



Rhenium isotopes: applications to modern environments

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We present Rhenium (Re) concentrations and isotopic compositions of a variety of natural samples in conjunction with the better established molybdenum (Mo) and uranium (U) isotope system. While Re, U and Mo share important chemical characteristics, they do not share identical environmental sources, are released differently during weathering and appear not to be removed in the same relative proportions to the same sedimentary sinks. Therefore, the Re isotopic composition is a promising new tool providing insights that are not apparent when any of these stable isotope systems is studied alone.

The isotopic composition of rhenium ($^{187}\text{Re}/^{185}\text{Re}$) is measured by MC-ICP-MS relative to the NIST SRM 989 standard with an external reproducibility of 0.04‰ (2SD). Instrumental mass fractionation is corrected by standard-sample-bracketing and external W-correction according to exponential law (1).

Sediments rich in organic matter are considered to be the largest sink for dissolved Re in seawater (2). Isotope fractionation of $^{187}\text{Re}/^{185}\text{Re}$ of at least 0.7‰ is observed in such sediments, and changes in $^{187}\text{Re}/^{185}\text{Re}$ and Re concentration have been reported in redox gradients developed in a weathering profile (3,4).

Here, we present data on Re isotope variations in different modern marine environments such as seawater, oxic and suboxic to slightly euxinic marine sediments. Furthermore, we investigate Re concentrations and isotope ratios of several small streams draining an abandoned Kupferschiefer mining district in an attempt to trace their sources within this anthropogenically modified site. Observed Re concentrations are more than 3 orders of magnitudes higher than the average modern Re river water concentration of $\sim 16.5 \text{ pmol kg}^{-1}$ (3).

References

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