

Diffuse CO₂ degassing from Brava Volcanic System, Cape Verde: a valuable tool to forecast volcanic unrest episodes

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Brava (67 km²) is the southwestern most and the smallest inhabited island of the Cape Verde archipelago. This oceanic active volcanic island is located 18 km west of Fogo Island and rises 976 m from the sea level. Volcanic hazard awareness among the Brava population and the authorities is very low because since no historical eruptions are recorded; therefore, its volcano monitoring program is scarce. A collaborative research on diffuse degassing and deformation monitoring at Brava among different Cape Verde and European institutions has been established. With the aim of providing a multidisciplinary volcano monitoring program for Brava, diffuse CO₂ emission surveys have been carried out since 2010; approximately every 2 years. To quantify the diffuse CO₂ emission rate, 100 sequential Gaussian simulations (sGs) were performed as interpolation method to construct soil CO₂ emission contour maps. An increase trend of diffuse CO₂ emission rate from 42 to 681 t d⁻¹ at Brava was observed one year before the 2014-2015 Pico do Fogo eruption (Fogo Island) and almost three years before the seismic-volcanic crisis on August 2016 with more than 1000 seismic events registered by the Cape Verde INMG on August 1st, 2016 (Bruno Faria, personal communication). Due to this seismic-volcanic crisis, diffuse CO₂ emission surveys at Brava were performed from August 2 to 10, and from October 22 to November 6, 2016. The estimated degassing rate yielded a value about 72 t d⁻¹ (typical background values) and 1.700 t d⁻¹ (maximum degassing rate measured) for the August and October-November surveys, respectively. These observed changes on diffuse CO₂ emission are geochemical evidences which seemed to support a volcanic unrest for the recent anomalous seismic activity registered at Brava (García-Merino et al., 2017). In October-November 2018 a new survey was carried out at Brava with 258 sampling sites homogeneously distributed along the island always depending on logistic reasons. Diffuse CO₂ emission ranged between non detectable and 25.3 Kg m⁻² d⁻¹, with the highest values being measured at Baleia and Vinagre villages. The 2018 diffuse CO₂ emission rate was estimated in 224 t d⁻¹, a value similar than the measured in a pre-unrest survey (2012). Our results demonstrate that periodic surveys of diffuse CO₂ emission are extremely important in the volcanic surveillance tools of Brava to improve the detection of early warning signals of future volcanic unrest episodes.

García-Merino et al., 2017. Geophysical Research Abstracts EGU2017-8905.