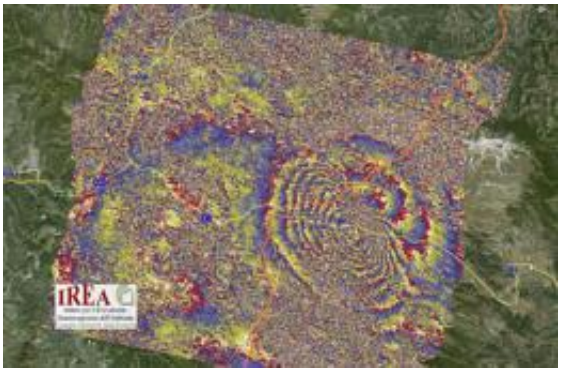
Satellites show how Earth moved during Italy quake

April 15 2009



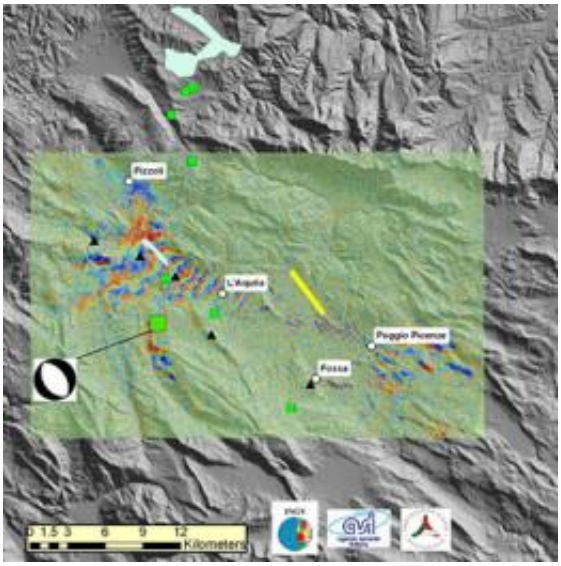
An Envisat Advanced Synthetic Aperture Radar (ASAR) interferogram over the L'Aquila area in central Italy showing the deformation pattern caused by the seismic events in early April 2009. This interferogram was generated by Italy's Istituto per il Rilevamento Elettromagnetico dell' Ambiente (IREA-CNR) in Naples, Italy just a few hours after Envisat's acquisition on 12 April 2009. It combines that acquisition with a pre-seismic acquisition on 1 February 2009, with an estimated baseline (separation between the two Envisat orbital positions) of about 154 m. The satellite's right-looking angle is 23 degrees. Each fringe of the interferogram, corresponding to a colour cycle, is equivalent to an Earth surface displacement of 2.8 cm along the satellite direction. Credits: IREA-CNR

(PhysOrg.com) -- Studying satellite radar data from ESA's Envisat and the Italian Space Agency's COSMO-SkyMed, scientists have begun analysing the movement of Earth during and after the 6.3 earthquake that shook the medieval town of L'Aquila in central Italy on 6 April 2009.

Scientists from Italy's Istituto per il Rilevamento Elettromagnetico dell' Ambiente (IREA-CNR) and the Istituto Nazionale di Geofisica e Vulcanologia (INGV) are studying Synthetic Aperture Radar (SAR) data from these satellites to map surface deformations after the earthquake and the numerous aftershocks that have followed.

The scientists are using a technique known as SAR Interferometry (InSAR), a sophisticated version of 'spot the difference'. InSAR involves combining two or more radar images of the same ground location in such a way that very precise measurements - down to a scale of a few millimetres - can be made of any ground motion taking place between image acquisitions.

The InSAR technique merges data acquired before and after the earthquake to generate 'interferogram' images that appear as rainbow-coloured interference patterns. A complete set of coloured bands, called 'fringes', represents ground movement relative to the spacecraft of half a wavelength, which is 2.8 cm in the case of Envisat's ASAR.



COSMO-SkyMed interferogram using data from 19 February 2009 and 9 April

2009. Perpendicular baseline is 480 m, and the satellite's right-looking angle is 37 degrees. The large green square represents the Mw 6.3 main shock, smaller green squares represent the Mw > 5 aftershocks, the yellow line marks the observed co-seismic surface breaks and the black triangles represent GPS stations used for SAR validation. Credits: INGV, ASI (Italian Space Agency)

The first Envisat data, acquired after the earthquake on 12 April, were made immediately available to the scientists.

"We produced an interferogram just a few hours after the Envisat acquisition by combining these data with data acquired before the earthquake on 1 February. We were pleased that we were able to immediately see the pattern of the earthquake," said Riccardo Lanari of IREA-CNR in Naples, Italy.

The Envisat interferogram, as explained by Stefano Salvi from INGV's Earthquake Remote Sensing Group, shows nine fringes surrounding a maximum displacement area located midway between L'Aquila and Fossa, where the ground moved as much as 25 cm (along a line between the satellite's orbital position and the earthquake area).

"By using available 3D ground displacements from five GPS location sites around the affected area, we were able to confirm the preliminary results obtained with Envisat data," Salvi said.

The COSMO-SkyMed constellation, which is currently made up of three satellites, allows for frequent data. This means new interferograms can be calculated every few days.

The COSMO-SkyMed data together with the Envisat data and possibly SAR data from other satellites will ensure a dense sampling of the

ground deformation around the L'Aquila area in the next months, which could make this earthquake one of the most covered by SAR Interferometry measurements.

To ensure all scientists are able to contribute to the analysis of the earthquake, ESA is making its Earth observation dataset collected over the L'Aquila area freely accessible with an innovative fast data download mechanism. The dataset will be continuously updated with the newest Envisat acquisitions.

Source: European Space Agency (news : web)