Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.10356

Continental weathering in East Asian margin response to global cooling and dynamic source-to-sink process, from Pliocene to Quaternary

FANGLIANG LI[1], SHOUYE YANG[2], EVAN RAMOS[3] AND DAN BREECKER[3]

[1]Tongji University

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

[3]The University of Texas at Austin

Presenting Author: lifl17@tongji.edu.cn

The silicate weathering feedback on the climate plays a key role on maintaining the Earth's habitability and regulating the geological carbon cycle. However, few studies systematically evaluate the influence of non-climate factors, such as tectonics, sediment provenance and sorting/recycling effects, on the weathering signals, which makes it difficult to clarify the temporal response of chemical weathering to climate change. Here we provided various proxy records from a 600-m-thick terrestrial-shallow marine sediment sequence in East Asian margin to evaluate changes in continental weathering from the Pliocene to the Quaternary. Provenance studies using elemental, clay mineral and Sr-Nd isotopic compositions revealed an overall enlarged source region, transitioning from proximal and cratonic crustal blocks with heterogeneous compositions in the Pliocene-early Pleistocene to continental-scale mixing materials as late as middle Pleistocene. This change might closely relate to the Yellow River integration. Chemical Index of Alteration (CIA) after grain-size effect correction, Mineral Index of Alteration (MIA) and clay-sized lithium isotope ratios were applied as proxies of weathering intensity. These records show consistent temporal changes and suggest that sediments within marginal region were under intermediate weathering conditions during the middle Pliocene, shifting to high intensities at middle-to-late Pliocene warmth (ca. 3.0-3.3 Ma), decreasing to lowest weathering conditions at mid-Pleistocene transition (MPT, ca. 0.8-1.2 Ma) period, and staying at weak intensity conditions after MPT. The long-term decline in weathering intensity tracks with global cooling, suggesting a direct control of global temperature on the degree of chemical weathering. However, the increase of fresh materials from higher reaches covering Tibetan and Loess Plateaus might also partly contribute to the significant weathering regime changes, amplifying the apparent weathering response to climate changes in late Cenozoic.