Origin of dissolved versus particulate organic carbon in tropical coastal ecosystems: a comparison of stable isotope data from different systems

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Dissolved organic carbon (DOC) is typically the dominant form of organic matter in estuaries and coastal waters, but relatively few studies have measured its stable isotope composition or compared its origin with that of the particulate organic carbon (POC) pool. We report here on measurements of the concentrations and stable isotope composition of both DOC and POC from a range of tropical coastal ecosystems: the Tana estuary and delta (northern Kenya), the mangrove-fringed Mtoni estuary (Tanzania), Ras Dege mangrove creek (Tanzania), the Betsiboka estuary (Madagascar), the Mekong delta (Vietnam), and mangrove creeks in the Ca Mau province (Vietnam).

Large variations in the δ^{13}C signatures of both DOC and POC were observed, and the difference in δ^{13}C signatures between both pools ($\delta^{13}C_{DOC} - \delta^{13}C_{POC}$) ranged from -7.6 to + 9.0 per mil. Thus, the origin of POC and DOC can exhibit surprisingly large differences within and between different coastal systems.

In the Tana estuary and delta, C4-derived material from the catchment area was more important in the POC pool than in the DOC pool. In the Betsiboka estuary (Madagascar), where C4 vegetation also covers a large extent of the catchment area, the opposite pattern was observed in the freshwater and low-salinity zone of the estuary, but at salinities $>$15, DOC became more ^{13}C-depleted than POC. In the Mekong delta and mangrove creeks in the Ca Mau province (Vietnam), where the catchment is dom-

inated by C3 vegetation, DOC was consistently depleted versus POC by $\sim$1.5-2.5 per mil. In the two Tanzanian mangrove systems, the large variations in $\delta^{13}C$ of both pools were largely consistent with a mixing process between marine- and mangrove-derived organic matter, with significant internal inputs of mangrove-derived DOC along the salinity gradient in Mtoni. Differences in $\delta^{13}C$ signatures between both pools (which ranged up to 9 per mil) could be explained by the different end-member signatures and pool sizes.

In summary, our results show an often unexpected difference in the origin of dissolved and particulate organic carbon in tropical coastal ecosystems, and stress the need for a more refined characterization of organic matter (in particular DOC) to improve our understanding of carbon cycling in these systems.