Silicon isotope composition of diatoms as a paleoenvironmental proxy in Lake Huguangyan, South China

J. CHEN[1], J. LI[1], S. TIAN[2] AND G. WAN[1]

[1]State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550002, China

[2]Key Laboratory of Isotope Geology, CAGS, Beijing 100037, China

Silicon is essential for the growth of diatoms. During the uptake of dissolved silicic acid, there is a preferential incorporation of light silicon isotope (^{28}Si) into biogenic silica. The silicon isotope composition of diatom silica ($\delta^{30}Si_{diatom}$) may thus record changes in the percentage utilization of dissolved silicic acid by diatoms, which can be then related to other aspects of climate/environment. With the aim of exploring the potential of $\delta^{30}Si_{diatom}$ as an indicator of lacustrine environment, here we made the first measurements of $\delta^{30}Si_{diatom}$ in the sediment core from Lake Huguangyan, a closed crater lake in China. The result shows that $\delta^{30}Si_{diatom}$ varies from -0.6‰ to 1.1‰ and displays broad similarities to variations in contents of biogenic silica and organic carbon. $\delta^{30}Si_{diatom}$ is a reliable paleotemperature proxy in Lake Huguangyan, which is supported by good correlation between $\delta^{30}Si_{diatom}$ and available temperature records. Heavier $\delta^{30}Si_{diatom}$ indicates greater dissolved silicic acid utilization at higher temperature. The most negative $\delta^{30}Si_{diatom}$ values in the sediment core occur between AD 1580 and 1920, providing evidence for the existence of the LIA in tropical South China. There are few means by which to reconstruct the history of temperature changes in tropical terrestrial region. $\delta^{30}Si_{diatom}$, in this study, has proven to be a new promising paleotemperature proxy in lacustrine sediments, and may play important role in reconstructing past temperature changes at low latitude.

Multi-isotopic (Zn, Cu) approach for anthropogenic contamination of suspended sediments of the Seine River, France

J. CHEN, J. GAILLARDET AND P. LOUVAT

Equipe de Géo-Cosmochimie, IPGP, Paris 7, 4 place Jussieu, 75005 Paris, France (chen@ipgp.jussieu.fr)

Metal contamination is a major issue of human impact on the environment. River water is particularly susceptible to contamination for both dissolved and particulate loads, displaying a major challenge in understanding what are the dominant sources and pathways of metals in polluted drainage basins. Recent improvements in mass spectrometry allow isotopic measurements of Zn and Cu, making their isotopes a new potential device to investigate contamination of metals under dissolved and particulate forms in rivers.

We focus here on the suspended phase (SPM) of water samples from the carbonate-dominated Seine River basin. Zn and Cu isotopic compositions were measured on MC-ICP-MS (Neptune) after being separated from the matrix according to an ion exchange chromatographic protocol. Accurate $\delta^{66}Zn$ and $\delta^{65}Cu$ values were obtained with a precision $\leq$ 0.04‰ for almost all samples. With this precision, significant isotopic variations of Cu and Zn are found in SPM of the Seine basin rivers. The total isotopic variations span 0.20‰ and 0.90‰ for $\delta^{66}Zn$ and $\delta^{65}Cu$ in suspended phase of the Seine River, respectively. Our results demonstrate a clear $\delta^{66}Zn$ contrast between natural and anthropogenic sources, making Zn isotopes an effective probe of anthropogenic contamination. Both Zn and Cu display inverse relationships between concentrations (or enrichment factors) and isotope compositions in SPM of water samples as a function of the distance from the Seine spring. Suspended sediments from a time series of samples collected in Paris reveal inverse relationships between Zn and Cu concentrations and their isotopic variations according to the SPM content or water discharge. Unlike Cu, Zn isotopic variations are mainly explained by mixing of different sources of particles whose nature will be discussed. The first order conclusion of this study is that Zn and Cu isotopes have indeed interesting proxies of human impact in hydrosystems.