Geophysical Research Abstracts
Vol. 18, EGU2016-4544, 2016
EGU General Assembly 2016

Signature of magmatic processes in ground deformation signals from Phlegraean Fields (Italy)

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Ground deformation signals such as dilatometric and tiltmetric ones, are nowadays well studied from the vulcanological community all over the world. These signals can be used to retrieve information on volcanoes state and to study the magma dynamics in their plumbing system.

We compared synthetic signals in the *Very Long Period* (VLP, $10^{-2} - 10^{-1}$ Hz) and *Ultra Long Period* (ULP, $10^{-4} - 10^{-2}$ Hz) bands obtained from the simulation of magma mixing in shallow reservoirs ([3], [4]) with real data obtained from the dilatometers and tiltmeters network situated in the Phlegraean Fields near Naples (Italy), in order to define and constrain the relationships between them.

Analyses of data from the October 2006 seismic swarm in the area show that the frequency spectrum of the synthetics is remarkably similar to the transient present in the real signals. In depth studies with accurated techniques for spectral analysis (i.e wavelet transform) and application of this method to other time windows have identified in the bandwidth around $10^{-4}Hz$ (between $1h30m$ and $2h45m$) peaks that are fairly stable and independent from the processing carried out on the full-band signal. These peaks could be the signature of ongoing convection at depth.

It is well known that re-injection of juvenile magmas can reactivate the eruption dynamics ([1], [2]), thus being able to define mixing markers and detect them in the ground deformation signals is a relevant topic in order to understand the dynamics of active and quiescent vulcanoes and to eventually improve early-warning methods for impending eruptions.

[1] Arienzo, I. et al. (2010). "The feeding system of Agnano–Monte Spina eruption (Campi Flegrei, Italy): dragging the past into present activity and future scenarios". In: *Chemical Geology* 270.1, pp. 135–147.

[2] Bachmann, Olivier and George Bergantz (2008). "The magma reservoirs that feed supereruptions". In: *Elements* 4.1, pp. 17–21.

[3] Longo, Antonella et al. (2012). "Magma convection and mixing dynamics as a source of ultra-long-period oscillations". In: *Bulletin of volcanology* 74.4, pp. 873–880.

[4] Montagna, CP., P. Papale, and A. Longo (2015). "Timescales of mingling in shallow magmatic reservoirs". In: *Geological Society, London, Special Publications* 422, SP422–6.