



Muon tomography and Volcanic Risks in the Lesser Antilles: the Example of the Soufrière of Guadeloupe

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The Lesser Antilles is a subduction volcanic arc counting a dozen of either potentially or presently erupting volcanoes located in populated areas. During the last century violent eruptions occurred, killing 29000 people in 1902 with the explosion of La Montagne Pelée in Martinique, leading to the evacuation of 73000 persons during 6 months during the 1976 crisis of La Soufrière of Guadeloupe, and devastating most of the Montserrat island since the beginning in 1995 of the yet ongoing eruption of the Soufrière Hills.

The Soufrière of Guadeloupe volcano is subjected to an intense hydrothermal activity which alters the mechanical integrity of the lava dome with a high risk level of destabilisation. Indeed, 8 flank collapses occurred during the last 8500 years, several of them were followed by the creation of new lava domes. The present dome is dated 1530 B.P. And appears very heterogeneous as revealed by both seismic tomography and electrical resistivity tomography. Gravity data show that the bulk density of the dome is about 2.2 g/cm^3 . The hydrothermal activity at the summit of the Guadeloupe Soufrière is regularly increasing with emitted fluids becoming more and more acid. Imaging the internal structure of such a volcano brings important informations for the hazard evaluation and density muon tomography is particularly adapted to brought constraints on collapse models.

A muon telescope was placed at the base of the lava dome the Guadeloupe Soufrière in July 2010. This field instruments is adapted to the extreme field conditions encountered during hurricane season and it is entirely autonomous with a total power consumption of less than 40W. Ethernet link allows both daily downloading of the data and remote control of the electronic devices and on-board computers. The telescope is equipped with 3 scintillator matrices completed with an iron shielding of 24 mm in thickness in order to efficiently filter out fortuitous events. The density radiographies obtained with this telescope are presented and compared with the other geophysical data available on this volcano.