Effect of sediment resuspension on the cycling of nutrients in the East China Sea

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The continental shelf with strong bottom tidal currents, such as the East China Sea (ECS), is generally characterized by the relative high planktonic productivity compared to the stratified open ocean water. We hypothesized that tidal stirring of the bottom sediment rich in planktonic or other biogenic matter might enhance the dissolution or decomposition of their components due to the increased collision and subsequent breakdown and further dissolution or decomposition reaction of suspended bottom sediments near the sea floor, particularly in the suspended matter rich nepheloid layer as the tidal energy being dissipated along the sea floor. The resuspension effect of sediment on the nutrients regeneration within water column was studied by shaking or non-shaking bottles, containing seawater only and seawater with the surface sediment from three different sites including one site with high turbulent kinetic energy in the ECS. Inorganic nutrient concentrations were measured at the 1-3 day intervals for two weeks. The anomaly of nutrient concentration between shaking bottles and non-shaking bottles implies the sediment resuspension effect on the nutrient concentration. The phosphate and nitrate concentrations clearly showed logarithmic increase during the shaking experiment, suggesting positive sediment resuspension effect on the nutrient regeneration within the incubation bottle. The portions of phosphate and nitrate regenerated by massive resuspension during two weeks accounted for 0.77 - 2.80 and 0.65 - 1.28 % of organic phosphorus and nitrogen in suspended sediment, respectively. The increase of nutrient by sediment resuspension were more conspicuous in the surface sediment from sites with weak turbulent kinetic energy than that from sites with high turbulent kinetic energy . There was no apparent increase of silicate concentration during the shaking experiment, suggesting that the regeneration of silicate may be different from oxic-degradation of organic matter. This study indicates that the sediment resuspension by strong tidal current may play an important role in maintaining high productivity over the continental shelf of the ECS.