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

maintain a steady level. On a seasonal basis, however, the monthly fluxes of most of the water quality variables exhibit significant mass during wet seasons and lower fluxes during dry seasons, except the ammonia flux, which exhibits an opposite trend. Further analyses demonstrate that the monthly mass fluxes are mainly controlled by the runoff; while the annual fluxes are mainly affected by the concentrations.

Rehabilitation and eco-environmental protection of the Yangtze Estuary

The Yangtze is the largest river in China, the world's famous "Treasure House of biota", and the "Golden Waterway" connecting the east, middle and west part of the nation. Located at the joint of the Yangtze Economic Zone and the Costal Economic Zone, the Yangtze estuary occupies an essential position in China. Along with the fast economic growth in the past decades, the pollution discharge in the basin has been increasing rapidly leading the deterioration of water quality in the estuary region. As a result, the Yangtze estuary and its adjacent sea area has become one of the most serious places of "Red tide" occurring in west Pacific Ocean. After completion of the Three Gorges Project and the Water Transfer from South to North Project as well as a number of hydropower projects in the upper reaches, the temporal and spatial distribution of water resources in the basin will be alternated, which will exert significant impacts on the ecosystem and environment in the estuary region. In order to preserve the ecosystem and environment, the Rehabilitation Planning of the Yangtze Estuary has been compiled to protect the important wetland and bio-diversity in the region, control the water pollution and the salt-water intrusion to ensure the safety of water supply in the mean time of maintaining the deep channels for navigation.

Investigation of microbial diversity and its degradation potential to PAHs in the sediment in Bohai Bay, China, by PCR-DGGE

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In order to investigate the biodegradation potential of the indigenous microorganisms in the sediment in Bohai Bay, China, an improved understanding of the diversity and structure of the microbial communities in the sediment is required. Seventeen sediment samples were collected in Bohai Bay (117° 41′ -117° 60′ E, 38° 33′ -39° 00′ N). DGGE analysis of PCR-amplified 16S rDNA gene fragments confirmed that there was a remarkable different in the composition of the bacterial community in some different station. The content of polycyclic aromatic hydrocarbons (PAHs) in the sediment was also investigated. The presence of common bands for microbial species in the native sediment DNA indicated that some strains could be potential in situ PAH-degraders.

Ecological characteristics of the macrobenthic community in the Changjiang Estuary and its adjacent waters

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Spatial distribution and evolution of macrobenthos in the Changjiang estuary and its adjacent waters were presented in this study. Samples were collected from 86 stations in four investigations during 2005~2006. Among all the samples, a total of 330 macrobenthic species were identified including in the number of species: 122 Mollusca, 83 Polychaeta, 67 Crustacea, 23 Echinodermata, 28 Pisces and 7 other species. Total average abundance of macrobenthos in the study area was 146.4± 22.3 ind/m^2, the mean biomass (AFDW) was 2.31± 0.41 g·m^{-2}, and the mean secondary production was 2.48± 0.38 g (AFDW) m^{-2} a^{-1}. The average values of Shannon-Wiener's, Margalef's and Pielou's indices were 1.72± 0.16、 1.37± 0.19、 0.64± 0.04 respectively.

The results showed that the macrobenthos of the study area could be divided into 3 levels from west to east, or from nearshore to offshore. In the most westward area named the Hekou subarea and the Hangzhou Bay subarea, the species composition of macrobenhos was very simple, and the indices of biodiversity were very low, indicating that the community structure was very susceptible. In the Kouwai subarea and the Zhoushan subarea close to the central part of the research region, the species composition of macrobenthos was more complex than that in the most westward area, and the indices of biodiversity were higher, indicating that the community structure was relatively steady. In the most outside area named the Jinhai subarea, the species composition was most complex in the whole research region, and the indices of biodiversity were highest, indicating that the community structure was most steady.

Comparisons of the present results with those of other sea areas in China make it clear that the macrobenthos usually has low production in estuary area where the environments are usually