

Anomalous increase of diffuse CO₂ emission from Brava (Cape Verde): evidence of volcanic unrest or increase gas release from a stationary magma body?

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Brava (67 km²) is the southwestern most and the smallest inhabited island of the Cape Verde archipelago. It is located 18 km west of Fogo Island and rises 976 m from the sea level. Brava has not any documented historical eruptions, but its Holocene volcanism and relatively high seismic activity clearly indicate that it is an active volcanic island. Since there have been no historic eruptions in Brava, volcanic hazard awareness among the population and the authorities is very low; therefore, its volcano monitoring program is scarce. With the aim of helping to provide a multidisciplinary monitoring program for the volcanic surveillance of the island, diffuse CO₂ emission surveys have been carried out since 2010; approximately every 2 years. Soil CO₂ efflux measurements are periodically performed at ~ 275 observation sites all over the island and after taking into consideration their accessibility and the island volcano-structural characteristics. At each sampling site, soil CO₂ efflux measurement was performed by means of a portable NDIR sensor according to the accumulation chamber method. To quantify the total diffuse CO₂ emission from Brava volcanic system, soil CO₂ efflux maps were constructed using sequential Gaussian simulations (sGs). An increase trend of diffuse CO₂ emission rate from 42 to 681 t d⁻¹ at Brava was observed; just one year prior the 2014-2015 Fogo eruption and almost three years before the anomalous seismic activity recorded on August 2016 with more than 1000 seismic events registered by the INMG on August 1st, 2016 (Bruno Faria, personal communication). Due to this anomalous seismic activity, a diffuse CO₂ emission survey at Brava was performed from August 2 to 10, 2016, and the estimated degassing rate yield a value about 72 t d⁻¹; typical background values. An additional survey was carried out from October 22 to November 6, 2016. For this last survey, the estimated diffuse CO₂ emission from Brava showed the highest observed value with a degassing rate about 1.700 t d⁻¹. These observed changes on diffuse CO₂ emission are geochemical evidences which seem to support a volcanic unrest for the recent anomalous seismic activity registered at Brava.