

Pulsating Magma Output Detected by Helicopter Thermal Surveys: the 2011-2012 El Hierro Submarine Eruption Test Case, Canary Islands

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The use of a hand-held thermal camera during daily helicopter flights carried out to monitor the 2011-2012 submarine volcanic eruption at El Hierro, Canary Islands, allowed us to estimate for the first time the daily erupted magma volume from a submarine eruption. Temporal evolution of estimated magma volume erupted from October 18, 2011 until February 12, 2012, is in a good agreement with the observed changes in the effusive dynamics of the submarine eruption. Three peaks have been recorded in the output rate pattern. The first one occurred on October 20, 2011, during the initial phase of the eruption and few days after the appearance of floating volcanic rocks (restingolite pyroclasts). The second peak and the highest occurred in November 8, 2011, one day after the maximum gas discharge rate observed due to both strong explosive and effusive activity. The third peak was recorded on January 6, 2012, and suggests a new input of gas-rich magma feeding the eruption before its decline. Thermal imagery by helicopter proved to be a fast, cheap and reliable technique of monitoring volcanic eruptions, even when they occur on the shallow sea floor.