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Distribution of diverse styles of hydrothermal vent fields along the slow-spreading Central Indian Ridge between 8° and 16°S

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The middle part of Central Indian Ridge (MCIR; 8°–16°S) shows typical morphology of slow-spreading ridges (i.e., development of a 500-1,000 m deep axial rift valley along the spreading center), marked by six first-order segments offset by well-defined transforms. The MCIR comprises both magmatic symmetric and less-magmatic asymmetric ridge segments. Variable types of non-transform discontinuities (NTDs) and Ocean Core Complexes (OCCs) are spatially associated with the asymmetric segment. Ten active and inactive hydrothermal vent fields were identified in various geological features formed at symmetric and asymmetric ridge sections, indicating different physiochemical processes for the formation of each hydrothermal system. They are created in different geological settings (i.e., within rift valleys, off-axis abyssal hills, NTDs, and OCCs), rock types (i.e., basalt, gabbro, ultramafic), likely heat sources (i.e., magmatic melt, gabbroic intrusion, serpentinization), and fluid pathways. Field observation of each site shows a wide range of styles of venting, sizes (and possibly ages) of hydrothermal activity, and abundances of vent faunas. Some notable features of vent fields include; (1) formation of high-temperature black smokers on the abyssal hill up to 9 km off-axis on a symmetric segment, (2) high methane, low-temperature diffuse vents with abundant vent faunas at the summit of OCC, (3) enrichment of Pb and Ba in the chimney and mound formed near the ridge axis, and (4) presence in pairs of active and fossil vent fields with different mineralogy in the vicinity. These newly identified vent fields will contribute valuable information toward understanding various aspects, from the ore-forming system to microbial diversity and biogeochemical processes, of the Indian Ocean hydrothermal system in the present and past.