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# Diffuse He degassing from Furnas Volcano, Sao Miguel, Azores

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Furnas is the easternmost of the three active central volcanoes on the island of Sâo Miguel in Azores archipielago. Unlike the other two main volcanoes, Sete Cidades and Fogo, Furnas does not have a well-developed edifice, but consists of a steep-sided caldera complex 8 x 5 km across. It is built on the outer flanks of the Povoaçao - Nordeste lava complex that forms the eastern end of Sao Miguel. The caldera margins of Furnas reflect the regional-local tectonic pattern which has also controlled the distribution of vents within the caldera and areas of thermal springs. Helium is considered as an ideal geochemical tracer due to its properties: chemically inert, physically stable and practically insoluble in water under normal conditions. These properties together with its high mobility on the crust, make the presence of helium anomalies on the surface environment of a volcanic system to be related to deep fluid migration controlled by volcano-tectonic features of the area and provide valuable information about the location and characteristics of the gas source and the fracturing of the crust. On the summer of 2011, a diffuse helium emission survey was carried out on the surface environment of Furnas volcano, covering an area of 15.4 km2 with a total of 276 sampling site observations. To collect soil gases at each sampling point, a stainless steel probe was inserted 40 cm depth in the soil. Helium concentration was measured within 24 hours by means of a quadrupole mass spectrometer Pfeiffer Omnistar 422. DeltaHe (DeltaHe= Hesoil atmosphere – Heair) distribution map was constructed following Sequential Gaussian Simulation. DeltaHe distribution map shows that most of the study area presents values similar to those of air (Heair = 5,240 ppb). Soil gas helium enrichment was mainly observed at the areas affected by the discharge of hydrothermal fluids: the fumarole area on the north part of Furnas Lake (DeltaHe> 10,000 ppb) and the fumarole area on Furnas Village (DeltaHe> 5,000 ppb). No other significant enrichment DeltaHe were found which indicate the presence of a vertical permeability area for the migration of deep fluid to the surface.