

Distribution and sources of uranium in Okinawan rivers, Japan

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We measured natural background concentrations of dissolved U in 194 Japanese rivers and the highest concentrations were observed in two Okinawan rivers in the limestone region, the Hija and Kokuba Rivers (Mochizuki and Sugiyama, 2012). However, the U concentrations in the earth's surface of their drainage areas are relatively low and therefore the mechanisms of U supply to these rivers are of interest. In this study, we determined U concentrations as well as major chemical compositions in 17 Okinawan rivers and estimated the sources of U supplied to these rivers.

The major chemical compositions of the rivers in the northeastern region of the island were the Na-Cl or Na-HCO₃ types, while those in the southwestern region were the Ca-HCO₃ type. The Ca-HCO₃-type composition is derived from the dissolution of limestone, which is widely distributed in the southwestern region. The U concentrations in rivers were much higher in the southwestern region (32 - 3500 ng/L) than in the northeastern region (5.6 - 18 ng/L).

In the 11 rivers with Ca-HCO₃-type compositions, the limestone-derived fraction of U was estimated using the concentration ratio of U/Ca in the limestone and the Ca concentration derived from limestone. The U concentrations were almost explained by the simple dissolution of limestone in 6 rivers, but this mechanism could not account for the concentrations in 5 rivers with higher U levels (710 - 3500 ng/L). These results suggest that the U in these 5 rivers is supplied by other mechanisms, such as selective dissolution of U from rocks in the drainage areas by carbonate ions.

Keywords: Uranium, Okinawan rivers, Limestone