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Nutrient Structure and Potential Limitation Factors of the Phytoplankton During Summer and Winter in Changjiang Estuary and Adjacent East China Sea

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The spatial distribution of NO_3^-, PO_4^{3-}, SiO_3^{2-} were studied on the basis of the 2006 summer and winter cruises in the Changjiang (Yangtze River) Estuary and the adjacent East China Sea(ECS), the nutrients distribution was mainly controlled by the Changjiang dilution water and offshore seawater mixing. NO_3^-, PO_4^{3-}, SiO_3^{2-} were high west and low east, presenting two tongues shape nearshore, meanwhile the high concentration tongue expanded northeast due to the Changjiang dilution water northeast turning. There were still two high concentration areas at Changjiang River mouth and Hangzhou Bay in winter, the contours of same value were closer to the coast than summer because of the Kuroshio invasion. Combined with the nutrient structure difference along the estuary gradient, the potential relative nutrient limitation of surface water at each station was distinguished. Coastal water was featured with excess nitrogen, in summer DIN/P ratio was up to 160 at some station in the frequent algae blooms area, while Si/N reached as low as 0.5, which could be caused by luxury consumption of P and sufficient uptake of Si by diatom bloom. The absolute N, P limitation area was located in the east of 124˚E in summer, but in winter there were no absolute nutrients limitation because of the strong vertical mixing. Moreover, temperature, suspend particles, grazing impact of zooplankton, entrainment of currents would limit phytoplankton growth, deeper research are needed. For better understanding the process of nutrients structure variation and influence on phytoplankton growth during the Changjiang dilution water and seawater mixing, we also conducted field incubation simulating different fresh-saline water mixing scale. The results showed the higher percentage of freshwater, the higher growth rate of the phytoplankton. PO_4^{3-} depleted in 48 h, was likely the potential limition factor of the phytoplankton growth in the water below the salinity of 26. DIN/P was increasing during phytoplankton exponential growth period at each spike except the 0%, while DIN/Si was decreasing, indicating dinoflagellate might be dominant species in the incubation group. The incubation presented the phytoplankton growth extent and rate difference during fresh-saline water mixing, which makes nutrients gradient, and this mixing process may cause local blooms to change the nutrient structure, then might result in phytoplankton regime shift.