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A satellite geodetic survey of spatiotemporal deformation of Iranian volcanos

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Surface deformation in volcanic areas is usually due to movement of magma, hydrothermal activity at depth, weight of volcano, landside, etc. Iran, located at the convergence of the Eurasian and Arabian tectonic plates, is the host of five apparently inactive volcanoes, named 'Damavand', 'Taftan', 'Bazman', 'Sabalan' and 'Sahand'. Through investigation of the long term surface deformation rate at Damavand volcano, the highest point in the middle east, Shirzaei et al. (2011) demonstrated that a slow gravity-driven deformation in the form of spreading is going on at this volcano. Extending the earlier work, in this study, I explore large sets of SAR data obtained by Envisat radar satellite from 2003 through 2010 at all Iranian volcanoes. Multitemporal interferometric analysis of the SAR data sets allows retrieving sub-millimeter surface deformation at these volcanic systems. As a result, I detect a transient flank failure in the form of landslide at Damavand that is followed by elevated fumarolic activity. This suggests that landslide might have triggered volcanic unrest. Moreover, I measure significant surface deformation at Taftan and Bazman volcanos associated with different episodes of uplift and subsidence. The inverse model simulations suggest that the time-dependent inflations and deflations of extended and spherical pressurized magma chambers are responsible for the surface displacements at these volcanoes. I also detect time-dependent surface displacements at Sabalan and Sahand volcanoes, where the investigation of the type and the sources of the observed deformation is subject of ongoing research.
This study is a best example that shows the absent of recent eruption can not be used as a reliable factor in volcanic hazard assessment and a continuous monitoring system is of vital importance.

Reference
Shirzaei, M., Walter, T.R., Nankali, H.R. and Holohan, E.P., 2011. Gravity-driven deformation of Damavand volcano, Iran, detected through InSAR time series. Geology, 39(3): 251-254.