Seasonal and Secular Change in Sulfur, Hydrogen, Oxygen and Strontium Isotopic Ratios of Precipitation Across Chugoku District.

Huixing Mao[1], Kai Tsukada[1], Tatsuya Yodose[1], Katsuyuki Yamashita[1], *Hitoshi CHIBA[1]

1.Graduate School of Natural Science and Technology, Okayama University

We have sampled precipitations at 7 sampling points in Tottori and Okayama prefectures. Sampling method is bulk sampling by which both wet- and dry-deposition are sampled together. We measured major chemical composition, sulfur isotopic ratio of sulfate ion, hydrogen, oxygen and strontium isotopic ratios of water, and considered the origin and seasonal and secular change of precipitation and its dissolved components from 2011 to 2015.
Sulfur isotopic ratio of non-sea-salt sulfate ion decreases with increase in the distance from the Sea of Japan in most seasons. It shows seasonal change, high in winter and low in summer. Therefore, cross-border pollution from mainland China seems to affect strongly at the Sea of Japan side than at the Seto Inland Sea side, and affect stronger at winter season. The maximum and minimum sulfur isotopic ratio of non-sea-salt sulfate ion seems to increase gradually from 2011 to 2015. It is necessary to monitor sulfur isotopic ratio of non-sea-salt sulfate ion continuously in order to find whether this increase is due to the increase of cross-border pollution or not.
The d-index of precipitation calculated from its hydrogen and oxygen isotopic ratio shows seasonal variation, high in winter and low in summer, at every sampling point. Furthermore, d-index of the Sea of Japan Sea side precipitation is lower than that at Seto Inland Sea side precipitation in summer season, and the former is higher than the latter in winter season. It indicates that winter precipitation is caused by the air mass coming from the mainland China and that summer precipitation is caused by the air mass coming from the Pacific Ocean. It supports that the cross-border pollution indicated by high sulfur isotopic ratio of non-sea-salt sulfate ion is brought by the air mass coming from mainland China.
Non-sea-salt Sr isotopic ratios in Yurihama and Misasa, both close to the Sea of Japan, show seasonal variation with higher ratio (>0.7010) at spring and lower ratio (~0.7070) at summer and autumn. The higher ratio at spring reflect the contribution of yellow sand from the mainland China. On the other hand, low isotopic ratio at summer and autumn seems to be affected by the low isotopic ratio material derived from local rock, which accords with the low material transfer from the mainland China indicated by sulfur isotopic ratio of nss-sulfate and d-index of precipitation. The moderate Sr isotopic ratio at winter seems to result from the small yellow sand transport during winter season.

Keywords: precipitation, Chugoku district, non-sea-salt sulfate, S isotope ratio, H and O isotope ratio, Sr isotope ratio

