

SVC050-P12

Room:Convention Hall

Time:May 23 16:15-18:45

Subsurface airflow detection at Miyakejima and Piton de la Fournaise volcanoes from micrometeorological and thermal data

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Subsurface airflow in the unsaturated zone of the soil has been extensively investigated in a variety of engineering disciplines such as mining, nuclear waste or agriculture science. In volcanology, the recent discovery of subsurface airflow close to the terminal cone of Piton de La Fournaise volcano (La Reunion Island, France) provides for the first time insights into the convective behavior of air within the unsaturated layer [1]. The characteristics of the aerothermal system, its occurrence in other volcanoes, its ability to transport heat during quiescent periods and the perturbation of this system before eruptions are the key questions we want to address following this discovery.

In this study, we present observations of subsurface convective airflow within surface-exposed fractures located at the summit of Miyakejima and Piton de la Fournaise volcanoes from micrometeorological and thermal data. At Miyakejima, air exhausts from several fractures with a vertical velocity of tens of cm/s. A difference of temperature of 10-15 degrees Celsius between the fractures and the atmosphere has been measured, while the fractures never cool during the diurnal cycle. In the case of Piton de la Fournaise volcano, several air exits as well entrances have been observed at the summit, suggesting that the aerothermal system may affect the whole volcano. The velocities and temperatures are close to the ones recorded at Miyakejima. Finally, thermal profiles realized across the fractures allow us to define the convective patterns. This study is the first concerning the occurrence of an aerothermal system within another volcano than Piton de la Fournaise. It constitutes a preliminary step to further investigations dedicated to the understanding of the perturbation of such systems before eruptions.

[1] Antoine R., Baratoux D., Rabinowicz M., Fontaine F.J., Bachelery P., Staudacher T., Saracco G., Finizola A., Thermal infrared images analysis of a quiescent cone on Piton de La Fournaise volcano: Evidence for convective air flow within an unconsolidated soil, *Journal of Volcanology and Geothermal Research*, Volume 183, Issues 3-4, 2009, Pages 228-244

Keywords: Volcano, Subsurface Airflow, Convection, Porous Medium, Micrometeorology, Thermal data