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Biogeochemical Processes in the Canary Islands Seamount Province: Insights from the Tropic Seamount

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The Canary Islands Seamount Province (CISP) is a hotspot of geological and biological processes, hosting extensive ferromanganese (Fe-Mn) crusts and polymetallic nodules that play a fundamental role in deep-sea biogeochemistry. These mineral deposits host strategic and rare elements[1], provide habitats for benthic communities, and support diverse microbial consortia involved in key biogeochemical transformations[2]. Despite their ecological and economic significance, the interactions between sedimentological, geochemical, and microbial processes across the CISP remain poorly understood.

As a first step toward addressing this knowledge gap, this study aims to investigate the relationship between microbial diversity, sediment granulometry, and geochemistry in the Tropic Seamount, a representative feature of the CISP. Preliminary analyses of the first 10 cm of sediment using different technics, such as granulometric, XRD, microscopy, XRF and ICP-MS, revealed a predominance of sandy sediments rich in carbonate bioclasts (e.g., foraminifera), with minor contributions from silicate minerals. Granulometric profiles indicate a fine- to medium-grained texture at the surface, with coarser fractions appearing at greater depths. Sediment heterogeneity is high, with transitions between sandy ripples, nodule-crust interfaces, crust pavements, and rocky outcrops. Microbial communities in these sediments are primarily associated with nitrogen, sulfur, and metal cycling (e.g., Fe, Mn, Co, Ni). Additional analyses of rare earth element (REE) enrichment and microbial metabolic pathways involved in metal cycling are currently underway.

A key aspect of this research is assessing how anthropogenic disturbances may impact microbial communities. Given that these microorganisms influence not only mineral formation but also primary production through chemosynthetic pathways, alterations in their structure and function could have cascading effects on precipitate formation and trophic dynamics in deep-sea seamount ecosystems.

By integrating sedimentological, geochemical, and microbial analyses, this study provides preliminary insights into the resilience and vulnerability of seamount-associated microbiota under natural and anthropogenic pressures. Understanding these interactions is crucial for evaluating the long-term impacts of deep-sea mining and for developing strategies to mitigate potential ecological consequences in seamount environments.

[1] Marino, E., González, F. J., Somoza, et al. (2017), *Ore Geology Reviews* 87, 41–61.

[2] Bergo, N. M. (2020), Doctoral dissertation, *Universidade de São Paulo.*