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Identification and Quantification of Sediment Organic Carbon in the Inter-tidal Wetlands of Eastern Coast of China

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Inter-tidal wetlands at mangroves, salt marshes and sea grass bed are important carbon reservoirs that play a significant role in climate change mitigation. However, the lack of large-scale quantification and source identification of sediment organic carbon (SOC) in inter-tidal wetlands hampers the assessment of carbon storage potential in these systems. In this research, we hypothesized that SOC in the inter-tidal wetlands of Chinese East Coast were mainly from three potential sources (terrestrial soil, marine phytoplankton, local C₃ and C₄ plants as mangrove and salt marsh plants). Based on elemental ratios and stable carbon isotope of core sediment from the inter-tidal wetlands along the east coast of China, we quantified the contribution of organic carbon (OC) sources and explored the hydrological and plant drivers controlling the variations of OC source contribution among different coastal environmental settings. We found SOC in the large estuaries (river runoff more than 50 billion m³/a) originated predominantly from terrestrial soil OC (46±9%), while the primary OC source of the smaller estuaries was marine phytoplankton OC (61±14%). These results suggested that the contribution of terrestrial soil OC increased with river runoff, whereas the share of marine phytoplankton OC decreased with runoff. Moreover, while mangroves played a substantial role in carbon storage at the southern part of the coast, our estimates revealed a sharp decline in the contribution of mangrove OC since the 1980s. These findings indicate carbon storage in the inter-tidal wetlands varies among contrasting coastal environmental conditions and among wetlands with different ages, providing implications for inter-tidal wetlands as an important carbon sink in the global carbon budget.