Carbon transport from a riverine mangrove forest on Panay Island in the Philippines

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Mangrove forests are well-known for the high net primary productivity, and the significant export of fixed carbon (C) as solutes (e.g. DIC or DOC) or as particulates (POC) to adjacent coastal areas by tidal exchanges. Compilation from the world's mangrove ecosystems suggests that about 67 % of carbon is discharged as DIC to the coastal ocean, followed by 22 % as POC and 12 % as DOC. The sources of these C can be dependent on mangrove status (e.g. pristine, degraded, and regenerated) as well as catchment characteristics. But information is limited to characterize these fluxes yet. The objectives of this study, therefore, is to characterize C exports from a relatively pristine riverine mangrove forest in Katunggan It Ibajay (KII) Eco-Park on Panay Island, the Philippines, from a fieldwork conducted in September 2017.

Samples were collected and analyzed for total alkalinity (TA), dissolved inorganic carbon (DIC), the carbon isotope composition of DIC ($\delta^{13}C_{DIC}$), dissolved organic carbon (DOC), particulate organic carbon (POC), and the carbon isotope composition of POC ($\delta^{13}C_{POC}$) during a 24-hr sampling at an outlet of the forest and during low tide and high tide spatial samplings in the creeks including the freshwater endmember.

TA and DIC in the freshwater were as high as 5,000 μmol kg^{-1}, suggesting weathering of limestone in the watershed. DIC in the creeks ranged from 2,000 to 5,000 μmol kg^{-1}. Mangrove-derived DIC ($\Delta DIC_{mangrove}$) was calculated based on conservative mixing model between the freshwater and seawater endmembers using DIC and $\delta^{13}C_{DIC}$ values. $\Delta DIC_{mangrove}$ in mesohaline (salinity 5-18) and polyhaline (salinity 18-30) waters ranged from 184 to 2050 μmol kg^{-1} and was especially high in polyhaline waters. Majority of mangrove-derive carbon (~95%) was in the form of DIC, followed by DOC and POC in this mangrove ecosystem during the survey period. TA was also generated within the mangrove forest, suggesting groundwater or interstitial water can be a significant source of the solutes. Better understanding of groundwater flux and source organic matter signatures will be needed to further refine carbon export processes from the mangrove forest to the adjacent ecosystems.

Keywords: DIC, Carbon transport, Mangrove forest, Philippines

