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Spatial and temporal variations of diffuse CO_2 degassing at the Tenerife North–South Rift Zone (NSRZ) volcano (Canary Islands) during the period 2002-2016

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Subaerial volcanic activity on Tenerife (2034 km^2), the largest island of the Canary archipelago, started 14 My ago and 4 volcanic eruptions have occurred in historical times during the last 300 years. The main volcano-structural and geomorphological features of Tenerife are (i) the central volcanic complex, nowadays formed by Las Cañadas caldera, a volcanic depression measuring 16×9 km that resulted from multiple vertical collapses and partially filled by post-caldera volcanic products and (ii) the triple junction-shaped rift system, formed by numerous aligned monogenetic cones. Up to 297 mafic monogenetic cones have been recognized on Tenerife, and they represent the most common eruptive activity occurring on the island during the last 1 My (Dóniz et al., 2008). The North–South Rift Zone (NSRZ) of Tenerife comprises at least 139 cones. The main structural characteristic of the NSRZ of the island is an apparent absence of a distinct ridge, and a fan shaped distribution of monogenetic cones. Since there are currently no visible gas emissions at the NSRZ, diffuse degassing surveys have become an important geochemical tool for the surveillance of this volcanic system. Five diffuse CO_2 degassing surveys have been carried out at NSRZ of Tenerife since 2002, the last one in the summer period of 2016, to evaluate the spatio-temporal variations of CO_2 degassing as a volcanic surveillance tool for the NSRZ of Tenerife. At each survey, around 600 sampling sites were selected to cover homogenously the study area (325 km^2) using the accumulation chamber method. The diffuse CO_2 output ranged from 78 to 707 t/d in the study period, with the highest emission rate measured in 2015. The backgroung emission rate was estimated in 300 t/d. The last results the soil CO_2 efflux values ranged from non-detectable up to 24.7 g m^{-2} d^{-1}. The spatial distribution map, constructed following the sequential Gaussian simulation (sGs) procedure, showed the highest CO_2 values as multiple isolated anomalies and did not show a clear relation with the main volcano-structural features of the area. The CO_2 output released to the atmosphere in a diffuse way has been estimated at 524 t d^{-1}, which represents a value lower than the previous one (707 t d^{-1} at summer of 2015) but higher than the background emission rate. These changes in the temporal series confirm the need of periodic diffuse emission surveys in the area as a powerful volcanic surveillance tool in volcanic systems where visible gas emanations are absent.

References:

Dóniz et al., 2008. J. Volcanol. Geotherm. Res. 173, 185.