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Dynamic influence of volcanic activity at Mauna Loa, Hawaii, on earthquake occurrence in Kaoiki investigated via time dependent source modeling and static stress transfer

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Volcanoes are known to be closely related to the tectonic environment, such as they may be controlled by active faults or trigger seismic and magmatic activity at nearby systems. At Hawaii Island the host of five volcanoes, with two of them Mauna Loa and Kilauea being amongst the most active volcanoes worldwide, we observe intriguing examples of interaction between volcanic and tectonic activities.
In this study we examine how magmatic activity at Mauna Loa may excite earthquake occurrence at Kaoiki at Mauna Loa's east flank, the location of some of the largest earthquakes on Hawaii. For this purpose we generate a time series of surface deformation over Mauna Loa using a data set of radar data acquired between 2003 and 2005 by ENVISAT satellite. To investigate the source of the observed deformation and integrate full capacity of the InSAR time series we devise a time dependent source modeling approach as a combination of Genetic Algorithm and Kalman filter. The dislocation sources, magmatic source and rift dikes at Mauna Loa, are simulated using pressurized sphere and Okada plane in elastic half space and the effect of topography is considered following [Williams and Wadge, 1998]. Having the time series of the dislocation source parameters allows estimating the time series of the coulomb failure stress at the location of Kaoiki seismic zone.
In the following we explain the detail of our approach and discuss the results of this study.

Reference:
Williams, C. A., and G. Wadge (1998), The effects of topography on magma chamber deformation models: Application to Mt. Etna and radar interferometry, Geophys. Res. Lett., 25, 1549-1552.