

Observed anomalous diffuse gas emission rates and heat flow from the summit crater of Teide volcano, Tenerife, Canary Islands

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The most obvious active surface geothermal features of Tenerife occur at the summit cone of Teide volcano where the occurrence of a weak fumarolic system and high rates of diffuse CO₂ degassing are observed. Monitoring diffuse degassing has become an important geochemical tool for volcanic surveillance, but few studies have been focused on He and H₂ efflux measurements. Here we present the results of diffuse CO₂, He and H₂ emission rates and heat flow surveys performed at the summit crater of Teide volcano since 2016 to evaluate the temporal variations and their relationships with seismic–volcanic activity in and around Tenerife. Measurements have been regularly performed at the same 38 observation sites distributed within an area of 6,972 m² inside summit crater. On 2 October 2016, a relevant seismic swarm of long-period events recorded, on Tenerife. The swarm lasted more than 5 hours and consisted of at least 766 detected events. As result to this seismic swarm, a sharp increase on the diffuse CO₂, He and H₂ emissions were observed. Diffuse CO₂ emission reached a maximum value of 176 td⁻¹ on february 2017, whereas diffuse He emission reached a maximum values of 1,4 kg·d⁻¹ in January 2017 and diffuse H₂ emission 35 kg·d⁻¹ in May 2017. Diffuse H₂S emission reached its first anomalous increase on June 2016, four months before the occurrence of the seismic swarm. In the case of heat flux, since 2016 it has been observed a continue increase on this parameter, suggesting changes in the the energy balance of the volcanic system. These geochemical and geophysical observations seem to be evidences of changes of processes operating deep in the hydrothermal-magmatic system of Tenerife such as the sudden release of fluids accumulated at the top of a magma chamber beneath Teide volcano.