

## **Anomalous diffuse H<sub>2</sub> degassing prior to the recent magmatic intrusion at Cumbre Vieja volcano, La Palma, Canary Islands**

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Cumbre Vieja volcano in La Palma (220 km<sup>2</sup>), is the most active basaltic volcano in the Canaries. Since Cumbre Vieja does not show any visible degassing the geochemical volcano monitoring program has been focused on soil degassing surveys. On October 7th (2017) a remarkable seismic swarm interrupted a seismic silence of 46 years in Cumbre Vieja volcano: more than 75 earthquakes were located beneath Cumbre Vieja volcano at depths ranging between 15 and 28 km with a maximum magnitude of 2.7. On October 13rd a second seismic swarm, lasting about 14 hours, was registered with more than 47 earthquakes at depths ranging between 14 and 25 km and with a maximum magnitude of 2.1. Hydrogen (H<sub>2</sub>) is one of the most abundant trace species in volcano-hydrothermal systems and is a key participant in many redox reactions occurring in the hydrothermal reservoir gas. H<sub>2</sub> generated within the crust moves rapidly and escapes to the atmosphere, making H<sub>2</sub> an ideal geochemical indicator of magmatic and geothermal activity at depth. Soil H<sub>2</sub> emission surveys have been carried out regularly since 2001. A simple diffusive emission mechanism was applied to compute the emission H<sub>2</sub> rate at each survey and used to construct spatial distribution maps allowing the estimation of the emission rate. In the period 2001-2003, the average H<sub>2</sub> emission rate was ~2.5 kgd<sup>-1</sup>. However, increased significantly during the 2013-2018 period (~16.6 kgd<sup>-1</sup>), reaching the maximum value of the series (36 kgd<sup>-1</sup>) in June 2017, 4 month before the seismic swarms. H<sub>2</sub> emission surveys have demonstrated to be sensitive and excellent precursors of magmatic processes occurring at depth in Cumbre Vieja.