

## Diffuse CO<sub>2</sub> and H<sub>2</sub>S degassing from the summit crater of Pico do Fogo

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Pico do Fogo volcano (2.800 m.a.s.l) is the youngest and most active volcano of the Cape Verde archipelago and it is located to the east of the Bordiera semicircular escarpment at Fogo Island. Soil gas geochemical surveys in volcanic areas are useful tool to identify changes in volcanic activity related to magmatic processes. Among these studies, to monitor spatial and secular variations of soil CO<sub>2</sub> and H<sub>2</sub>S effluxes pattern can provide important information about the state of activity of the volcanic system. CO<sub>2</sub> has been one of the most studied gases in volcanic environments. Many studies have shown that significant amounts of CO<sub>2</sub> are released to the atmosphere by quiescent volcanoes and geothermal systems through soil diffuse degassing. Since the emission rate of diffuse CO<sub>2</sub> can increase dramatically prior to an eruption (Hernandez et al. 2001a; Carapezza et al. 2004), efforts have to be made to obtain a CO<sub>2</sub> flux baseline for a given volcanic system. However, and mainly due to analytical limitations, very few works on diffuse H<sub>2</sub>S emission have been carried out at volcanic-hydrothermal areas. With the aim of improving the geochemical surveillance program of Pico do Fogo, periodic soil degassing surveys have been performed at the summit crater of this volcano, focusing on the diffuse CO<sub>2</sub> and H<sub>2</sub>S emissions. Each diffuse CO<sub>2</sub> and H<sub>2</sub>S survey has been carried out following the accumulation chamber method at 65 sites homogeneously distributed at Pico do Fogo summit crater covering an area of about 0.142 km<sup>2</sup>. Soil CO<sub>2</sub> and H<sub>2</sub>S efflux distribution maps were constructed following a Sequential Gaussian Simulation (sGs) in order to distinguish areas with anomalous CO<sub>2</sub> and H<sub>2</sub>S emission rates and to compute the total gas emission from the studied area. The total diffuse CO<sub>2</sub> output released to atmosphere was estimated in the range 30-339 t/d for the period of study. Furthermore, the total H<sub>2</sub>S output was estimated in the range 2-68 Kg/d during the same period of study. Highest CO<sub>2</sub> and H<sub>2</sub>S efflux values were measured in an around western flank of the crater where the most evident fumarolic activity occurs. The 1999 survey was performed 4 years after the last eruption at Fogo (April 1995), and an emission rate of 918 ± 409 t/d was estimated. This value was followed by a drastic decrease in the CO<sub>2</sub> and H<sub>2</sub>S emission rates during the survey performed in May 2007. In the last survey (April 2012), CO<sub>2</sub> emission rate was estimated on 186 ± 34 t/d, which is still below the higher limit observed in 1999 whereas estimated H<sub>2</sub>S emission rate was 15 ± 11 Kg/d. This observed decreasing trend on diffuse CO<sub>2</sub> emission from the summit crater of Fogo seems to be related to its eruptive cycle. At the present, following the evolutionary model of gas release from volcanoes described by Notsu et al., 2006, Fogo is an inter-eruptive phase. Diffuse soil degassing in volcanic areas releases high amount of gases and its monitoring can be helpful for the mitigation of volcanic risk at Fogo Island.