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# Earth's surficial Mg cycle evolution over the past 2 billion years: evidence from Mg isotopes in halite and dolostone

**XIA ZHIGUANG**[1], LI SHILEI[1] AND WEIQIANG LI[2]

[1]School of Earth Sciences and Engineering, Nanjing University
[2]Nanjing University

Presenting Author: mg1729035@smail.nju.edu.cn

The global cycle of carbon and silicon is believed to be critical to maintaining the long-term habitability of the Earth. However, the exact mechanism is still controversial, and the secular records of other key elements are demanded to provide further constraints. The global ocean Mg cycle can be linked with the carbon-silicon cycle through the processes such as continental weathering, reverse weathering, hydrothermal alteration of the oceanic crust, and the formation of carbonates and clays. Meanwhile, these processes that control the ocean Mg cycle are accompanied by significant Mg isotope fractionation. Therefore, the reconstruction of Mg isotope composition of ancient seawater has the potential to quantitatively track the global ocean Mg cycle and provide a new tool for understanding the global carbon-silicon cycle and Earth's habitability. Our study reconstructed the variation curve of seawater Mg isotope composition over the past 2 billion years employing two independent archives of marine dolostone and halite. The results show that the seawater Mg isotope value generally declines from Paleoproterozoic to modern. Furthermore, the calculation of the Mg isotope mass balance highlights that the precipitation and weathering of dolostone play an essential role in regulating $CO_2$ levels and maintaining climate stability.