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Influences of tropical monsoon climatology on the delivery and dispersal of organic carbon over the Upper Gulf of Thailand, SE Asia

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The seasonal reversal of monsoon climatology modulates precipitation, currents, river influx and a variety of biogeochemical processes. In the present study, we evaluated the role of tropical monsoon pertaining to fluvial discharge, sediment load, coastal current and water stratification on seasonal organic carbon dynamics during four sampling campaigns in the Upper Gulf of Thailand (UGoT), SE Asia. This study demonstrates that particulate organic carbon (POC) is closely correlated with the river influx of suspended sediment, which is generally regulated by the local rainfall. Higher POC is found near the large estuarine section (Chao Phraya River, CHAO) during southwest monsoon period and the small estuarine section (Mae Klong River, MK) during the tropical cyclones impacted November 2013. POC in the estuarine sections is influenced more by the seasonal shift than the coastal sections. Land-derived organic matter prevails in the small estuarine and coastal sections, while marine-derived organic matter dominates in the CHAO and MK impacted estuarine sections. Total organic carbon (TOC) however displays less significant seasonal monsoon variations than POC. Further, TOC tends to accumulate in the sub-silt fraction of sediments, which mainly occurs in the small estuarine and eastern coastal sections and is obviously influenced more by marine-derived factors. TOC in surface sediment of the CHAO and MK influenced sections however displays more seasonal variations with prevailing river input as evidenced by coarser sediment and higher C/N ratios. Moreover, the almost year round water stratification across the region acts as the barrier in retaining organic carbon in the estuaries and their vicinities from dispersal into the lower portion of Gulf of Thailand. High sedimentation rate ($\sim 1.1 \text{ cm}\cdot\text{yr}^{-1}$) further facilitates the organic carbon burial in the study area. The delivery, dispersal and burial of organic carbon are closely associated with the climate controlled precipitation, and thus the tropical monsoon climatology under the global warming in particular is an important factor influencing the organic carbon in the UGoT.

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