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Sulfur isotope map of surface water in northeastern Kanto, central Japan

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I determined the concentration and isotope ratio of sulfur in Naka and Kuji river watersheds in northeastern Kanto, and analysed their geographical distribution in terms of the watershed geology. Sulfur isotope ratio (d34S) in the surface water in the granite watershed of Abukuma mountainous area ranged from 2 to 8 per mill. Similar value is observed in the stream water on the plateau of Quaternary sediments.

These values are different from the d34S value of rock sulfur, but are close to that of rain water, indicating that the major source of sulfur is originated from meteric water. This suggestion is consistent with the low concentration of sulfur in the provenant geology of Abukuma granite and its clastic sediments.

The d34S value of surface watrer in the watershed of Mesozoic sedimentary rocks ranged from -2 to 6 per mill. This value is indistinguable from the d34S value of rock sulfur, suggesting the sulfur in the water is derived from sulfide and/or sulfate minerals in the rock through chemical weathering. This suggestion is consistent with that surface water in the sedimentary-rock watershed tends to be higher than that in the granite one.

Surface water, whose watershed geology is composed of sedimentary rocks of Miocene age, had variable d34S values (-8 to 18 per mill). It is likely that water with low d34S value is derived from the dissolutuion of 34S-depleted sulfides, which formed in anoxic marine environment by the activity of surfur-reducing bacteria. In contrast, the source of sulfur with high 34S is unclear. It would be possible to attribute this 34S-enriched sulfur to sulfate in the Miocene seawater, which had high d34S value (20-24 per mill). An alternate view is that the high 34S sulfate ion is derived from the remaining sulfate of groundwater which was subjected to sulfate reduction. Further study is needed to elucidate the formation of high 34S-enriched water.

Keywords: sulfur isotope, river water, Kanto