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Monitoring El Hierro submarine volcanic eruption events with a submarine seismic array

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A submarine volcanic eruption took place near the southernmost emerged land of the El Hierro Island (Canary Islands, Spain), from October 2011 to February 2012. The Instituto Geografico Nacional (IGN) seismic stations network evidenced seismic unrest since July 2012 and was a reference also to follow the evolution of the seismic activity associated with the volcanic eruption.

From the beginning of the eruption a geophone string was installed less than 2 km away from the new volcano, next to La Restinga village shore, to record seismic activity related to the volcanic activity, continuously and with special interest on high frequency events. The seismic array was endowed with 8, high frequency, 3 component, 250 Hz, geophone cable string with a separation of 6 m between them. The analysis of the dataset using spectral techniques allows the characterization of the different phases of the eruption and the study of its dynamics. The correlation of the data analysis results with the observed sea surface activity (ash and lava emission and degassing) and also with the seismic activity recorded by the IGN field seismic monitoring system, allows the identification of different stages suggesting the existence of different signal sources during the volcanic eruption and also the posteruptive record of the degassing activity. The study shows that the high frequency capability of the geophone array allow the study of important features that cannot be registered by the standard seismic stations. The accumulative spectral amplitude show features related to eruptive changes.