

## **Thermal anomalies in fumaroles at Vulcano island (Italy) and their relationship with seismic activity and stress-induced permeability changes**

Paolo Madonia (1), Paola Cusano (2), Iole Serena Diliberto (1), and Marianna Cangemi (1)

(1) I.N.G.V., Sez. di Palermo, Palermo, Italy, (2) I.N.G.V., Sez. di Napoli Oss. Vesuviano, Italy

Fumarole thermal monitoring is a useful tool in the evaluation of volcanic activity, since temperatures strongly relate to the upward flux of magmatic volatiles. Once depurated from meteorological noise, their variations can reflect permeability changes due to crustal stress dynamics eventually associated to seismic activity.

In this work, we discuss a fumarole temperature record acquired in the period September 2009 - May 2012 at Vulcano island (Italy), during which changes of volcanic state, local seismic activity and teleseisms occurred. Apart from positive thermal anomalies driven by increments in volcanic activity, we observed 3 episodes at least of concurrence between tectonic earthquakes and fumarole temperature increments, with particular reference to the local August 16th, 2010 Lipari earthquake, the March 11th, 2011 Sendai-Honshu (Japan) earthquake and a seismic swarm occurred along the Tindari-Letojanni fault in July-August 2011.

We interpreted the seismic-related anomalies as "crustal fluid transients", i.e. signals of volcanogenic vapour flow variations induced by stress-induced permeability changes. From this perspective fumarolic activity can be considered as a tracer of geodynamic instability but, since seismic and volcanic phenomena are in mutual cause-effect relationships, a multidisciplinary observation system is mandatory for correctly addressing thermal data interpretation.