Lateral Nitrogen Input During Summer to Sagami Bay, Japan: A Deep Bay and Carbon Dioxide Sink

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Sagami Bay is a deep bay with a depth of 1,500 m at the center, connecting the deep water of the Pacific Ocean through the Sagami Trough. Our previous study revealed that the central Sagami Bay absorbs carbon dioxide (CO_2) at an annual flux (30 gC m^{-2} y^{-1}), more than six times the global average, which was attributed to biological drawdown of the seawater CO_2 partial pressure (i.e., CO_2 fixation by phytoplankton) during spring and summer, followed by accelerated downward transports of particulate organic carbon. This study investigated variations in surface water suspended particulate nitrogen (PN) isotope delta ($\delta^{15}N_{PN}$) to examine upper layer PN and nutrient dynamics in Sagami Bay. The $\delta^{15}N_{PN}$ exhibited variation corresponding to seasonal nitrate concentration changes, and its horizontal distribution in summer closely correlated with a significant salinity gradient, alongside PN concentration. Analysis of the negative $\delta^{15}N_{PN}$-salinity relationship, using a conservative mixing model with Kuroshio offshore water and low-salinity coastal water as endmembers, revealed that N with a high $\delta^{15}N$ was supplied to Sagami Bay through freshwater inflow from Tokyo Bay,connected to the bay. The transport efficiency of this N input increased with heavy rain events, significantly contributing to the bay's highest productivity of the year. This summer N input plays a vital role in exporting particulate organic carbon to the mesopelagic zone and absorbing atmospheric CO_2.

Keywords: Sagami Bay, Surface water suspended particle, Stable nitrogen isotope, Nutrients, Biological carbon pump

