

{rokbox title=| Map showing the study area :: Image:

Authors|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-physical-chemical-gradients-venting-2026-baena-thumb-et-al.png|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-physical-chemical-gradients-venting-2026-baena-et-al.png{/rokbox}

Juan Pablo Martín-Díaz, Alba González-Vega, Clàudia Pérez-Barrancos, Jesús M. Arrieta, Desirée Palomino, **Ignacio Baena-Vega**, **Sandra Mallol**, **Nuria R. de la Ballina**, Irene Díez, Juan T. Vázquez, David Díaz and Eugenio Fraile-Nuez, 2026.

[Physical-chemical gradients, CO₂ venting dynamics and microbial community composition in a shallow Mediterranean CO₂-rich hydrothermal system.](#)

Scientific Reports volume 16, Article number: 27061 (2026).

<https://doi.org/10.1038/s41598-026-57265-z>

Abstract: Shallow-water CO₂-rich hydrothermal systems provide natural laboratories for studying localized ocean acidification under realistic environmental conditions. Here, we present a multidisciplinary characterization of the Calent mound CO₂-rich system (Columbretes Islands, Western Mediterranean), based on oceanographic surveys conducted in 2020 and 2021. Localized pH anomalies were detected directly above active vents, reaching maximum reductions of 1.12 pH units, whereas water-column temperature anomalies were minimal and subsurface sediment temperatures exceeded ambient seawater by 5.67 °C. Gas analyses indicated high CO₂ concentrations (0.094 ± 0.008 mol L⁻¹), with heterogeneous degassing regimes, ranging from sporadic to continuous emissions and an average flux of 189.4 ± 15.4 kg CO₂ m⁻² yr⁻¹ at the active vent field. Vent fluids were significantly enriched in dissolved inorganic nutrients, particularly silicate, phosphate, nitrate+nitrite, and ammonium. Benthic microbial mats hosted metabolically diverse prokaryotic and eukaryotic communities, including hydrothermal-associated taxa such as Zetaproteobacteria, Campylobacterota, and Nitrososphaeria, consistent with iron, sulfur, and ammonia oxidation metabolisms. Several microbial core taxa persisted across years despite shifts in relative abundance. These findings demonstrate that Calent mound sustains an intense yet highly localized biogeochemical environment within the photic zone, where CO₂ venting and nutrient inputs jointly influence carbonate chemistry and microbial community structure.

Keywords: Shallow hydrothermal system, calent mound, CO₂ emissions, pH anomaly, nutrient enrichment, microbial community.