slightly different between flood tide/inflow and ebb tide/outflow in the tidal flat, because of bars as banks. It will consider that *Ulva* sp. in the tidal flat is accumulated by the difference of the path of water flow as inflow and outflow on it; i.e. the inflow line is shorter than outflow line. Conversely speaking, contact period between atmosphere and the surface of muddy sediment layer has a tendency of decreasing.
Secondly, the distribution area of *Uva* sp. in the tidal flat is increased in proportion to seawater temperature in the region of more than 15 degree centigrade. Finally, it is analyzed that the accumulation of Ulva sp. in Yatsu Tidal Flat for the wind direction and velocity are classified in four patterns; combination pattern of sear breeze and flood tide/inflow, multiplication pattern, combination pattern of land breeze and ebb tide/outflow and run-up pattern due to typhoon.

Effects of phytoplankton vertical migration on the formation of oxygen depleted water in a shallow coastal sea

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It is widely recognized that oxygen depletion in the lower layer of water column during summer stratified season is mainly caused by higher decomposition rate of organic matter and lower oxygen supply from the upper layer. However, vertical migration of phytoplankton has not been adequately considered on the formation of oxygen depleted water in the lower layer. In this paper, we will show the effect of vertical migration of dinoflagellate on the oxygen budget at 10 m depth in semi-enclosed bay, Ago Bay, Japan. Benthic oxygen consumption rates were measured directly with in situ transparent chamber at 3 hours intervals from 13 July to 16 August, 2004. Hourly observations of water column temperature, salinity, and oxygen, combined with wind data, allowed calculations of oxygen flux from the air to seawater and diffusive oxygen flux through the pycnocline. The effect of horizontal advection and diffusion were neglected, because horizontal variations of oxygen and salinity were small during calculation period. During 30 July -2 August, stratification was temporarily destroyed due to strong wind-induced mixing caused by typhoon. Before the mixing, phytoplankton species, the diatom *Skeletonema costatum* dominated in the lower layer below picnocline. Oxygen supply rate to the lower layer by in situ planktonic net oxygen production and by physical processes from the upper layer was 2.1 g O_2 m^{-2} day^{-1} and 0.54 g O_2 $m^{-2}day^{-1}$, respectively. The total supply rate was almost equal to the sediment oxygen consumption rate of 3.4 g O_2 $m^{-2}day^{-1}$. As a result, oxygen decreased gradually at 0.3 g O_2 m^{-2} day^{-1} but was still remaining in the lower layer during the period of the diatom dominancy. In contrast, after the mixing, the dominant species was shifted to the dinoflagellates *Heterocapca circularisquama*. Average net oxygen production in the upper layer increased to 3.4 g O_2 m^{-2} day^{-1}, which was larger than that of 0.64 g O_2 m^{-2} day^{-1} during diatom dominant period. In the lower layer, however, despite the sediment consumption rate decreased compared to that in the diatom dominant period, oxygen decreased with 4 times higher rate (-3.2 g O_2 m^{-2} day^{-1}). This could be attributed to a decrease in planktonic net oxygen production (-1.3 g O_2 m^{-2} day^{-1}) (negative value signifies oxygen consumption) due to daytime upward migration of the dominant dinoflagellate *H. circularisquama*. The results of the present study indicate that phytoplankton migration behavior can affect on the formation of oxygen depleted water in the lower layer of eutrophic shallow coastal seas.

Contaminant loads and their variability in the Yangtze River estuary and its mouth

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Mass fluxes of the water quality constituents to the Yangtze River estuary, including chemical oxygen demand (COD_{Mn}), 5-day biochemical oxygen demand (BOD_5), nitrate nitrogen, ammonia nitrogen, and suspended sediments, are calculated using the water quality data of three stations in the lower reach of the Yangtze River from 1995 to 2002. The temporal trends of concentrations of water quality variables and their fluxes are analyzed and discussed. The results indicate that on an year-to year basis, the concentrations and annual fluxes of organic pollutants and suspended sediments show a declining trend over the past 11 years, while those of nitrates nitrogen, and phosphates