

Communication

A New Remote Sensing Method to Estimate River to Ocean DOC Flux in Peatland Dominated Sarawak Coastal Regions, Borneo

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Abstract: We present a new remote sensing based method to estimate dissolved organic carbon (DOC) flux discharged from rivers into coastal waters off the Sarawak region in Borneo. This method comprises three steps. In the first step, we developed an algorithm for estimating DOC concentrations using the ratio of Landsat-8 Red to Green bands $B4/B3$ ($DOC (\mu\text{M C}) = 89.86 \cdot e^{0.27 \cdot (B4/B3)}$), which showed good correlation ($R = 0.88$) and low mean relative error (+5.71%) between measured and predicted DOC. In the second step, we used TRMM Multisatellite Precipitation Analysis (TMPA) precipitation data to estimate river discharge for the river basins. In the final step, DOC flux for each river catchment was then estimated by combining Landsat-8 derived DOC concentrations and TMPA derived river discharge. The analysis of remote sensing derived DOC flux (April 2013 to December 2018) shows that Sarawak coastal waters off the Rajang river basin, received the highest DOC flux (72% of total) with an average of 168 Gg C per year in our study area, has seasonal variability. The whole of Sarawak represents about 0.1% of the global annual riverine and estuarine DOC flux. The results presented in this study demonstrate the ability to estimate DOC flux using satellite remotely sensed observations.

Keywords: DOC flux; Landsat-8; TMPA; tropical coastal waters

1. Introduction

Dissolved organic carbon (DOC) is an important component in the global carbon cycle. This is particularly true for the ocean, where DOC represents about 97% of the organic carbon pool [1]. One of the main inputs of DOC to the ocean is from rivers, with approximately 62% of this export occurring in tropical regions [2]. The discharge into the South China Sea (covering 1% of the world's ocean) accounts for almost 10% of global riverine DOC fluxes [3]. The high contribution is due to extensive peat deposits along the coasts of Borneo and Sumatra [4,5]. These peatlands are drained by