Understanding Circum-Antarctic Ridges: Magnetic insights into off-axis volcanism and hydrothermal systems near the Rodrigues Triple Junction

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Oceanic lithosphere is formed along volcanic mid-ocean ridges with spreading rate of several centimeters per year. Hydrothermal circulation is a fundamental process in mid-ocean ridges, and it essentially affects the solid-Earth cooling, ocean temperature, and material cycles. The Kairei hydrothermal field (KHF) is known as the first confirmed active seafloor hydrothermal system of the Central Indian Ridge (CIR) since its discovery in 2000 (e.g., Gamo et al., 2001, Kumagai et al., 2008, Nakamura et al., 2009; Okino et al., 2015). It is situated in the southernmost segment of the CIR near the Rodrigues ridge-ridge-ridge triple junction. The Yokoniwa hydrothermal field (YHF) was identified in 2009 in the same segment (Fujii et al., 2016a, b). The KHF and YHF are hosted in mafic as well as ultramafic rocks distributed at an off-axis volcanic knoll. Despite intensive investigations, their geological and geophysical background is still debated.

Here, we show new results of near-seafloor magnetic data obtained by the submersible *Shinkai 6500*. We investigated crustal magnetization of the hydrothermally altered zone and surrounding off-axis lava flows, and evaluated their intensities compared to previously reported values at axial areas of seafloor spreading environments. The KHF is characterized by low coherence between observed and modeled anomalies and low values of magnetization. This result suggests that magnetic minerals within basaltic lava flows were likely altered by hydrothermal fluid circulation. The variation pattern in the observed magnetic anomalies above the lava flows is in phase with that of modeled magnetic anomalies for a simple assumption with a magnetization direction parallel to the geomagnetic field. This result suggests that these lava flows preserve normal magnetic polarity corresponding to the Brunhes chron. The estimated magnetization intensity reaches 20 A/m in this area, which is clearly greater than that of the previously reported off-axis areas. This study provides new insight into the distribution of highly magnetized lava flows and indicates the distribution of recent off-axis volcanic activity, which is potentially linked to sub-seafloor hydrothermal circulation.

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