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Olga Sánchez-Guillamón¹, Luis Miquel Fernández Salas², Juan-Tomas Vazquez¹, Desirée Palomino¹, Eugenio Fraile-Nuez³, María Gómez-Ballesteros⁴, Nieves López-González¹, Olvido Teillo⁴, J. Magdalena Santana-Casiano⁵ and Melchor González-Dávila⁵, (1)Instituto Español Oceanografía, Fuengirola - Málaga, Spain, (2)Instituto Español de Oceanografía, Cádiz, Spain, (3)Spanish Institute of Oceanography, Santa Cruz de Tenerife, Spain, (4)Instituto Español de Oceanografía, Madrid, Spain, (5)Universidad de Las Palmas de Gran Canaria, Las Palmas de Gran Canaria, Spain

Abstract:
An underwater volcanic eruption took place 1.8 km south of El Hierro Island (Canary Islands) in October 2011 and remained active until March 2012 (Fig. 1A). The Spanish Institute of Oceanography has leaded 21 multidisciplinary oceanographic cruises through BIMBACHE, RAPROCAN, VULCANO-I and II and VULCANA projects, in order to monitor the evolution of the new submarine volcano Tagoro. This volcano rises from 400 to 88 m water depth (mwd) with an elongated summit in NNW-SSE direction built up during this single eruption. It consists of a near-circular main cone and at least nine secondary cones extended towards the SSE from the main one (Fig. 1B).

Using multibeam EM710 echosounder data we have collected 15 different bathymetric models (DEMs) of 1 to 5 m resolution. These models allowed to study the geomorphological evolution during the last 5 years of a seabed circular depression located on this edifice (Fig. 1C). This depression was first time mapped during VULCANA0313 cruise on the top of an arc-like shape crest of ENE-WSW orientation, 80 m length and 127.5 mwd. At first, it was located at 127.8 mwd and had 15 x 6 m dimensions and 0.3 m deep. The latest DEMs obtained (2015-2016) reveal that the depression has enlarged its width up to 10 m and its depth in 0.8 m reaching a deepest point of 128.6 mwd. The increase of both size and depth may be directly related with the Tagoro degasification process, which started when the volcanic activity ceased. This is supported by the exhaustive physical-chemical analysis of the water column carried out on depression that show the maximum anomalies in the area, comprising a release of heat and gases (mainly CO₂), at the main and secondary craters, and the presence of chimneys of hydrothermal fluids observed in situ during the 2016 cruise. The high resolution bathymetric monitoring of the Tagoro volcano allows controlling the degasification processes during the post-eruption phase. These processes generate mesoforms as crater-like depressions that are produced by local subsidence and erosion of seabed related to gas venting.

Fig. 1. A) Location of the study area in El Hierro Island. B) Bathymetric model of 5 m resolution showing the location of the circular depression. C) Bathymetric comparison of 5 of the 15 bathymetric models showing the geomorphological evolution of the circular depression.