Hydrothermal plume along the northern Central Indian Ridge, 8°S–17°S: Magmatic and tectonic control on hydrothermal activity at slow-spreading ridge

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CTD/MAPR profiles collected on 118 vertical casts on the slow-spreading Central Indian Ridge (8°S–17°S) reveal that hydrothermal plumes were most commonly associated with the asymmetric ridge sections where ultramafic massifs formed along one ridge flank near ridge-transform intersections or nontransform offsets (NTOs). The combined plume incidence for axial and valley wall casts, *ph*=0.30, is consistent with the existing global trend. This agreement confirms that the long-term magmatic budget of the CIR is the primary control on the spatial frequency of hydrothermal venting at this slow spreading ridge. Because plume frequency was higher along asymmetrical than symmetrical ridge sections, permeability likely controls where venting is expressed. The occurrence of hydrothermal plumes at six locations on the axial flanks indicates that such cooling can also produce vent sites far off axis, perhaps fed by fluids channeled along detachment faults.

Both the concentration and stable carbon isotope composition of dissolved methane at two vent sites indicate that methane in the hydrothermal plumes was most likely derived from magmatic outgassing or the chemical synthesis of inorganic matter. The behavior of methane in the two high-methane plumes is regulated by different processes, physical mixing and microbial oxidation of methane, mainly depending on the bathymetry of the sites. Bathymetry has a measurable effect on methane behavior even in this deep-water, mid-ocean ridge environment.