Lateral Carbon and Nutrients Exchanges in a Mangrove Tidal Creek: A Multi-Stable Isotope Approach

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Mangroves act as both a sink and a source of carbon and nutrients within the tropical coastal marine environment. While the significant role of this ecosystem to durably sequester carbon is well documented, less is known about the biogeochemical exchanges occurring via tides between mangrove sediments and tidal creeks, and the coastal system.

The two objectives of our research were (a) to determine the importance of lateral carbon and nutrients fluxes, from both the mangrove soil and the water column, and (b) to estimate the respective contribution of the surface and subsurface runoff from the mangrove sediment during this process. 24h time series were conducted at both, dry and wet seasons, during the different tidal regimes in a low latitude mangrove tidal creek (Can Gio Biosphere Reserve, Vietnam).

Our results show that a large amount of the organic and inorganic matter produced by the mangrove vegetation is transferred via surface runoff and subsurface groundwater discharge (SGD). Porewater seepage, estimated with ^{222}Rn natural gas tracer, is therefore a major driver of carbon and nutrients outflow. As a result, mangrove tidal creek, particularly at low tide, acts as a source of carbon to be reemitted into the atmosphere -under its gaseous phase (CO_2), and in the coastal ocean via the tidal pumping process – under its dissolved and particulate phase. Unlike Phosphorus, concentrations and availability of the dissolved forms of nitrogen species are also correlated with tidal variations: NH_4 being higher at low tide while NO_3 being higher at high tide. Nitrogen and oxygen stable isotope compositions of nitrate ($\delta^{15}N_{NO3}$ & $\delta^{18}O_{NO3}$) were studied and are providing essential information for understanding N transformation mechanisms and their potential implications for the carbon production and transformation processes.