

Geochemical and isotopic analyses of river waters from the Okayama and Tottori Prefectures, Japan

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In order to understand the mechanisms responsible for the geochemical and isotopic variations observed in river waters, we investigated major dissolved components, trace element concentrations, and O-H isotopes of 540 river water samples collected from 379 locations of the Okayama and Tottori prefectures. Some of these samples were also studied for S and Sr isotopes. These data were used to construct high-resolution geochemical and isotopic maps of the two Prefectures.

The O-H isotopes of the studied samples display regional variations that exceed seasonal variations. A clear altitude effect is observed in the O isotopes. The d-excess value is high in the northern Okayama and Tottori Prefectures (>20), and gradually decreases towards the southern Okayama (5~15).

With the exception of a few locations in the northeastern part of the Tottori Prefecture, the SO₄ concentration is low (<5 ppm) in Tottori and northern region of the Okayama Prefecture, and gradually increases towards the southern Okayama (>10ppm). Change in the SO₄ concentration is accompanied by shift in the sulfur isotope ratio, which converges to ~0 in the high SO₄ regions. As proposed by Nakano et al. (2008, *Sci. Total Environ.*, 389, 132), decomposition of fertilizers used in agricultural activities may, at least in part, be responsible for this variation.

The concentrations of major cations such as Ca, Mg, Na, K, as well as trace elements (47 elements) also display regional variations, which can be classified into several groups. By comparing the geochemical maps of these elements with the geological maps, we note that the geochemical variations of some of these elements can be explained by reaction of ground water with rocks exposed in the area. On the other hand, variation of trace elements such as As, Cd, and Zn in some areas requires additional input from sources such as mine drainage.

Keywords: Okayama Prefecture, Tottori Prefecture, River Water