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Diffuse CO_2 emission from the NE volcanic rift-zone of Tenerife (Canary Islands, Spain): a 15 years geochemical monitoring

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The North East Rift (NER) volcanic zone of Tenerife Island is one of the three volcanic rift-zones of the island (210 km^2). The most recent eruptive activity along the NER volcanic zone took place in the 1704-1705 period with the volcanic eruptions of Siete Fuentes, Fasnia and Arafo volcanoes. The aim of this study was to report the results of a soil CO_2 efflux survey undertaken in June 2015, with approximately 580 measuring sites. In-situ measurements of CO_2 efflux from the surface environment of NER volcanic zone were performed by means of a portable non-dispersive infrared spectrophotometer (NDIR) model LICOR Li800 following the accumulation chamber method. To quantify the total CO_2 emission from NER volcanic zone, soil CO_2 efflux contour maps were constructed using sequential Gaussian simulation (sGs) as interpolation method. The total diffuse CO_2 emission rate was estimated in 1209 t d^{-1}, with CO_2 efflux values ranging from non-detectable ($\sim$0.5 g m^{-2} d^{-1}) up to 123 g m^{-2} d^{-1}, with an average value of 5.9 g m^{-2} d^{-1}. If we compare these results with those obtained in previous surveys developed in a yearly basis, they reveal slightly variations from 2006 to 2015, with to pulses in the CO_2 emission observed in 2007 and 2014. The main temporal variation in the total CO_2 output does not seem to be masked by external variations. First peak precedes the anomalous seismicity registered in and around Tenerife Island between 2009 and 2011, suggesting stress-strain changes at depth as a possible cause for the observed changes in the total output of diffuse CO_2 emission. Second peak could be related with futures changes in the seismicity. This study demonstrates the importance of performing soil CO_2 efflux surveys as an effective surveillance volcanic tool.