Magmatic and Structural Interaction at Mt. Etna Volcano (Italy) Observed with SAR Interferometry

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Abstract
We present the latest synthetic aperture radar (SAR) interferometry observations and numerical modeling results to interpret the dynamic deformation of Mt. Etna volcano. European Space Agency ERS1 and ERS2 SAR data has allowed us to generate a large number of interferograms for Mt. Etna during the period 1992-present. As such it is one of the best studied volcanoes in the world using interferometric SAR (InSAR). Although Etna has been recognized from field studies as having active rifts and flank faults, recent InSAR studies have revealed a more complete picture of this flank instability and has put constraints on its subsurface geometry. During its phase of summit activity and general volcano inflation due to recharge of its magmatic system from 1993-2000, Etna also experienced episodic flank motion, suggesting that motion of its unstable eastern flank is related to the activity of the magmatic system. Recent analysis of InSAR data spanning the 2001 flank eruption shows a new pattern of deformation. The deformation patterns from both ascending and descending satellite passes put important constraints on models for magmatic and structural sources. In the case of the 1993-2000 phase, numerical models require both inflation of a spheroidal magma chamber and eastward motion of the eastern sector of the volcano. Instead, the 2001 flank eruption shows a surprising pattern that is most simply modeled as dike opening within the volcano edifice and volcano spreading above faults dipping shallowly to both the east and west at the base of the volcano.