Supply and transformation of organic matter in Tasik Chini and its role in underpinning lake ecosystem functioning

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In tropical wetlands, seasonal connectivity with upstream river systems leads to large transformations in limnological characteristics, differences in Dissolved Organic Matter (DOM) sources and the succession of aquatic communities. These are all important factors in global carbon cycling. This is particularly relevant for the tropical flood pulse wetland of Tasik Chini, which is seasonally inundated by the Sg. Pahang, thereby sustaining the aquatic life cycle of the wetland including the iconic, native aquatic lotus (*Nelumbo nucifera*).

For the first time, we combine advanced geochemical analyses of DOM (liquid chromatography organic carbon and nitrogen detection) with algal pigment biomarkers and calculations of algal biomass (Chl *a*) in Tasik Chini. These data were collected on a monthly basis (January to November) for the year 2017, in conjunction with lake physio-chemical characteristics, total suspended solids (TSS), inorganic nutrient concentrations and the oxygen isotope composition ($\delta^{18}O$) of lake waters. Together, these measurements identify key ecological phases, over the year, in the transport of DOM and its transformation via primary producers. The first phase coincides with the transition from the wet to dry season (January to May 2017) and captures the high nutrient influx and pedogenic (allochthonous) sources of DOM following the monsoon (high TSS, lower $\delta^{18}O$). This leads to a peak phytoplankton response between March and April, dominated by siliceous (fucoxanthin) algae. Between the months June to October, the second ecological phase in Tasik Chini is characterised by aquagenic(autochthonous) DOM, coincident with the peak dry season (higher $\delta^{18}O$) and a second peak in algal productivity. Due to nutrient exhaustion in phase 1, mixotrophic phytoplankton communities (cryptophytes [alloxanthin]) dominate phase 2, highlighting the importance of the internal cycling of DOM as a result of the reduction in pedogenic supply, peak in algal productivity (e.g. phytoplankton and macrophytes) with a shift to heterotrophy.

Here we show that studies on aquatic biomass and communities in seasonal flood pulse wetlands provide a valuable tool to explore changes in DOM transport, as well as its processing and burial, as a function of primary productivity. Forming the building blocks of aquatic foodwebs, these key components and their interactions have to date been undervalued in conceptual models of basin scale river connectivity which our paper explores (e.g. The River Continuum Concept, River Productivity Model and Flood Pulse Concept).