

Turbulence associated with volcanic activity: the submarine volcano at the island of El Hierro

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Abstract

Three multidisciplinary cruises (March, October 2013 and March 2014) have been carried out (VULCANO project) to study physical-chemical anomalies, among other objectives, due to the degasification phase that is still active in the submarine Hierro volcano. In the last two cruises, we could deploy a microstructure profiler (turboMAP-L) to study the turbulence effects of this volcanic activity.

The preliminary results show for the October 2013 cruise temperature inversions with high instabilities on the secondary cones. The dissipation rates of turbulent kinetic energy, ϵ , observed by microstructure profiler reached values above $10^{-7} \text{ m}^2 \text{ s}^{-3}$ along the water column enough away from the surface layers. These regions of high turbulence induced by thermal instabilities must play an important role in the mixing of the different chemical substances whose effects would be assessed in the future.

However, ϵ observed on March 2014 cruise show high values near the bottom on the main crater of the submarine volcano. Comparisons were performed to distinguish between the turbulence of the bottom boundary layer and the induced by thermal instabilities. This turbulence in the main cone would help the mixing of chemicals substances along the water column.

The study of submarine volcanic activity in the generation of turbulence will help us understand the role that submarine volcanoes play on the vertical flux of chemicals substances and their possible effects on different marine ecosystems.

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References

- Fraile-Nuez et al., 2013. The submarine volcano eruption at the island of El Hierro: physical-chemical perturbation and biological response. *Scientific Reports* 2:486.
- Santana-Casiano et al., 2014. The natural Ocean acidification and fertilization event caused by the submarine eruption of El Hierro. *Scientific Reports* 3:1140.