The Mo-isotopic composition of Siberian rivers

A. MORERAS MARTI*[1], A.J DICKSON[2], M.J. MURPHY[2], D.PORCELLI[2], O.POKROVSKY[3]

[1]School of Earth and Environmental Sciences, University of St Andrews, UK
*correspondence email : amm48@st-andrews.ac.uk
[2]Department of Earth Sciences, University of Oxford, UK
[3]CNRS, GETS, Tolouse, FR

Molybdenum (Mo) isotopes are an important trace metal proxy for reconstructing the redox history of the oceans. However, little is known about how changes in Mo isotope fractionation during riverine transport and weathering processes may have impacted on the global Mo-cycle in the geological past.

The aim of this work is to investigate the relationship between weathering and the Mo-isotope composition in Artic Rivers, and shed some light into understanding the mechanisms responsible for the variation of $\delta^{98/95}$Mo in river waters. Furthermore, significantly increase the available riverine Mo isotope data.

Water samples were collected from the Lena and the Yenisei Rivers, Siberia. The Lena River is underlain by continuous permafrost, whereas the Yenisei is predominantly underlain by discontinuous permafrost; weathering reactions in permafrost regions are limited to a shallow active layer throughout much of the year. Water samples were collected in the river main channel and tributaries which drain varying lithologies, topographies, and permafrost extent. The rivers have Mo-isotope compositions ranging from 0.01–1.62‰ (mean of 0.72‰), and concentrations from 0.81–14.51 nmol/L (mean of 4.88 nmol/L). Overall there is little relationship between major catchment lithologies, topography and permafrost, although in some tributaries the relationship between $\delta^{98/95}$Mo values and major cations suggests a role for source lithologies (particularly sulfur-rich rocks) in governing macro-scale variations in $\delta^{98/95}$Mo. For the lowlands tributaries, samples with lighter signatures of $\delta^{98/95}$Mo have higher Dissolved Organic Carbon (DOC) concentrations.

A comparison between the new Siberian river Mo-isotope data and previously published data reveals a broad similarity between rivers in different climate regimes. Such similarity suggests that the composition of the global riverine Mo-isotope flux remained relatively invariant during the long-term climatic variations that occurred in the geological past. This has implications for palaeoredox studies using Mo isotopes.