Offshore detachment of the Changjiang diluted water and its ecological impacts in summer

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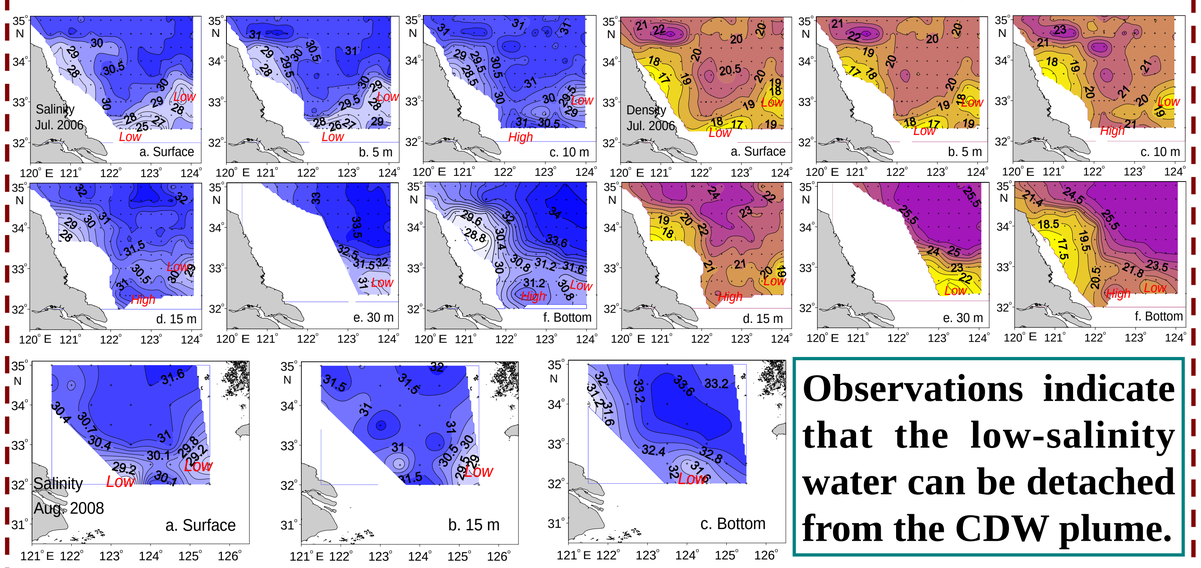
Introduction

