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Climatology and trends of Dissolved Organic Carbon in coastal waters off Sarawak, Borneo

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South-East Asian peatlands are a globally significant carbon store. Rivers draining these peatlands have some of the highest dissolved organic carbon (DOC) concentrations in the world and account for up to 10% of the global land-to-ocean carbon flux, thus representing an important input to the marine carbon cycle. The release of DOC from peatlands is a natural process, yet the rapid and extensive transformation of these peatlands for agriculture over the past two decades is thought to have increased fluvial carbon losses significantly. However, not only do we lack a firm understanding of the fate of this terrigenous DOC in tropical seas, the distribution and long-term variability in DOC have never been studied at large scales in SE Asia. We will present the seasonal climatology (2002–2018) of spatial distribution patterns of DOC concentrations and optical properties (absorption coefficients, spectral slope) of colored dissolved organic matter (CDOM) for coastal waters of Sarawak, Malaysian Borneo derived using a regionally tailored semi-analytical inversion model from MODIS Aqua. Our results reveal substantial inputs of DOC from Sarawak rivers DOC close to shore exceeds 125 μM , and CDOM across the study region shows predominantly terrigenous spectral signatures. DOC concentrations were higher during the rainier northeast monsoon than during the drier south-west monsoon. Our data suggest that long-term increases in DOC concentration have occurred across parts of our study region from 2002–2018, which has implications for the aquatic light regime and coastal biogeochemistry [PM5]. These results will be discussed in the context of past anthropogenic disturbance to coastal peatlands.

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