

Near-bottom geomagnetic survey over NTO (Non-transform offset) massif at Central Indian Ridge

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The near-bottom magnetic data reflect the difference, such as rock types and degree of weathering, rather than magnetic polarity reversal pattern. In this presentation, we focus on the magnetic characteristics over the hydrothermal field. If the host rock is extrusive (basaltic) rock, thermal demagnetization is expected, and there are a number of these research results. On the other hand, if the host rock is upper mantle rock, it is expected the positively enhanced magnetization by induced magnetization of magnetite through serpentinization. But this type of magnetic feature is not so much reported.

We conducted near-bottom magnetic survey using an AUV (Autonomous Underwater Vehicles), R2D4 during R/V Hakuohmaru KH10-6 cruise on November 2010. Three-component magnetometer was attached in the head of R2D4. Only one dive was done at NTO (Non-transform offset) massif between Central Indian Ridge segment1 and segment2 near the Rodriguez triple junction. NTO massif is considered to be composed of lower crust and/or mantle rock, and these rocks sometimes are exposed on its surface. The survey was consisted of four NS trending lines of about 6km and the line interval was about 500m. The mean vehicle height was 80 m from seafloor and the height varied between 40 and 200m. The figure 8 turn was operated before entering the survey line to calculate the vehicle magnetization coefficient. Three component magnetic data were calculated by removing ship magnetization estimated from vehicle coefficient. Total magnetic anomaly was calculated from three components magnetic data and by removing the IGRF value. Crustal magnetization was calculated through a magnetic inversion method (Honsho et al., 2012). 100m-thick magnetic layer and ambient magnetic direction were assumed in the calculation.

Northern survey area shows 0 or reversed magnetization and southern survey area shows positive magnetization. This positive magnetization is observed on the shallow area of the NTO massif. The remarkable high magnetization up to 30A/m is observed at the eastern area of the southern survey area. It spreads 500m*1500m in EW and NS direction. This area corresponds to shallow, NS trending knoll. Basalt, peridotite and serpentinized peridotite were dredged at the western slope of this knoll during the same cruise. In addition, a collection of dead chimney was found on the knoll by submersible dives of Sinkai 6500 on 2009. Based on the dredged rocks and the discovery of the dead hydrothermal field, it is reasonable to consider that this high normal magnetization is caused by induced magnetization originated from water-mantle rock interaction. Our geomagnetic result is a good example of the magnetization feature of mantle rock hosted hydrothermal field.

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