Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.33651

Understanding glacial-interglacial variations in hydrothermal metal flux: New off-axis records from the Southern East Pacific Rise

SARAH MCCART[1], DAVID LUND[1], FRANK PAVIA[2] AND KENNETH A. FARLEY[3]

[1]University of Connecticut
[2]University of Washington
[3]California Institute of Technology

The flux of hydrothermal metals to ridge crest sediments on the Southern East Pacific Rise (SEPR) was higher during the last deglaciation (8-18 ka) than either the Last Glacial Maximum (18-23 ka) or the late Holocene [1,2]. Higher metal fluxes have been interpreted to represent greater hydrothermal output from the SEPR or more rapid oxidation of hydrothermal Fe(II), modulated by deep ocean pH and dissolved oxygen levels [3,4]. Enhanced ventilation of the deep Pacific during the deglaciation may have accelerated the oxidation rate of dissolved iron, yielding higher particulate Fe fluxes near the ridge axis [3]. If the overall flux of iron from the SEPR remained constant, greater fallout of Fe-rich particles near the ridge axis would yield synchronous metal flux deficits at off-axis locations. Here we test this prediction using a transect of eleven sediment cores at ~18ºS on the EPR, located 10 km to 300 km from the ridge axis. Because most suspended particulate Fe is lost to the sediments within several hundred kilometers of the SEPR [5], the core transect is well-suited for monitoring fallout from hydrothermal plumes. At all western flank sites, the fluxes of Fe and Mn during the deglaciation were either higher than or within error of the LGM value at the same location, consistent with greater hydrothermal output from the SEPR. High deglacial metal fluxes near the ridge axis were likely driven by higher suspended particulate Fe and Mn concentrations, resulting in particle self-aggregation and fallout to axial sediments. During the LGM, however, the spatial pattern in metal fluxes was likely due to removal of particulate hydrothermal Fe and Mn by collision with the persistent rain of biogenic particles from the surface ocean.

[1] Lund et al., 2016, Science, v. 351. [2] Lund et al., 2019, Earth Planet Science Letters, v. 510. [3] Cullen and Coogan, 2017, Geophysical Research Letters, v. 44. [4] Field and Sherrell, 2000, Geochimica et Cosmochimica Acta, v. 64. [5] Fitzsimmons et al., 2017, Nature Geoscience, v. 10.