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FIRST DIRECT HYDROTHERMAL HEAT FLUX MEASUREMENTS AT TAGORO SUBMARINE VOLCANO, EL HIERRO ISLAND: PRELIMINARY RESULTS

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Abstract: Tagoro is one of the few worldwide submarine volcanoes that satisfies the following features: i) is an intraplate and shallow-water volcano; ii) comprises diffuse low-temperature hydrothermal fields; and iii) its physical-chemical and biological characteristics that have been monitored since its first eruption in 2011 (Fraile-Nuez et al., 2018). Despite a decade of widespread investigation, there is still a gap of knowledge on Tagoro volcano hydrothermal system. Hence, this preliminary research aims to report a precise estimation on the amount and distribution of hydrothermal vents, as well as an estimative quantification of the heat fluxes associated therein.

The hydrothermal vents distribution was determined through video imagery recorded by the Remote Operated Vehicle (ROV) Liropus-2000 during oceanographic expeditions in March and November of 2018 on board the *R/V Ángeles Alvariño*. Moreover, fluid flow velocities were estimated using a previously proposed sampling technique involving a custom-built particle-tracker device, designed to be manipulated by ROV Liropus-2000 on the hydrothermal areas (Sarrazin et al., 2009; Germanovich et al., 2015). This device was deployed during oceanographic cruises in October of 2021 and February of 2022 on board the *R/V Ángeles Alvariño*.

Preliminary results highlight the remarkably vast richness and complexity of the Tagoro hydrothermal system, which is mainly distributed in the main crater and secondary cone. Covering an area of more than 3000 m^2, the system is composed of over 3000 vents of various morphologies including diffuse-discharge fields, crevices and very fragile chimney-like vents. Additionally, hydrothermal fluid velocities at substratum level were estimated to be, on average, approximately 1 mms^{-1} with a heat flux exceeding 150 MWs^{-1}. This comprehensive study contributes to the broadening knowledge of the magnitude of hydrothermal activity at Tagoro submarine volcano and builds a reference for further studies.

Key words: heat flux, hydrothermal vents, particle-tracker device, Tagoro submarine volcano, El Hierro island.

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References:

Fraile-Nuez, E.,Santana-Casiano, J.M., González-Dávila, M., Vázquez, J.T., Fernández-Salas, L.M., Sánchez-Guillamón, O., Palomino, D., Presas-Navarro, C. (2018). Cyclic behavior associated with the degassing process at the shallow submarine volcano Tagoro, Canary Islands, Spain. Geosciences 8,457, DOI: 10.3390/geosciences8120457

Sarrazin, J., Rodier, P., Tivey, M.K., Singh, H., Schultz, A., Sarradin, P.M. (2009). Deep-Sea Research I 56, 2065-2074, DOI: 10.1016/j.dsr.2009.06.008

Germanovich, L.N., Hurt, R.S., Smith, J.E., Genc, G., Lowel, R.P. (2015). Measuring fluid flow and heat output in seafloor hydrothermal environments. Journal of Geophysical Research: Solid Earth, 120, 8031-8055, DOI: 10.1002/2015JB012245