

Seasonal Change of Organic Carbon Mixing, Degradation and Deposition in Yangtze River Dominated Margin Related to Intrinsic and External Factors

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The East Asian monsoon, characterized by warm, humid summer and cool, dry winter, results in seasonal variability in fluvial sediment and organic carbon (OC) discharge. Here, we report the measurement of elemental, isotopic and optical compositions of OC in waters and sediments along the lower Yangtze River, Estuary and East China Sea continuum in March and July 2019. Principal component analysis separates samples into three groups that correspond to fresh water area, mixing area and seawater area. The terrigenous signal in the mixing area, indicated by water salinity and $\delta^{13}\text{C}$, was stronger in July. The applications of binary mixing models based on water salinity, dissolved OC concentration and specific terrigenous fluorescence component reveal: (1) net removal of dissolved OC from waters in July but net addition of dissolved OC into waters in March, attributed to more extensive degradation and larger deposition of OC in summer; and 2) more conservative behaviors of terrigenous OC compared to marine or mixed OC, suggesting an important role of intrinsic molecular characteristics on the persistence of dissolved OC. The estimated monthly OC burial flux in the estuary and continent shelf is 0.48×10^{12} g in July and 0.081×10^{12} g of OC in March, equal to 15.5% and 2.6% of the annual OC discharge by the Yangtze River, respectively. Our study suggests that the burial of OC mainly occurs in summer monsoon due to larger sediment load of the Yangtze River, prevailing southeastern wind, and intensified Kuroshio Current.