

Sulfur and Oxygen Isotopic Ratios of Rain Water Sulfate at Tottori-Okayama and Water-soluble Sulfate Ion in Suspended Particulate Matter at Okayama City

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In order to investigate secular change of cross-border pollution from China, we have collected monthly rain water samples at 7 sampling stations in Tottori and Okayama Prefectures and analyzed for their chemistry, isotopic compositions of water and sulfate ion. Also, we have collected suspended particulate matter (SPM) at Okayama University and analyzed their sulfur and oxygen isotopic compositions of water-soluble sulfate ion in order to evaluate contribution of SPM to rain water sulfate.

Rain water samples are collected as monthly composite. SPM is collected more than twice a month using high-volume sampler. The sampling duration of SPM is 4 days for each sampling. Therefore, data for rain water samples represents a monthly average value, and each data of SPM represents an event within 4 days.

Annual sulfur isotopic composition of nss-sulfate in rain water is higher at the Sea of Japan side and lower at the Seto Inland Sea side. This means only small amount of the cross-border pollution originating from coal combustion in China reaches Set Inland Sea area by crossing Chugoku Mountains. Sulfur isotopic ratios of nss-sulfate is generally high in winter and low in summer, indicating cross border pollution from China mainly occurs in winter. However, this phenomenon is not clear in some year, especially in 2018.

Oxygen isotopic composition of nss-sulfate in rain water is high in spring at all the sampling stations. This may be due to the yellow sand events in spring.

Sulfur isotopic composition of water-soluble sulfate in SPM is similar or slightly lower than that of rain water sulfate. Oxygen isotopic composition of SPM is also similar or slightly lower than that of rain water sulfate in summer, autumn and winter. However, it is higher than that of rain water sulfate sometimes in spring. The timing when oxygen isotopic composition of SPM becomes higher than that of rain water sulfate coincides with the period of high oxygen isotopic composition of rain water sulfate and yellow sand event. Therefore, high oxygen isotopic composition of rain water sulfate likely indicates the contribution of water-soluble component of yellow sand.

Keywords: Rain water sulfate, Sulfate ion in Suspended Particulate Matter, Sulfur isotope ratio, Oxygen isotope ratio, Okayama