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Monitoring Santorini volcano (Greece) with earth observation techniques

Satellite earth observation has proved its potential as a powerful and reliable tool to monitor volcanic activity. One of the main indicators that should be considered to assess volcanic hazard is ground deformation monitoring. Satellite earth observation data and methods have been used continuously since 1992 to measure or study the temporal evolution of surface deformation in volcanic areas in conjunction with ground-based geodetic measurements.

Synthetic Aperture Radar (SAR) is a powerful remote sensing radar system used for earth observation applications. The sensor emits electromagnetic radiation and then records the amplitude and phase of the returned signal to produce images of the ground. Interferometric Synthetic Aperture Radar (InSAR) is a recognized and established remote sensing technique that measures the phase change between two or more SAR phase images acquired at different times of the same area. This technique can be applied to accurately measure ground deformation. Such methods were applied to monitor the current state of Santorini volcano. During the period 1992-2010 the volcano was characterized by a gradual subsidence of the volcanic island Nea Kameni. However, at the beginning of 2011 the volcano displayed signs of unrest with increased microseismic activity and significant ground uplift. A gradual decrease of the uplifting rates within the first quarter of 2012 was confirmed from subsequent observations and thus indicating that the volcano entered a post-unrest state.

The ongoing period, was examined using 89 Sentinel-1A satellite scenes covering the period October 2014 to June 2016. Several deformation maps and time series graphs were produced to illustrate the status of the volcano. Interferometric results show that the volcano displays a relative uniform surface deformation with low uplifting rates, horizontal velocities and interesting alterations in the deformation pattern through time, with the decrease of microseismicity in the area.

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