

## Diffuse CO<sub>2</sub> and He Emission From Sao Miguel Volcanic Systems, Azores.

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Azores archipelago forms a 650 km WNW ESE lineament across the Mid-Atlantic ridge between 37 and 40 N and is situated close to the triple point junction of the African, American and Eurasian plates. Sao Miguel is the largest (747 km) of the nine volcanic islands that were formed by a stillactive hotspot volcanism and are mainly composed of alkali basalt and its differentiated products. Six different volcanic zones have been identified in Sao Miguel Island. The oldest unit, the Northeast volcanic complex, in the easternmost part of Sao Miguel, was followed a few hundreds of thousand years ago by the trachytic stratovolcanoes of Sete Cidades, Agua de Pau and Furnas. During latest Pleistocene and Holocene time, eruptions occurred in the two zones between these three volcanoes. To contribute to a better understanding of the volcano-structural characteristics of the different volcanic systems, a soil CO<sub>2</sub> and soil helium survey was performed in the summer period of 2011. CO<sub>2</sub> is the second most abundant gas typically released into the atmosphere from volcanic systems and helium is considered 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. The survey covered the total surface of the island with 1471 homogenously distributed sampling points. At each sampling site, soil CO<sub>2</sub> efflux measurements have been performed by means of portable NDIR sensors according to the accumulation chamber method. At each sampling site, soil gas samples were collected at 40 cm depth for helium content analysis. Helium content in the soil gases was analyzed within 24 hours by means of Quadrupole Mass Spectrometer, model Pfeiffer Omnistar 422. The highest soil CO<sub>2</sub> flux and helium enrichments were measured at Fogo and Furnas fumaroles areas. The main CO<sub>2</sub> anomalies areas were found it at Fogo and Furnas volcanic systems in the central area<sup>1</sup> of the island, while the most important soil helium enrichments, were observed at the westernmost volcanic complexes, where the younger materials are present. Significant soil helium enrichments were measured in a NE-SE trend at Sete Cidades, Dos Picos and Fogo volcanic systems, in agreement with the direction of Terceira Rift. The CO<sub>2</sub> and helium emission rates estimate for the entire island amounted for 19709 3000 t d and 45 15 kg d respectively.