Geophysical Research Abstracts
Vol. 21, EGU2019-1508, 2019
EGU General Assembly 2019

Geochemical monitoring of the Tenerife Northeastern Rift Zone (NERZ) volcano (Canary Islands) by means of diffuse CO_2 degassing surveys

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Tenerife (2058 km2) is the largest island of the Canary Islands and is located in the central area of the archipelago. The structure of the island is controlled by a volcano-tectonic rift system with NW, NE and NS directions and Las Cañadas caldera hosting Teide-Pico Viejo volcanic complex in the intersection of the three rifts. The volcanic rifts are characterized by the alignment of cinder cones and fissure systems where historical eruptions occurred. The North East Rift Zone (NERZ) is one the three major volcanic rift zones of Tenerife, with the most recent eruptions taking place in the 1704-1705 period. Nowadays visible degassing is absent in NERZ so soil diffuse CO_2 degassing represent a potential geochemical tool for its volcanic surveillance. During June 2018 diffuse CO_2 degassing studies were performed covering and area of 210 km2 with 658 sampling sites according to the accumulation chamber method, using a non-dispersive infrared (NDIR) LICOR-820 CO_2 analyzer. Soil CO_2 efflux values ranged between non-detectable values and 220.317 g m2 d-1, with an average of 15.021 g m2 d-1. The probability plot technique applied to the data allowed to distinguish three different geochemical populations: background, intermediate and peak represented by 95.2%, 4.3% and 0.5% respectively, with geometric means of 7.60, 79.99 and 159.70 g m2 d-1 respectively. Sequential Gaussian simulations was used as interpolation method to construct CO_2 efflux spatial distribution maps, resulting in an emission rate of 2602 t d-1, with the highest values located in the northern area of northwest slope of the rift. This emission value represent the highest value in the temporal evolution since 2001. This work highlights the importance of diffuse degassing studies in volcanic areas where visible degassing is non-existent.