

Monitoring Cumbre Vieja volcano (La Palma, Canary Islands) from 2001 to 2015 by means of diffuse CO₂ degassing

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La Palma Island, the fifth longest (706 km²) and second highest (2,423 m asl) of the Canary Islands, is located at the northwestern end of the archipelago. Subaerial volcanic activity on La Palma started ~2.0 My ago and has taken place exclusively at the southern part of the island in the last 123 ka, where Cumbre Vieja volcano, the most active basaltic volcano in the Canaries, has been constructed. Cumbre Vieja volcano, which has been likened to a Hawaiian-style rift zone, includes a main north-south rift zone 20 km long and up to 1,950 m in elevation, and covers 220 km² with vents located also at the northwest and northeast. Nowadays, there are no visible gas emissions from fumaroles or hot springs at Cumbre Vieja, but large amounts of CO₂ are released as diffuse soil emanations from the flanks of the volcano. Recent studies have shown that enhanced endogenous contributions of deep-seated CO₂ might have been responsible for higher diffuse CO₂ emission values (Padrón et al., 2015). We report here the latest results of the diffuse CO₂ efflux survey at Cumbre Vieja volcano. The CO₂ efflux measurements were taken using the accumulation chamber method in the summer period of 2015 to constrain the total CO₂ output from the studied area and to evaluate occasional CO₂ efflux surveys as a volcanic surveillance tool for Cumbre Vieja. Soil CO₂ efflux values ranged from non-detectable up to 360 g m⁻² d⁻¹. Spatial distribution maps were constructed following the sequential Gaussian simulation (sGs) procedure. The spatial distribution of diffuse CO₂ emission values did not seem to be controlled by the main structural features of the volcano since the highest values were measured in the southern part. The total CO₂ output released to the atmosphere in a diffuse way has been estimated at 359 t d⁻¹, which represents one of the lowest emission rates reported since 1997 (Padrón et al., 2015). Our results confirm the volcanic quiescence state of Cumbre Vieja, but reassert the need for periodic diffuse emission surveys as a powerful volcanic surveillance tool in volcanoes where visible gas emanations are absent.

References:

Padrón et al., 2015. Bull. Volcanol. 77, 28.