



## **Radon-222 investigation in thermal springs near the La Soufrière volcano, Guadeloupe, a precise tool to detect a small change in springs dynamics**

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During and after the 1976 crisis of the La Soufrière volcano (Guadeloupe), numerous geochemical measurements were performed on the La Soufrière volcano to survey and to eventually detect a possible volcanic reactivation. More precisely, since 1979, nine thermal springs localized near the volcano were sampled every month by the Volcanological and Seismological Observatory of Guadeloupe (OVSG) to measure water temperature, conductivity, pH, flow-rate, chemical composition, major, some minor and trace elements. Long term geochemical monitoring are necessary identification and analyze geochemical or physical precursor signals possibly correlated to a possible volcanic reactivation. Since February 2006, we added a very sensitive parameter in this survey: the Radon-222. Indeed, numerous studies have suggested that the radon concentration in groundwaters and soil gases could be an effective tool for the prediction of seismic events or volcanic reactivation. Radon is a radioactive and alpha-emitting noble gas (half life 3.8 days) and a direct daughter of Radium-226 (Uranium-238 chain); it is transported by groundwaters and soils- and fumaroles- gases. The Radon-222 concentration is usually uncorrelated with the Radium-226 dissolved in groundwater, but is rather representative of the local geology, the Radium-226 contents in rock, the Radon-222 transfer mechanisms from rocks towards water and the fractures density. During a recent campaign in Guadeloupe, we have measured radon activity in thirteen groundwater samples collected throughout the active area of La Soufrière volcano using a Lucas-type scintillation flask. The measured activities are

low and range from 0.4 to 10.55 Bq.L-1 with an average equal to 3.5 Bq.L-1. In addition, for more the long-term survey of the radon signal in groundwater, we have designed and installed a new probe for continuous measurement of Radon-222 and temperature in the Tarade Spring (located south of the Soufrière lava dome) (3.1 $\pm$ 0.1 Bq.L-1). This probe is equipped with a polyethylene diffusion membrane and acquires hourly data. These first results are presented and the objective of long term survey of Radon-222 in thermal springs are discussed on the basis of previous works in this domain. The main objective being to establish a well calibrated long term series which could be compared to other geochemical and geophysical observations and discussed using transport models suited for such complex volcanic systems.