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Preliminary Results of Oxygen and Sulfur Isotopes of River Sulfates in the Min Jiang, a Headwater Tributary of the Yangtze River

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We measured O and S isotope ratios of dissolved river sulfates at 5 stations (CJ301, CJ 303, CJ 304, CJ305, and CJ308: among these stations CJ304 and CJ305 are located in the main channel of the Min Jiang) in the Min Jiang, a major headwater tributary of the Yangtze River. The Min Jiang is alkaline and has high concentrations of dissolved load compared to other world rivers. Carbonate weathering is dominant in the main channel of Min Jiang, although silicate weathering and evaporite dissolution are locally important. The rate of chemical denudation in the Min Jiang is measured as 115 tons/km^2/year (in its TDS yield), which is higher than the rate of average Yangtze basin (85 tons/km^2/year).

Combined use of O and S Isotope ratios with major ion concentrations are beneficial to trace physical and biogeochemical processes of SO_4 in the river system. Main aims of the study are to identify sources of SO_4 and corresponding geochemical processes such as recharge, mixing of different water bodies, atmospheric deposition and anthropogenic effect.

The $\delta^{18}O$ values of Min Jiang sulfates range from -0.5 ‰ to 5.2 ‰ (average value: 2.8 ‰) vs. V-SMOW and the $\delta^{34}S$ values range from 1.9 ‰ to 7.5 ‰ (average value: 5.6 ‰) vs. CDT. The $\delta^{18}O$ and $\delta^{34}S$ values of sulfates on CJ301, CJ305, and CJ308, which are the branches of the Min Jiang indicate dominance of soil sulfate or oxidation of inorganic sulfide, whereas the isotopic ratios on CJ303, and CJ304, located in main channel of Min Jiang are more positive, possibly accounted for atmospheric deposition or mixing of soil sulfate and dissolved local evaporites. Low $\delta^{34}S$ values suggest that biological effect on SO_4 (e.g. bacterical sulfate reduction) is not significant in the area.

Sulfate/chloride ratios are highly dispersed which might indicate various contribution of local lithology and human effects. The tributaries of the Min Jiang (CJ301, CJ303, and CJ308) are enriched in sulfate, which might explained by dissolution of local evaporites. Main channel of Min Jiang (CJ305), however, have elevated chloride concentration, which could be the result of human activities. Intermediate ion compositions of CJ304 might represent a transitional zone between the regions of two distinct SO_4/Cl ratios.

Keywords: sulfur isotope, oxygen isotope, river sulfate, Min Jiang

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