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Boron and lithium concentrations of vent fluids from submarine hydrothermal systems

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Boron and lithium concentrations were determined for vent fluids from arc-backarc hydrothermal systems in West Pacific. The hydrothermal vent fluids were collected from the Suiyo Seamount in the Izu-Bonin arc, the Mariana Trough (Alice Springs and Forecast vent sites), the Manus Basin (Vienna Woods and PACMANUS sites), the North Fiji Basin (White Lady, Kaiyo, and LHOS sites), and the Okinawa Trough (JADE, CLAM, and South Ensei sites) twenty years ago. The boron and lithium concentration of vent fluids basically showed negative correlation with the magnesium concentration for each hydrothermal system, which indicates mixing of hydrothermal end member and ambient seawater. In hydrothermal fluids, Li concentrations are always higher than those in seawater (0.026 mmol/kg), while B concentrations are various compared with the seawater value (0.41 mmol/kg). Especially, at the sediment-hosted hydrothermal systems in the Okinawa Trough, the Li and B concentrations are significantly higher than those in seawater. The hydrothermal end members of Li and B concentrations in the Okinawa Trough are 4-6 mmol/kg and 4-5 mmol/kg, respectively. This suggests that large amounts of B and Li are derived from sediment during reaction between sediment and fluid. In sediment-starved hydrothermal systems, the vent fluids from the Suiyo Seamount and PACMANUS site in the Manus Basin were more enriched in B (1.6-1.8 mmol/kg) relative to other sites (0.4-0.8 mmol/kg). This difference is probably resulted from type of rock which fluid reacts with. It is suggested that dacitic rocks in the Suiyo Seamount and PACMANUS site provided more boron than basaltic rocks in other sites. On the other hand, the Li concentrations of the hydrothermal end members in sediment-starved sites ranged from 0.4 to 1.2 mmol/kg with no relationship with rock type. Further isotopic study on the vent fluids will help to reveal the behaviors of boron and lithium in submarine hydrothermal systems.

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