



## Surface diffuse degassing monitoring of the Tenerife Northeastern Rift Zone (NERZ) volcano, Canary Islands

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The North East Rift volcanic Zone (NERZ) of Tenerife Island is one of the three volcanic rift-zones of the island, oriented NW-SE (NWRZ), NE-SW (NERZ) and a more scattered area on the south (NSRZ). From a volcano-structural point of view, NERZ is more complex than NW or NS rifts due the existence of Pedro Gil stratovolcano that broke the main NE-SW structure. Pedro Gil Caldera was formed 0.8 Ma ago by a vertical collapse of this stratovolcano. The most recent eruptive activity along the NERZ took place during 1704 and 1705 along a 13 km of fissural eruption of Arafo-Fasnia-Siete Fuentes. Diffuse CO<sub>2</sub> emission surveys have been undertaken in a yearly basis since 2001 in order to provide a multidisciplinary approach to monitor potential volcanic activity changes at the NERZ. The aim of this study is to report the results of the last soil CO<sub>2</sub> efflux survey undertaken in summer 2019, with 639 measuring sites homogeneously distributed in an area of 210 km<sup>2</sup>. In-situ measurements of CO<sub>2</sub> efflux from the surface environment of NERZ were performed by means of a portable non-dispersive infrared spectrophotometer (NDIR) following the accumulation chamber method. Soil CO<sub>2</sub> efflux contour maps were constructed to identify spatio-temporal anomalies and to quantify the total CO<sub>2</sub> emission using the sequential Gaussian simulation (sGs) interpolation method. The CO<sub>2</sub> efflux values ranged from non-detectable (0.5 g m<sup>-2</sup> d<sup>-1</sup>) up to 72,3 g m<sup>-2</sup> d<sup>-1</sup>, with an average value of 10,9 g m<sup>-2</sup> d<sup>-1</sup>. Statistical-graphical analysis of the 2019 data show two different geochemical populations; background (B) and peak (P) represented by 70.4% and 1.9% of the total data, respectively. The geometric means of the B and P populations are 0.4 and 4.3 g m<sup>-2</sup> d<sup>-1</sup>, respectively. The diffuse CO<sub>2</sub> emission rate was estimated in 2,205 t d<sup>-1</sup>. Studying the long-term variations on the diffuse CO<sub>2</sub> emission since 2001, two main pulses are identified: one in 2007 and a second one sustained over time between 2014 and 2019. Enhanced endogenous contributions of deep-seated CO<sub>2</sub> might have been responsible for the higher CO<sub>2</sub> emissions values observed during those pulses. The 2014-2019 pulse appears to be related to the seismic activity that started taking place in Tenerife at the end of 2016. This study denotes the importance of soil CO<sub>2</sub> efflux surveys at the NERZ volcano of Tenerife Island as an effective volcanic monitoring tool.

