Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.27715

Lithium isotopes constrain the silicate weathering regime in the South China Sea during the Middle Miocene Climatic Optimum

WENWEN LIU[1] AND SHOUYE YANG[2]

[1]State Key Laboratory of Marine Geology, Tongji University
[2]State Key Laboratory of Marine Geology, Tongji University, Shanghai, China

Silicate weathering plays a significant role in regulating the carbon cycle and global climate by consuming atmospheric CO_2 over geological timescales. However, the mechanism behind the roles of continental weathering in climate change on tectonic scale is unclear and furthermore, some proxies for paleo-weathering intensities need more robust constraints. The Middle Miocene Climatic Optimum (MMCO, 16.9~14.7 Ma) was a geologically rapid warming period associated with carbon release, which remarkably strengthened the hydrological cycle. To reconstruct the evolutionary history of silicate weathering during the MMCO, we present continuous and high-resolution records of major and trace elemental compositions of clay-sized (<2 μm) siliciclastic sediments from the International Ocean Discovery Program (IODP) Site U1501 in the northern South China Sea. Higher values of chemical index of alteration (CIA) and lower of K/Al ratio in MMCO indicate stronger silicate weathering coupling with warm period, with the averages of 76.60 and 0.23, respectively. Meanwhile, the Lithium isotopes exhibit the in-phase variations with CIA and temperature reconstructed from paleoceanographic data, suggesting the strong dependence of weathering intensity on climate during the late Cenozoic. Combined with the high physical erosion rate and large delivery of clays to the ocean during this period, our findings speculate an enhanced carbon burial in MMCO thereby stabilizing climate to a certain extent.