

Sulfur isotopic compositions of sulfate in rainwater in the Kyoto-Osaka-Kobe area

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We determined the sulfur isotope compositions ($\delta^{34}\text{S}$) of monthly wet precipitation to elucidate the seasonal and regional variation in the provenance of dissolved sulfate. We collected monthly rainwater samples at Kyoto city and Kyotanabe city in Kyoto, at Neyagawa city in Osaka and at Nishinomiya city in Hyogo from January 2007 to December 2008.

We calculated the non-sea-salt (nss) SO_4^{2-} and nss- $\delta^{34}\text{S}$ in monthly rainwater samples on a Na basis. The nss- $\delta^{34}\text{S}$ were slightly lower than the $\delta^{34}\text{S}$ in monthly rainwater, indicating the effect of sea-salt on atmospheric deposition are small in the Kyoto-Osaka-Kobe area.

The nss $\delta^{34}\text{S}$ of monthly rainwater samples showed seasonal variation. The monthly rainwater samples in summer had the lower nss- $\delta^{34}\text{S}$, suggesting nss SO_4^{2-} in atmospheric deposition contained sulfur derived from oil in industrial activities. On the other hand, the nss- $\delta^{34}\text{S}$ and nss- SO_4^{2-} deposition in the monthly rainwater samples in winter and spring showed higher than those in summer. These results suggest that the addition of coal from the eastern Asia to nss SO_4^{2-} in atmospheric deposition were occurred in winter and spring.

Sulfur isotopic compositions of monthly rainwater samples varied depending on seasons and sites, indicating they are useful tracer to study on the provenance of sulfur in atmosphere of urban area.

Keywords: sulfur isotope, rainwater, non sea salt sulfate