

## **Eighteen years of geochemical monitoring at the oceanic active volcanic island of El Hierro (Canary Islands, Spain)**

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We report herein the latest results of a diffuse CO<sub>2</sub> efflux survey at El Hierro volcanic system carried out during the summer period of 2015 to constrain the total CO<sub>2</sub> output from the studied area during post-eruptive period. El Hierro Island (278 km<sup>2</sup>) is the youngest and the SW-most of the Canary Islands. On July 16, 2011, a seismic-volcanic crisis started with the occurrence of more than 11,900 seismic events and significant deformation along the island. On October 10, 2011, the dominant character of seismicity changed dramatically from discrete earthquakes to continuous tremor, a clear indication that magma was rapidly approaching the surface immediately before the onset of the eruption, October 12. Eruption was declared over on 5 March, 2012. In order to monitor the volcanic activity of El Hierro Island, from 1998 to 2015 diffuse CO<sub>2</sub> emission studies have been performed at El Hierro volcanic system in a yearly basis (~600 observation sites) according to the accumulation chamber method. Spatial distribution maps were constructed following the sequential Gaussian simulation (sGs) procedure. To quantify the total CO<sub>2</sub> emission from the studied area, 100 simulations for each survey have been performed. During the eruption period, soil CO<sub>2</sub> efflux values range from non-detectable (~0.5 g m<sup>-2</sup> d<sup>-1</sup>) up to 457 g m<sup>-2</sup> d<sup>-1</sup>, reaching in November 27, 2011, the maximum CO<sub>2</sub> output estimated value of all time series, 2,398 t d<sup>-1</sup>, just before the episodes of maximum degassing observed as vigorous bubbling at the sea surface and an increment in the amplitude of the tremor signal. During the 2015 survey, soil CO<sub>2</sub> efflux values ranged from non-detectable up to 41 g m<sup>-2</sup> d<sup>-1</sup>. The spatial distribution of diffuse CO<sub>2</sub> emission values seemed to be controlled by the main volcano structural features of the island. The total diffuse CO<sub>2</sub> output released to atmosphere was estimated at 575 ± 24 t d<sup>-1</sup>, value slightly higher than the background CO<sub>2</sub> emission estimated at 422 t d<sup>-1</sup> (Melián et al., 2014). The above data demonstrate that discrete surveys of diffuse CO<sub>2</sub> emission provide important information to optimize the early warning system in volcano monitoring programs and to monitor the evolution of an ongoing volcanic eruption, even though it is a submarine eruption.

### **References:**

Melián et al., 2014. *J. Geophys. Res.* DOI: 10.1002/2014JB011013.