Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.37318

Hydrogenetic trace metal precipitation and oxidative fixation processes at the Tropic Seamount's summit (NE Atlantic)

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The hydrogenetic polymetallic nodules and Fe-Mn crusts are long-term deposits for dissolved metals in the deep ocean and are important for the chemical evolution of the ocean nowadays. However, the present understanding of the coupling between the composition of the water column, the local hydrodynamics, and the precipitation of the metals is not sufficiently detailed in the seamount environments. Here, trace and major element cycles in the area over the top of the summit of the Tropic Seamount, located in the South of the Canary Islands at around 1000 meters of water depth, are investigated through the integration of field observations collected during the Trident-2 oceanographic campaign with geochemical analysis in line with the approaches adopted in the themes of the session.

The surveys were conducted with the aid of the ROV surveys with the ROV-Luso equipment that showed the extensive presence of nodules and crusts over the plateau area. The orientation and navigation data were used to obtain the current direction vectors with the PHINS system, allowing for the construction of the wind-rose diagram that takes fluid conditions into account. This enables comparison between measured flow vectors and visual plume transport observed in the ROV imagery. Summit's water samples were collected using ROV-mounted Niskin bottles, and sediment samples were recovered using ROV's push-cores.

Major elements (Fe, Mn, Ca, Mg, K and SO_4^{2-}) and trace elements (Co, Ni, Zn and Cu) along the summit environment show patterns consistent with hydrogenetic precipitation in an oxic environment. The lack of hydrothermal presence and the steady flow conditions favour slow hydrogenetic precipitation from ambient seawater, which allows long-term growth of nodules and crusts. These results constrain modern trace metal removal processes at seamount summits and emphasize the importance of seamounts as geochemical reactors affecting regional oceanic metal deposits.