

## Discrimination of dissolved sulfate and chloride sources in Yangtze river, China

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Sulfur and Chlorine isotopes were applied as natural tracers to determine their various natural and anthropogenic sources in the Yangtze River in China after the first year of the fulfillment of the Three Gorges Dam. The chemical and isotopic compositions of water samples from the main Yangtze River channel and its main tributaries were analyzed, and the results indicated that four sources, that is, carbonate, silicate, evaporate weathering and agriculture/urban effluents contribute to the total dissolved solutes (Chetelat *et al.*, 2008). The most water samples from the tributaries have lower  $\text{Cl}^-$  contents than the water samples from the mainstream. Different from  $\text{Cl}^-$  content variation,  $\text{SO}_4^{2-}$  contents of the tributary waters from upper reach show higher values, while those of tributary waters from middle and lower reach of the river have lower values than those of the mainstream waters.

The difference of  $\delta^{34}\text{S}$  values among the water samples from the mainstream and tributaries of the upper reach of Yangtze River is small. In contrast, the difference of  $\delta^{34}\text{S}$  values become larger in the middle and lower reach of the river, most likely suggestive of more human inputs into the river compared with upper reach waters.

The relationships between  $\text{Cl}^-/\text{SO}_4^{2-}$  vs.  $\delta^{34}\text{S}$  of the river waters indicate the dissolved sulfate was mainly derived from dissolution of evaporite for the most upper reach water samples with much higher  $\text{Cl}^-$  contents and relatively low  $\delta^{34}\text{S}$  values. In addition, this relationships suggest a mixing trend between the small amount of evaporite dissolution and anthropogenic inputs for the middle and lower reach water samples. The variations of chemical and isotopic compositions along the river show that lower reach water were more contaminated as compared to upper reach waters of the river.

The  $\text{Na}^+/\text{Cl}^-$  vs.  $\delta^{37}\text{Cl}$  diagram was proposed for the first time as a possible tool for discriminating water sources for the large rivers. There are two distinct parts or data clusters between the mainstream and tributary waters in the diagram, which show different origins of  $\text{Cl}^-$  of the waters, and indicates that rainwater and few sewages were the main inputs to the mainstream of Yangtze River, and that of local polluted sources to its tributaries.

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