Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35399

Marine silicate alteration in early diagenetic conditions

DR. WEI-LI HONG, PHD[1], TZU-HAO HUANG[2], MR. SARATH PULLYOTTUM KAVIL, MSC[1], REBECCA A PICKERING, PHD [1], JI-HOON KIM[3], JONG-SIK RYU[4], JIYEONG LEE[5] AND DR. WEN-HSUAN LIAO, PHD[6]

[1]Stockholm University
[2]University of Bonn
[3]Korea Institute of Geoscience and Mineral Resources
[4]Institution of Integrated Analytical Center for Earth and Environmental Sciences, Pukyong National University
[5]Institute of Integrated Analytical Center for Environmental Sciences, Pukyong National University
[6]National Cheng Kung University

Dissolution of detrital silicate and precipitation of authigenic clayey phases in marine sediments may play an important role in regulating long-term carbon cycling and benthic fluxes of chemicals. In early diagenetic environments, silicate alteration reactions do not operate in isolation but are tightly coupled to transformations of particulate carbon, sulfur, and metal phases. Through these interactions, silicate alteration regulates pore-fluid composition, which in turn affects the stability and transformation of associated sedimentary phases. Despite increasing recognition of sedimentary silicate alteration, how early diagenetic reactions interact with marine silicate alteration remain poorly constrained. We hypothesize that the extent of silicate alteration, including dissolution of detrital/biogenic silicates and authigenesis of clayey phases, is primarily controlled by sediment accumulation rate as well as the ratio between particulate organic carbon and reactive silicate minerals in buried sediments, while processes such as carbonate precipitation, ion adsorption, and reduction of metal oxyhydroxides modulate these reaction pathways. To test this hypothesis, we present case studies from the East/Japan Sea (Ulleung Basin), Antarctic (Amundsen Sea), and Arctic (Svalbard and Greenland fjords) that represent distinct early diagenetic regimes. We integrate pore-fluid geochemistry, core-top incubation experiment, radiogenic Si-32 tracer incubation, stable isotopes of Si, Li, Mg, and Fe, and reactive transport modelling to resolve the geochemical fingerprints arising from this complex reaction network. The combined case studies and datasets allow us to evaluate the key factors regulate silicate transformation pathways.