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The watershed of the Changjiang river covers twenty percent of China's land area and about four hundred million people live in this watershed. This area produces about forty percent of agriculture and industrial products in China. To support this dynamical human activity, land uses are being changed dramatically in the watershed. For example, agricultural land is being converted to use for human settlements and industry, and forests are being cut and converted to agricultural land. These changes result in more nitrogen and phosphorus loads from factories and towns flowing into the Changjiang river, as well as greater amounts of soil, fertilizer and agricultural chemicals from farms. Based on field observations and flow rate data in 1998 and 1999, flux of nitrogen and phosphorus inputs from the Changjiang river was estimated and it was found that nutrients discharge from large cities, like Shanghai, contribute in large percentage to the total flux and the flux to the East China Sea was large during flood period. Relationship of nitrogen and phosphorus loads with the discharge, such as $L=aQ^b$, has been established for TP and TN at Cuntan and Datong stations (Fig.1) and it suggested that the prediction of nitrogen and phosphorus loads from the Changjiang river flowing into the East China Sea becomes possible. The estimation method of nitrogen and phosphorus input has been developed by using unit nutrient loads for 35 classified sectors based on input-output table in province level for year of 2000 in China. The basic inventory structure of unit nutrient loads for point source and non-point source is determined from the statistical data for each sector.

The comparison between estimated and observed data at Cuntan and Datong stations showed excellent agreements (Fig.2). The percentage of livestock and crop farming industry is about 60% of total nitrogen (Table.1) and non-point source is dominant in Changjiang river watershed.

This study suggests that the estimation method based on input output table is useful to understand the major sectors of point and nonpoint source responsible for improvement in water quality management in China.

Hydrological factors for exuberance of *Ulva* sp. in enclosed tideland lake; Yatsu tidal flat in Japan

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Tidal flat generally endows with a function of superior water quality purification. Especially, it is well known that algae as a prey have a great influence on water quality purification in the same as sandy shoreline.

The ranging area occupied by *Ulva* sp. classified in large chlorophyceae has been annually observed in Yatsu Tidal Flat since 1985. Total area of Yatsu Tidal Flat that is registered under Ramsar Convention in 1993 is 40.1 ha, and its tidal flat is connected to the seawater in Tokyo Bay by two narrow channels. The distribution of *Ulva* sp. in the tidal flat was continuously extended year by year, 6.8 ha in1995, 13 ha in 1999, and more than 20 ha in 2000. Finally, a space for *Ulva* sp. to occupy was increased and attained on about 70 percent of the surface area in Yatsu Tidal Flat. In recent years, the surface of sediment/muddy layer in the tidal flat area is, therefore slid into anaerobic condition by the bodies of *Ulva* sp. covering on the tidal flat. Because of holding the anaerobic condition, the combination of various factors in its tidal flat ecosystem was collapsed as disappearance of a biotope of benthos. The decreasing of share on replay and rest place is eventually drawn very big problems for migratory birds.

Various environmental problems in Yatsu Tidal Flat caused by hydrological functions are, therefore investigated in this paper, for restoration of ecosystem with photographical monitoring data, topographical surveying data and meteorological data, which were stored for eleven years from 1996 to 2007.

Firstly as results, it is clarified that topography in the tidal flat is formed with a muddy flat plateau and several guts. A set of both banks of which height is slightly higher than the plateau level, exists in mouth and down stream region along the guts. Flow pattern of the seawater is therefore

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