



PRE- AND SYN-ERUPTIVE SURFACE MOVEMENTS OF AZERBAIJAN MUD VOLCANOES DETECTED THROUGH INSAR ANALYSIS: PRELIMINARY RESULTS

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Mud volcanism is a process that consists in the extrusion of mud, fragments or blocks of country rocks, saline waters and gases, mostly methane. This mechanism is typically linked to in-depth hydrocarbon traps, and it builds up a variety of conical edifices with dimension and morphology similar to those of magmatic volcanoes.

Interferometry by Satellite Aperture Radar (InSAR) techniques have been commonly used to monitor and investigate the ground deformation connected to the eruptive phases of magmatic volcanoes.

InSAR techniques have also been employed to explore the ground deformation associated with the LUSI mud volcano in Java (Indonesia). We aim to carry out a study on the paroxysmal activities of the Azerbaijan mud volcanoes, among the largest on Earth, using similar techniques. In particular the deformations of the mud volcanic systems were analyzed through the technique of satellite differential interferometry (DInSAR), thanks to the acquisition of 16 descending and 4 ascending Envisat images, spanning about 4 years (October 2003-November 2007); these data were provided by the European Space Agency.

The preliminary analysis of a set of 77 interferograms and the unwrapping process elaboration of some of them selected according to the best coherence values, allowed the detection of significant deformations in correspondence of Ayaz-Akhtarma and Khara Zira Island mud volcanoes. This analysis has allowed to identify relevant ground deformations of the volcanic systems in connection with the main eruptive events in 2005 and in 2006 respectively, that are recorded by the catalogue of Azerbaijan mud volcano eruptions until 2007. The preliminary analysis of the interferograms of the Ayaz-Akhtarma and the Khara Zira mud volcanoes shows that the whole volcano edifice or part of it is subject to a ground displacement before or in coincidence with the eruption. Assuming that the movement is mainly vertical, we suppose that deformation is due to bulging of the volcanic edifices. In particular, for the Ayaz-Akhtarma, the interferograms show the pre- and the syn-eruptive phases, reaching a maximum displacements about 5.3 cm in 70 days. In the case of the Khara Zira mud volcano eruption, the time span covered by the interferograms with good coherence values ends some months before the eruption, thus only the initial stages of the pre-eruption deformation can be observed, with a maximum uplift about 2.3 cm in 70 days.

Paroxysmal phases that occasionally may interrupt the quiescent activity of mud volcanoes consist of violent release of large mud flows and flaming eruption caused by the self-ignition of the methane. The bulging observed in the interferograms connected with the pre- and syn-eruptive phases is probably due to an increase of overpressure which precedes a paroxysmal activity phase.