High-resolution Magnetic Signatures of Irabu Hydrothermal Fields, Okinawa Trough

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Near-seafloor magnetic fields near the active Irabu Hydrothermal fields (IHFs) were obtained by using the AUV *URASHIMA* during the R/V *Yokosuka* cruise YK14-16. The Irabu knolls are located on the axial area of a back-arc rift of the Okinawa Trough and consist of basalt to andesite. The seafloor rock samples from the same region were used for rock magnetic measurements and petrological observations. The integrated analysis of the magnetic anomaly and rock magnetic properties led to the following conclusions:

(i) The IHFs are associated with reduced magnetization reflecting the hydrothermal alteration of magnetic minerals present in the extrusive lavas and the deposits of non-magnetic hydrothermal material.

(ii) The basaltic rocks show high natural remanent magnetization (NRM) intensity ranging from 7 A/m to 214 A/m. The extremely strong NRM was caused by less oxidation, abundant single-domain-titanomagnetite grains formed under proper crystal growth rates, and low Ti content for titanomagnetites. These strongly magnetized host rocks produce large variations of magnetic anomalies in the Irabu knoll, resulting in a clear magnetic contrast between the IHFs and their surroundings areas.

(iii) The low magnetization zones (LMZs) related to the IHFs are located at the rim of the caldera floor in an elongated direction parallel to the local strike of the caldera, and extend into the caldera wall. These observations suggest that the hydrothermal fluids ascended through the caldera fault and caused accumulation of hydrothermal deposits and the occurrence of hydrothermally altered zones in both the caldera floor rim and wall.

(iv) The LMZ extends across several hundred meters along the caldera rim. Compared with similar hydrothermal fields of the Hakurei and Brothers situated in other arc-back-arc volcanoes with summit calderas, it is clarified that hydrothermal systems controlled by caldera faults have horizontal spatial scale equal to or larger than those of detachment-controlled large hydrothermal fields at slow-spreading ridges such as the TAG. It is implied that the permeability structure and style of hydrothermal circulation may play important roles in the formation of the larger demagnetized hydrothermal fluid pathways at caldera-controlled systems.

Keywords: Seafloor hydrothermal system, Marine magnetic anomaly, Rock magnetics, Okinawa Trough

