Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35191

Controls on labile-BSi distribution along the land-ocean continuum, the Northern East China Sea

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Biogenic silica (BSi) burial is a major sink of marine dissolved silica (dSi) and helps couple the marine Si and C cycles via diatom export. Shelf mud deposits archive physical, chemical, and ecological changes along the land-ocean continuum (LOC). In the East China Sea (ECS), mud geochemistry is commonly interpreted as being largely attributed to Changjiang-Huanghe inputs, but it remains unclear whether biogenic proxies follow the same controls in distal depocenters. The Korea Strait is a key corridor linking the northern ECS and the East/Japan Sea, where materials from Chinese rivers and Korean coastal systems are transferred and redistributed. Here we examine whether sedimentary BSi and autochthonous organic matter (TOC_{marine}) in the Korea Strait Shelf Mud (KSSM) are governed primarily by far-field Chinese-river-derived influence or by near-field forcing from the Nakdong River and the coastal front.

We analyzed five box cores (~30 cm length; 2 cm resolution) from an along-shelf transect in the southern distal KSSM for grain size, excess ^{210}Pb-derived sedimentation rates, total organic carbon (TOC) and nitrogen (TN), $\delta^{13}C_{org}$, and BSi fractions (labile and recalcitrant). Bulk TOC (TOC_{bulk}) was partitioned into TOC_{marine} and allochthonous TOC ($TOC_{terrestrial}$) using a TOC/TN-based end-member model.

$\delta^{13}C_{org}$ and TOC/TN fell within the typical marine organic matter ranges, but showed systematic along-shelf trends consistent with decreasing estuarine influence away from the Nakdong River mouth. TOC_{marine} covaried significantly with $\delta^{13}C_{org}$, whereas TOC_{bulk} did not, indicating that TOC_{marine} more robustly captures the autochthonous production signal. Sedimentary labile-BSi (lBSi; wt%) increased offshore and was inversely related to ^{210}Pb-derived sedimentation rate (R^2=0.69), consistent with the dilution effect of enhanced detrital sediment flux near the estuary. In contrast, $lBSi/TOC_{marine}$ increased away from the estuary, consistent with long-term Korea's National Marine Ecosystem Monitoring Program, showing lower dSi/DIN under N-rich freshwater influence and a reduced nearshore diatom contribution.

Overall, KSSM biogenic proxies (BSi and TOC_{marine}) respond more strongly to proximal Nakdong River fluxes than to far-field Chinese detrital signals, highlighting the need to disentangle various controls, such as nutrient-driven production, detrital dilution (sedimentation-rate effect), and grain-size effect, in interpreting LOC sedimentary records.