differential radar interferometry technique on the 30 October 2016 central Italy earthquake: the two co-seismic deformation maps (in the radar line of sight) are presented, obtained from ascending and descending orbits (Panel A and B, respectively) starting from the Sentinel-1 data acquired on 26/10/2016 (pre-event images) and 1/11/2016 (post-event images).

Satellites are used in the Earth Observation domain to systematically monitor and widely analyse sea ice, the oceans, ground surface, and atmosphere.

The TCS Satellite Data aims at implementing and deploying robust Earth Observation services transversal to the large EPOS community and suitable for use in several solid Earth science application scenarios.

These services have already well demonstrated their effectiveness and relevance in investigating the physical processes driving earthquakes, volcanic eruptions, and unrest episodes. They can therefore successfully contribute and foster advanced geophysical investigations.

In the first operational phase of the EPOS infrastructure, the TCS Satellite Data is mainly focused on radar techniques by benefiting from the Sentinel-1 constellation of the Copernicus Programme. For more than 25 years, radar images from space have been used to measure small displacements of the Earth surface related to earthquakes, landslides and volcanic activity. These images are collected night and day under any and all weather conditions by using sensors mounted on board satellites orbiting at several hundred kilometres away from the Earth. The results of these measurements provide crucial information for a comprehensive and synoptic understanding of ground deformation phenomena and their trigger events.

The TCS is also working to have a common interface to access the TCS products and services. To this aim, European Space Agency is contributing to the TCS with the Geohazards Thematic Exploitation Platform or GEP, a cloud-based user-driven environment specifically designed for the advanced exploitation of EO data. The GEP is using cloud processing facilities to enable both systematic and on-demand services.
SERVICES

The TCS will provide two levels of products and services, mainly dedicated to the analysis of the Earth surface displacements through Satellite Radar data: the first level deals with “standard” remote sensing products (i.e., displacement maps and deformation time-series). The second level concerns value-added products, such as 3D maps, source mechanisms and fault models.

In particular, the TCS will deploy 5 services, each one related to a different provider and a specific National Research Infrastructure: EPOSAR (CNR, Italy), GDM (CNRS, France), 3D-Def (CSIC, Spain), Comet (University of Leeds, UK), and MOD (GFZ, Germany).

The TCS will allow users to discover and download satellite products systematically generated over selected tectonic areas. Moreover, users will be able to run web tools in order to remotely process satellite datasets in a user-friendly environment, by benefiting from a large collection of SAR data, processing tools, as well as Cloud computing resources.

USE CASE

Under the coordination of the Italian Department of Civil Protection, scientists from INGV and CNR-IREA studied Sentinel-1 data to map deformations caused by the earthquake occurred in Italy on 24 August.

The team found that the main deformation pattern shows subsidence reaching about 20 cm in the Accumoli area, and sideways movement of up to 16 cm.

The scientists were able to quantify the ground movement in both vertical and east–west directions by combining the radar scans obtained as the satellites flew both south to north and north to south.

CONTACT

Michele Manunta, CNR, manunta.m@irea.cnr.it