Geophysical Research Abstracts
Vol. 15, EGU2013-12169, 2013
EGU General Assembly 2013

Precursory geophysical, geodetic and geochemical signatures of a new 2012 submarine eruption off the northwestern coast of El Hierro, Canary Islands, Spain

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Here we report precursory geophysical, geodetic, and geochemical signatures of a new submarine eruption off the northwestern coast of El Hierro, Canary Islands, which has been detected through acoustic imaging of submarine plumes on June 27, 2012, by the Spanish research vessel “Hespérides”. Five distinct acoustic submarine plumes have been recognized in this area at water depths between 64 and 88 m along a submarine platform located in front of the Lomo Negro volcanic cone, northwestern of El Hierro. Submarine plums are characterized by vertical columns of high-amplitude values rising from seafloor. These acoustic imaging data clearly support a new submarine eruption in 2012 associated to the recent magmatic reactivation of El Hierro volcanic system. This new eruption event was preceded by several precursory signatures: (i) a sharp increase of the seismic energy release and the number of daily earthquakes of magnitude $\geq$ 2.5 on June 25, 2012, (ii) significant vertical and horizontal displacements observed at the Canary Islands GPS permanent network (Nagoya University-ITER-GRAFCAN) at El Hierro with uplifts up to 3 cm from June 25 to 26, 2012, (iii) an anomalous increase of the soil gas radon activity at HIE02, a geochemical station located in the northwestern of El Hierro, from the end of April until the beginning of June reaching peak values of 2.7 kBq/m3 on June 3, 2012, and (iv) the highest observed corrected value of 3He/4He ratio in ground waters (8,5 Ra) from San Simón well at the northwestern of El Hierro on June 16, 2012. These precursory signals have revealed important to improve and optimize the detection of early warning signals of volcanic unrest episodes at El Hierro.