



## Soil carbon dioxide efflux weekly monitoring network for the volcanic surveillance of Tenerife, Canary Islands

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Carbon dioxide (CO<sub>2</sub>) is one of the first gases to escape from the magmatic environment due to its low solubility in basaltic magmas at low pressures. Monitoring of volcanic gases in Tenerife Island (2,304 km<sup>2</sup>) has been focused mainly on diffuse CO<sub>2</sub> degassing and other volatiles due to the absence of visible gas manifestations except fumaroles at the summit of Teide volcano. An inexpensive method to determine CO<sub>2</sub> fluxes based in the absorption of CO<sub>2</sub> through an alkaline medium followed by titration analysis has been used with the aim of contributing to the volcanic surveillance of Tenerife. During summer 2016, a network of 31 closed alkaline traps was deployed along the three volcanic rifts of Tenerife (NE, NW and NS) and at Cañadas Caldera. To do so, an aliquot of 50 mL of 0.1N KOH solution is placed inside the chamber at each station to absorb the CO<sub>2</sub> released from the soil. The solution is replaced in a weekly basis and the trapped CO<sub>2</sub> is later analyzed at the laboratory by titration. Values are expressed as weekly integrated CO<sub>2</sub> efflux. We present herein the results of one year CO<sub>2</sub> efflux estimated by closed alkaline traps. The CO<sub>2</sub> efflux values ranged from 1.0 to 14.5 g·m<sup>-2</sup>·d<sup>-1</sup>, with average values of 8.5 g·m<sup>-2</sup>·d<sup>-1</sup> for the NE rift-zone, 5.2 g·m<sup>-2</sup>·d<sup>-1</sup> for Cañadas Caldera, 6.4 g·m<sup>-2</sup>·d<sup>-1</sup> for NW rift-zone and 6.1 g·m<sup>-2</sup>·d<sup>-1</sup> for NS rift-zone. The estimated CO<sub>2</sub> efflux values were of the same order than the observed ones in 2016. Relatively high CO<sub>2</sub> efflux values were observed at the NE rift-zone, where maximum values were measured. The temporal evolution of CO<sub>2</sub> efflux estimated by closed alkaline traps did not show significant variations during 2019. However, small seasonal variations are observed during the period 2016 – 2019. To investigate the origin of the soil CO<sub>2</sub>, soil gas samples were weekly sampled on the head space of the closed chambers. Chemical and isotopic composition of C in the CO<sub>2</sub> were analysed in the gas samples. The concentration of CO<sub>2</sub> on the head space of the closed chambers showed a range of 355-50,464 ppm, with an average value of 1,850 ppmV, while the isotopic composition expressed as d<sup>13</sup>C-CO<sub>2</sub> showed a range from -5.03 to -30.44 ‰, with an average value of -15.9 ‰. The heaviest values of d<sup>13</sup>C-CO<sub>2</sub> are in the NW rift-zone. The systematics of closed static chambers alkaline traps can be a simple and economical tool with volcanic surveillance purposes in system

where visible volcanic gases manifestations are absence.