Geophysical Research Abstracts
Vol. 15, EGU2013-9535, 2013
EGU General Assembly 2013

The 2001 Mt. Etna eruption: new constraints on the intrusive mechanism from ground deformation data

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The occurrence of seismic swarms beneath the SW flank of Mt. Etna, often observed just a few months before an eruption, has been considered as the fragile response to a magma intrusion (Bonanno et al., 2011 and reference therein). These intrusions and/or pressurization of deep magmatic bodies, have been able to significantly affect the seismic pattern within the volcano edifice, leading to a changes in the local stress field. For example, during the months preceding the 1991-1993 Mt. Etna eruption, shallow intense seismic swarms (4-6 km deep) occurring in the SW flank (e.g. Cocina et al., 1998), related to the magma intrusion before the eruption onset, were observed contemporaneously with a rotation of stress field of about 90°. A similar scenario was observed during January 1998, when a magma recharging phases induced a local rotation of stress tensor, forcing a buried fault zone located beneath the SW flank of Mt. Etna to slip as a right-lateral strike-slip fault (Bonanno et al., 2011). This fault system was forced to slip again, during late April 2001 (more than 200 events in less than 5 days; maximum Magnitude = 3.6) by the pressurization of the magmatic bodies feeding the July-August 2001 Mt. Etna eruption. Here we analyzed in detail the July-August 2001 Mt. Etna eruption as well as the dynamics preceding this event, by using a large dataset of geodetic data (GPS and synthetic aperture radar interferometry) collected between July 2000 and August 2001.

References

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