Preservation of sedimentary organic carbon in mud deposits of the eastern China marginal seas

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Marginal seas are major repositories of organic carbon (OC) in the ocean. Many studies have shown that OC is usually concentrated in fine-grained sediments, thus high concentration of sedimentary OC (SOC) is mainly found in mud deposits along continental margins, where fine particles are deposited. Despite such efforts, the preservation status and controlling mechanisms of SOC in coastal mud deposits is poorly constrained. In this study, 155 surface sediments from the eastern China marginal seas were analyzed for grain size composition, sediment surface area (SSA), total OC (TOC) contents and stable carbon isotope abundance ($\delta^{13}C$) to characterize the basic properties of sediments and OC, and TOC/SSA loadings were used to examine the role of mud deposits on preservation of SOC in these dynamic regions. In general, TOC and SSA had a similar distribution pattern in the study area, with high values in mud deposits and low values in sandy regions. The highest values of TOC (1.25%) and SSA (29.5 m^2/g) were found in the southern Yellow Sea mud zone. Enriched ^{13}C of TOC in these mud deposits indicated that OC was mainly derived from marine source, especially in the southwestern Cheju Island mud zone. When TOC was normalized to SSA, the distribution trend of TOC/SSA changed substantially. Distinctively low TOC/SSA loadings (<0.40 mg m^{-2}) were observed in one-third of the sampling sites, mostly in the mud deposits, indicating an inefficient SOC preservation. The preservation status and mechanisms of SOC in different mud deposits are likely to be different. In the Changjiang Estuary and Zhe-Min coastal mud zones, low terrestrial OC preservation efficiency was mainly attributed to the mobile-mud OC reactor in spite of high sediment discharges of the Changjiang and high sedimentation rates there. While in the southern Yellow Sea and southwestern Cheju Island mud zones, terrestrial particles and associated OC have experienced long distance transportation before they settle down. The counterclockwise cyclonic eddy formation mechanisms of these mud deposits further prolong the residence time of particles, which made the preservation of terrestrial OC even worse.