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Biomass and Stable Carbon Isotope distributions in the Amazon Plume Region

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Amazon River has the largest freshwater discharge into the world ocean. It exerts a profound influence on the composition of particulate organic matter over time and distance and in response to hydrological changes. We investigate the distribution of particulate carbon, C:N elemental ratio and $\delta^{13}C$ values during three seasons in the surface and upper 100 m of the water column in areas of the Western Tropical North Atlantic influenced by the Amazon River Plume: the Spring high flow period (KN197 Cruise, May-June), the late Summer period of reduced flow (AT2104 cruise, July), and the low flow period in the Fall (MV1110 cruise, Sept-Oct). We found distinct regional variations in biomass distributions, with the highest concentrations in the plume core and margins and the lowest in the offshore waters. The Surface and Mean Water Column [PC] ranged from 0.62 to 259.75 μmol L^{-1} and 0.51 to 512.7 μmol L^{-1}, respectively. The C: N ratio was highest during the peak flow season and decreased in the late summer and fall. The surface C: N ratio was higher than MWC C: N (ranging from 4.4 to 14.2 and 5.0 to 12.9, respectively). The $\delta^{13}C$ of suspended particles showed distinctive surface and depth variability, reflecting both variations in rate and cell size as well as the nutrient status of the sampled habitats. The most positive $\delta^{13}C$ value (-15.7 ‰.) was observed in the peak outflow season, and the most negative $\delta^{13}C$ (-26.9‰) was observed in the late summer, particularly in the RI habitat associated with its proximity to the river mouth, where terrestrial input predominates. Our findings emphasize the rule of the Amazon River Plume in enhancing the area's biomass and productivity and reworking the carbon cycle's biogeochemical dynamic.

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