

B isotopic variation of spring water in Japan

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Boron has two stable isotopes ¹⁰B and ¹¹B with abundance of 18.98% and 81.02%, respectively. Natural isotopic variation of ¹¹B/¹⁰B among geological samples is from -30 permil to +60 permil as delta-¹¹B values, which is defined as relative deviations from an isotopic reference material (NIST-SRM 951) in parts per 1000. Boron isotope ratio is a powerful tracer in the fields of geochemistry, biochemistry, and environmental chemistry to trace the origin of materials.

Here B isotope ratios of spring water samples were precisely determined by ICP-MS with a multiple collector array. About 70 samples were selected among those collected from the whole area of Japan. Boron was extracted from the water samples of less than 1mL, and anion and cation ion-exchange chromatography was applied to separate B from matrix elements. Boron amount required was about 50 ng, and procedural B blank was typically around 100 pg.

Resultant delta-¹¹B values had a very wide range from +40 permil to almost -10 permil. There was a decreasing tendency of delta-¹¹B values from fore-arc to back-arc of Japan Island, which was consistent with the previously reported trend of delta-¹¹B values observed in volcanic arc rocks. These results indicate that some kind of spring water has a B isotopic signature of fluids derived from continuous dehydration reaction within the slab, though interaction with granitic rocks during upwelling should be evaluated.

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