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Discovery and exploration of active off-axis hydrothermal vents at 9° 54'N East Pacific Rise

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Comprehensive knowledge of the distribution of active hydrothermal vent fields along mid-ocean ridges is essential to understanding global chemical and heat fluxes and endemic faunal distributions. However, current knowledge is biased by a historical preference for on-axis surveys. A scarcity of high-resolution bathymetric surveys in off-axis regions limits vent identification, which implies that the number of vents may be underestimated. Here, we present the discovery of an active, high-temperature, off-axis hydrothermal field on a fast-spreading ridge. This new site, the YBW-Sentry vent field, is located 750 m east of the East Pacific Rise axis and ~7 km north of on-axis vents at 9¡ 50'N, which are situated in a 50- to 100-m-wide axial summit trough. This site is currently the largest vent field known on the East Pacific Rise between 9 and 10¡ N. Its proximity to a normal fault suggests that hydrothermal fluid pathways are tectonically controlled. Geochemical evidence reveals deep fluid circulation to depths only 160 m above the axial magma lens. Relative to on-axis vents at 9¡ 50'N, these off-axis fluids attain higher temperatures and pressures during circulation through the seafloor. This tectonically controlled vent field may exhibit greater stability in fluid composition, in contrast to more dynamic, dike-controlled, on-axis vents. The location of this site indicates that high-temperature convective circulation cells extend to greater distances off axis than previously realized. Thorough high-resolution mapping is necessary to understand the distribution, frequency, and physical controls on active off-axis vent fields so that their contribution to global heat and chemical fluxes and role in metacommunity dynamics can be determined. Our 2021 observations and the discovery of the site are published in [1]. We also report new results from further exploration of the YBW-Sentry vent field in January 2023.

[1] McDermott et al. (2022), *Proceedings of the National Academy of Sciences* 119(30), e2205602119, doi: 10.1073/pnas.2205602119