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Spatial variability and driving factors of carbon in typical estuarine sediments in northern China

Zhitong Yu[1], Xiujun Wang[2], Luojia Hu[1], and Wei Yao[1]
[1]Qian Xuesen Laboratory of Space Technology, China Academy of Space Technology, Beijing, China (yuzhitong@escience.cn)
[2]College of Global Change and Earth System Science, Beijing Normal University, Beijing, China (xwang@bnu.edu.cn)

Studying the carbon dynamics of estuarine sediment is crucial to understanding of carbon cycle in the coastal ocean. This study is designed to investigate the spatial variability of organic (TOC) and inorganic carbon (TIC), and to explore the mechanisms regulating their dynamics in the Yellow River Estuary (YRE) and Liao River Estuary (LRE). Based on data of the surface sediment cores, we found that TIC (6.3-20.1 g kg^{-1}) was much higher than TOC (0.2-4.4 g kg^{-1}) in the YRE, but TIC (0.4 - 4.2 g kg^{-1}) much lower than TOC (0.1 - 8.7 g kg^{-1}) in the LRE. Both TOC and TIC were generally higher to the north than to the south in the YRE, and higher offshore than nearshore in the LRE, primarily due to the differences in kinetic energy level (i.e., higher to the south and nearshore). The ranges of C:N and $\delta^{13}C_{org}$ were smaller in the YRE (2.1 - 10.1 and -24.26‰ ~ -22.66‰) than in the LRE (0.8 - 13.4 and -27.80‰ ~ -22.12‰). Our analysis suggested that TOC was mainly from marine sources in the YER, except in the southern shallow bay where approximately 75% of TOC was terrigenous. The contribution of terrestrial sources TOC was much higher in the nearshore area than in the offshore area in the LRE. The overall low levels of TOC were due to profound resuspension that could cause enhanced decomposition. On the other hand, high levels of TIC resulted partly from higher rates of biological production, and partly from decomposition of TOC associated with sediment resuspension. The isotopic signiture in TIC seems to imply that the latter is dominant in forming more TIC in both the YRE and LRE, and there may be transfer of OC to IC in the water column. Further studies with integrative and quantitative approaches are needed not only to assess the spatial and temporal variations of major carbon forms in the water column and sediments, but also to quantify the contributions of various sources and transformations among the different carbon pools, which aims to better understand the carbon cycle in northern China in a changing climate.