Coastal and marine ecosystems, biology and ecology

Submarine Groundwater Discharge In Obama Bay

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Coastal seas are the most productive region in the world. Surface runoff from a river is considered as one of the most important pathway of nutrients for primary production in coastal seas. In recent years, however, a number of studies have shown that submarine groundwater discharge (SGD) is an alternative nutrient pathway and can drive primary production in coastal seas. In Obama Bay, which is located in central Japan facing to Sea of Japan, a prominent chlorophyll-a maximum layer is formed in the bottom layer (Depth: 15-20 m) around 2-3 km offshore from the river mouth. Although the aquifer distribution in Obama Plain shows discharges of unconfined groundwater may induce this phytoplankton blooms, influence of SGD on phytoplankton production is still unclear. In this study, we examined seasonal and spatial changes of Rn-222 (a natural groundwater tracer) in the bottom layers from the river mouth to the bay mouth, and assessed influence of SGD on phytoplankton production in Obama Bay. Seasonal variation of Rn-222 concentrations in the bottom layer was observed: higher in spring and lower in summer. Higher Rn-222 concentrations in spring were obtained from ~20 m depth around 3 km offshore from the river mouth. Assuming that Rn-222 concentration of groundwater is constant, seasonal variation of Rn-222 concentrations in bottom waters express that in SGD flux. Strong influence of SGD in spring would be driven by melting of snow within the watershed of the bay. Seasonal and temporal changes in nutrients and chlorophyll-a concentrations in the bottom layer were similar to those in Rn-222. These results imply that nutrient supply through SGD is an important nutrient source for phytoplankton production in Obama Bay.