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Seismic and geochemical signatures of a recent magmatic intrusion at Cumbre Vieja volcano, La Palma, Canary Islands

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La Palma Island (708.32 km^2) is located at the northwestern end of the Canarian 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. Nowadays, large amounts of diffuse CO_2 are release from the flanks of Cumbre Vieja volcano, mainly from a biogenic origin, but with significant endogenous contributions of deep-seated CO_2 (Padrón et al., 2015). On 7-9 and 13-14 of October 2017 two intense seismic swarm occurred beneath Cumbre Vieja. The Gutenberg-Richter b-value reached values higher than 1.9 in the seismic swarms. Furthermore the high stress drop values retrieved for some of the strongest earthquakes, the lack of similitude between events waveforms, as well as, the depth of the hypocenters (15-25 km) seems to indicate that the seismicity was related to a magmatic intrusion episode rather than to a hydrothermal source. Diffuse CO_2 measurements have been performed by means of the accumulation chamber method in about 600 sites homogenously distributed in the surface of Cumbre Vieja. To quantify the total CO_2 emission from the studied area, 100 simulations are performed for each survey following the sequential Gaussian algorithm. Additionally, diffusive helium emission surveys have been performed in the periods 2002-204 and 2011-present. Soil gas samples were collected in the same about 600 sampling sites at about 40 cm depth using a metallic probe for a later He content analysis by a QMS Pfeiffer Omnistar. A simple diffusive emission mechanism was applied to compute the emission rate of He at each survey. The last He emission survey performed before the occurrence of the mentioned seismic swarms, was finished in June 2017, and showed the higher value of the 2002-2017 series: 43 kg d^{-1}. In the surveys performed during the second seismic swarm, we computed a much higher value, reaching 198 kg d^{-1}. The He emission value has decreased steadily until reaching a minimum value (6 kg d^{-1}) in 2 month. The behaviour of diffuse CO_2 emission has been opposite to that of He, increasing the emission value from 788 at the beginning of the seismic unrest up to 2,303 t d^{-1} in the last survey (January 2018). Seismic and geochemical data suggest a consistent framework, which is also compatible with previous models of the magmatic system, proposed on the basis of petrological data. We hypothesize that the October 2017 seismic swarms were caused by an upward magma migration from an ephemeral magmatic reservoir, located in the upper mantle (about 25 km depth), toward another reservoir located close to the Moho beneath Cumbre Vieja (12-15 km). The consequent depressurization of the magma batch was the source of the volatiles observed at the surface, with a delay of few days for He and few weeks for CO_2, coherent with the expected geochemical behaviour of both gases.