Isotopically enriched N-MORB: a new geochemical signature for off-axis plume-ridge interaction

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Interaction between the Southwest Indian Ridge (46°E and 52°20'E) and Crozet hotspot has been proposed by geophysical studies [1] but remains controversial mostly due to the lack of E-MORB (enriched mid-ocean ridge basalts) as the direct geochemical evidence [2]. Forty-seven new samples were collected from this region by the *RV Dayang Yihao* Cruise, including 15 from segment 27 centered at 50°28'E with a 10 km thick crust. All the samples are N-MORB (normal MORB) and can be classified into two groups: a high-Al group only at 50°28'E and a Main group widespread. The former, with higher Al_2O_3 and lower TiO_2 and SiO_2, have slightly enriched Sr-Nd-Hf-Pb isotopic compositions. We propose that their major and trace elemental signatures were modified by reaction with primitive cumulate in the crust, whereas the enriched isotopic compositions indicate the contribution of Crozet plume materials. During upslope flow of the Crozet plume to the ridge, decompression melting would occur along the path, which would deplete the plume in incompatible elements but not significantly change the isotopic compositions. Thus, when they finally reach the ridge, the depleted residue would remelt due to further decompression at MOR and produce isotopically enriched N-MORB at segment 27 [3].

Isotopically enriched N-MORB are known elsewhere, mostly at slower-spreading ridges possibly influenced by plumes with large plume-ridge distances. In particular, the constant Nd isotopic compositions with decreasing $(La/Sm)_N$ ratios for off-axis magmatism between the Réunion hotspot toward the Central Indian Ridge perfectly match such a plume-ridge interaction. Therefore, aside from E-MORB, isotopically enriched N-MORB can also be considered as the geochemical signature for off-axis plume-ridge interaction.

REFERENCES

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