



The linkage between phytoplankton biomass and environment factors: a case study in the Pearl River estuary, China

Jiahui Liu (1), Jun Zhao (1,2), Bin Ai (1,2)

(1) School of Marine Sciences, Sun Yat-sen University, Zhuhai, Guangdong Province, China, (2) Southern Laboratory of Ocean Science and Engineering, Zhuhai, Guangdong Province, China

With rapid socio-economic development in the Pearl River Delta area, plenty of domestic, industrial, and agricultural effluent is discharged into the Pearl River estuary (PRE), which resulted in the deterioration of water quality in the region.

During two field surveys in March and September 2005 in the PRE, high chlorophyll-a areas were observed. The highest chlorophyll-a concentrations reached 8.34 mg m^{-3} and 6.15 mg m^{-3} during the two surveys, respectively. Nutrient analysis indicated that nitrates, phosphates, and silicate concentrations were high. The salinity was near 30 psu. Phytoplankton cell density data demonstrated that the high chlorophyll-a concentrations were related to bloom conditions. In order to find the possible causes of the eutrophication, data for environment factors during and before the observation periods were obtained, including winds, currents, precipitation, salinity, and sea surface temperature (SST).

Between 18 and 20 March 2005, there was a strong northwesterly wind with a speed of 9 m s^{-1} and the surface current flowed southwestward. The salinity rose and the SST dropped during that time. That suggests the probable occurrence of upwelling, which brought nutrient-rich bottom cold water up to the sea surface. The precipitation during March 12-15 reinforced river runoff, bringing more nutrients into the estuary. With respect to the case in September, a similar situation was observed. 6 days before the event, northwesterly winds prevailed with the highest speed reaching 10 m s^{-1} . The surface current moved southwestward. A precipitation rate of 1.3 mm h^{-1} was observed over the entire study area. Increased salinity was observed during the bloom period. These conditions are upwelling-favorable.

It can be concluded that the anomalous high chlorophyll events were very likely related to upwelling during the observation period. The winds favored upwelling. Further, the precipitation led to the supplement of nutrients from river runoff. The finding from this work is helpful for forecasting algal blooms in productive estuarine waters, like the PRE. Further efforts are required to better understand the mechanism of the linkage between high chlorophyll-a and environmental factors.