THEME: HAZARDS

PRESENTATION: ORAL

Sentinel 1A Time series SAR Interferometry monitoring of Santorini volcano during post unrest period (2014-2015)

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Abstract

Mitigation of volcanic risk is feasible and thus reducing damages can be achieved by knowing in detail about structure and history of the volcanoes, eruption mechanisms, unrest behavior etc. The identification, analysis and evaluation of risk comprise the basis for timely, well oriented and essential disaster management. It is clear that reducing risk for volcanoes requires many steps (hazard and vulnerability assessment, exposure, coping capacity) to be addressed. Long-term hazard assessment presents the basic tool for the behavior of a volcano especially in the case of dormant volcanoes due to the lack of plethora historical data.

Ground deformation monitoring is one of the main geoindicators that should be considered to assess volcanic hazard. Satellite Earth Observation data are used for different facets of risk management concerning volcanic hazards. Space-borne SAR interferometry has 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.

Santorini Volcanic Complex the period 1992–2010 is characterize by the gradual deflation signal over Nea Kameni volcano however, at the beginning of 2011 the volcano showed signs of unrest with increased microseismic activity and significant ground uplift. A gradual decrease of inflation rates within the first quarter of 2012 was confirmed from subsequent observations.

The goal of this study was to identify eventual surface deformation in the post unrest period (10-2014/3-2015) over Nea Kameni volcanic center and validate interferometric results with ground base geodetic observations.. To address this issue a hybrid method of multitemporal SAR interferometry has been used as method using Copernicus satellite Sentinel 1A SAR scenes. A set of 16 SLC Sentinel 1A ascending scenes covering the period March to October of 2015, frame 29 has been used. Additional repeated pass interferometry was applied (Figure 1) using suitable interferometric pairs by choosing scenes from the above dataset. The fact that the volcano exhibits high coherence independently of the time distance of the two images (master and slave) gave us this ability. Both Gamma and Sentinel toolbox have been used for multitemporal and conventional interferometry.

Interferometric results show that Nea Kammeni Volcano shows a relative uniform surface deformation with low uplifting rates. Interferometric results are compared with existing GPS measurements for the same period.

Keywords: Volcanoes, SAR, Interferometry, Persistent Scatterers Interferometry, GNSS Earth Observation

Satellite and data used: Sentinel-1, other

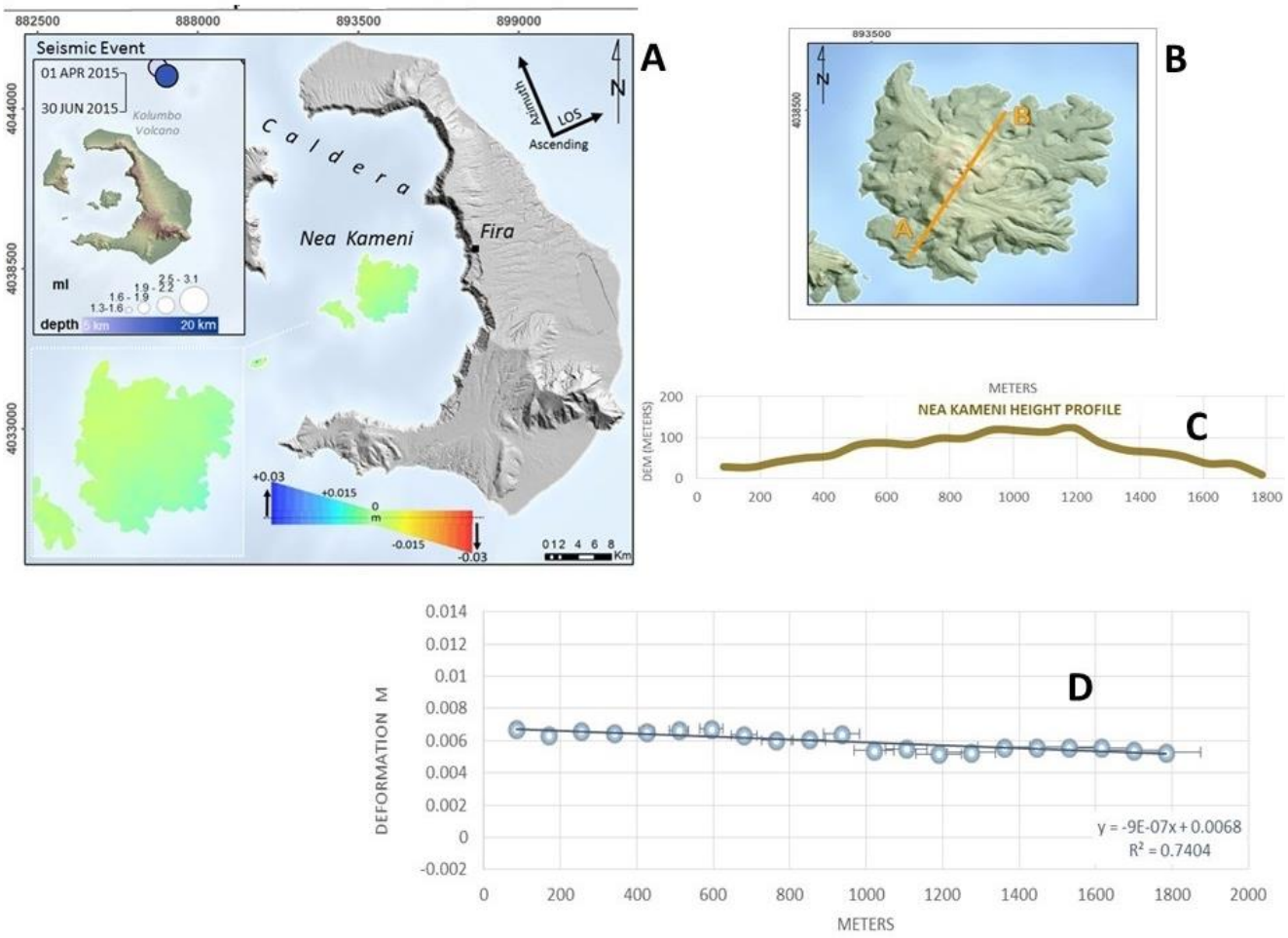

Fig. 1 (A) Displacement map over Nea kammeni Volcano for the period 17-4/4-6-2015 using Sentinel 1 IW ascending scenes, (B) Profile location over Nea Kammeni, (C) Corresponding elevation profile, (D) Corresponding deformation profile in meters.