Wetland-driven shifts in suspended particulate organic matter composition of the Hudson River estuary, New York

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ABSTRACT: Elemental carbon and nitrogen, stable isotopes, and lignin phenols were quantified for suspended particulate material exchanging between Tivoli Bays wetlands and the main stem of the freshwater-tidal Hudson River estuary (HRE) across a tidal cycle, seasonally in 2006 and monthly in 2007 during the ice-free portion of the year. Temporal shifts in organic matter (OM) composition ranged from 33.1 to 247.6 mg g^{-1} particulate organic carbon (POC), -34.7‰ to -27.2‰ stable carbon isotopic signature of POC ($\delta^{13}C_{POC}$), -3.6‰ to 13.6‰ nitrogen isotopic signature of particulate nitrogen ($\delta^{15}N_{PN}$), and 0.8 to 25.0 mg per 100 mg OC lignin phenols. From May to August, the wetlands transferred abundant (up to 247.6 mg g^{-1}), chemically distinctive ($\delta^{13}C_{POC}$ as depleted as -34.7‰) particulate OM to the HRE, particularly Tivoli South Bay. We estimated a net export of > 60 Mg km^{-2} yr^{-1} POC from Tivoli Bays into the HRE. Mixing model iterations indicated that planktonic OM was the dominant source (50% to 86%) during summertime, while contributions from allochthonous and planktonic OM during other seasons were roughly equivalent (~ 38%). Taken together, both geochemical data and mixing modeling underscore the function and value of HRE tidal wetlands as major generators of compositionally unique and labile POC for the estuarine carbon budget. In a broader context, lateral aquatic connections with tidal wetlands at seasonal or localized scales may overshadow internal or upland influences on OM composition, production, and processing in estuaries; a latent but key consideration when deciphering temporal and longitudinal trends.

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