Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18097

Large Mo isotope fractionation during the diorite weathering

ZHIBING WANG[1], JIE LI[2], XIAOLIANG LIANG[2], GANGJIAN WEI[2], JINLONG MA[2] AND HONGPING HE[2]

[1]University of Chinese Academy of Sciences

[2]Guangzhou Institute of Geochemistry, Chinese Academy of Sciences

Presenting Author: wangzhibing@gig.ac.cn

Clarifying the Mo isotope circulation on the Earth surface system is a prerequisite for constraining changes in redox conditions in the global ocean throughout Earth's history by using Mo isotope. However, our current understanding of a large gradient different between global rivers and upper crustal rock remains unclear, due to the limitation in investigated regions and rock types in previous studies. The diorite rock is representing the average chemical composition of the upper crust rock and its chemeicla weathering may provide an average degree of fractionation in Mo isotope in weathering process of the upper crust rock.

This study investigates δ^{98}Mo values of bulk samples in a diorite weathering profile in Guangdong province, South China. Results from bulk samples show that δ^{98}Mo values systematically range from −0.59‰ to −2.25‰, relative to NIST 3134 = +0.25‰, suggesting that substantial large fractionation (up to 2.0‰) occur in this studied profile relative to parent rock (-0.06‰). This fractionation extent is exceeding the reported range of the previous studies. Atmospheric input has a limited effect on δ^{98}Mo variations in the weathering profile. Adsorption processes of Fe-Mn (hydro) oxide is the dominant factor controlling the variations in δ^{98}Mo, with light Mo isotopes preferentially adsorbed by Fe (hydro) oxide, whereas the incongruent dissolution of primary minerals has little effect. The results of chemical extractions show that a large proportion (>50%) of total Mo is associated with Fe-Mn (hydro) oxide. The results advance our understanding the mechanisms of Mo isotope fractionation during chemical weathering and its mass balance in Earth’s surface system.