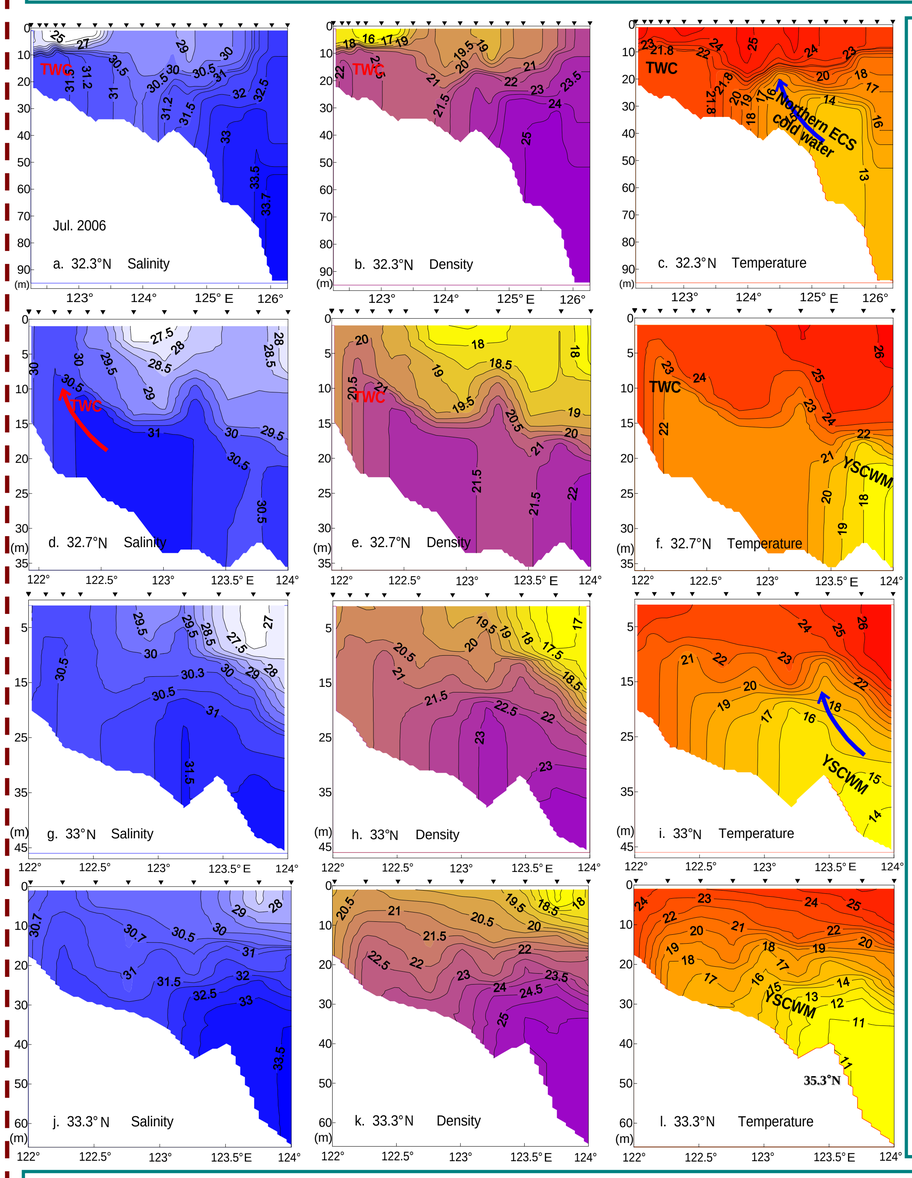
Based on the observed data off the Changjiang Estuary in the summers of 2006 and 2008, special attention is given to the spatial variations and vertical structure of the offshore detached CDW, and its mechanisms in relation with the local upwelling and anticyclonic eddy. Some related ecological impacts associated with the offshore detached CDW are also examined.

1. Offshore detachment of the diluted water in the CDW plume



Observations indicate that the low-salinity water can be detached from the CDW plume.

In general, the main body of the CDW near the river mouth mainly floats in the upper layers (<10 m), and the offshore low-salinity water reaches downward toward the bottom, with its area shrinking from the surface to the seabed and its center shifting first eastward and then southward.



Generally, there were two low-salinity areas with low density. The western area was located in the upper waters (~ 10 m) and moved eastward from transect 32.3° N to 32.7° N. In contrast, the eastern area occupied a larger depth range, forming a zonal area with low salinity that even reached the seabed locally.

The saline water underneath the low-salinity areas featured a low temperature on each transect. Based on the summertime water mass structure and current systems in the Yellow Sea and the East China Sea (ECS), it could be suggested that the saline water underneath the offshore low-salinity water on transect 32.3° N was part of the northern ECS cold water mass (Su et al., 1989) and that the saline water on the 32.7° N, 33° N and 33.3° N transects was part of the Yellow Sea Cold Water Mass (YSCWM) (Yu et al., 2006)

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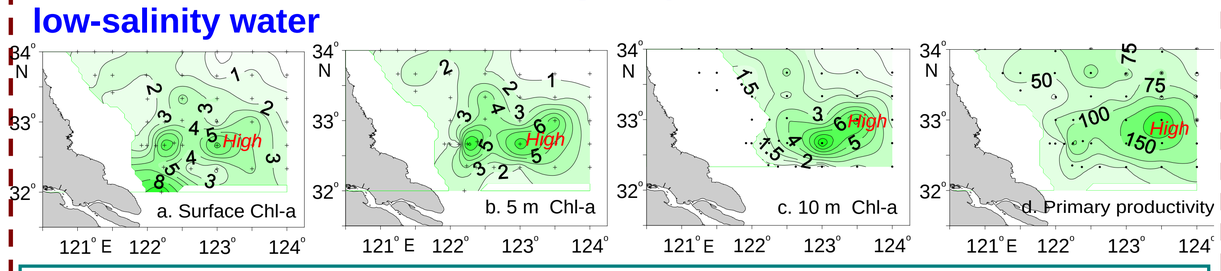
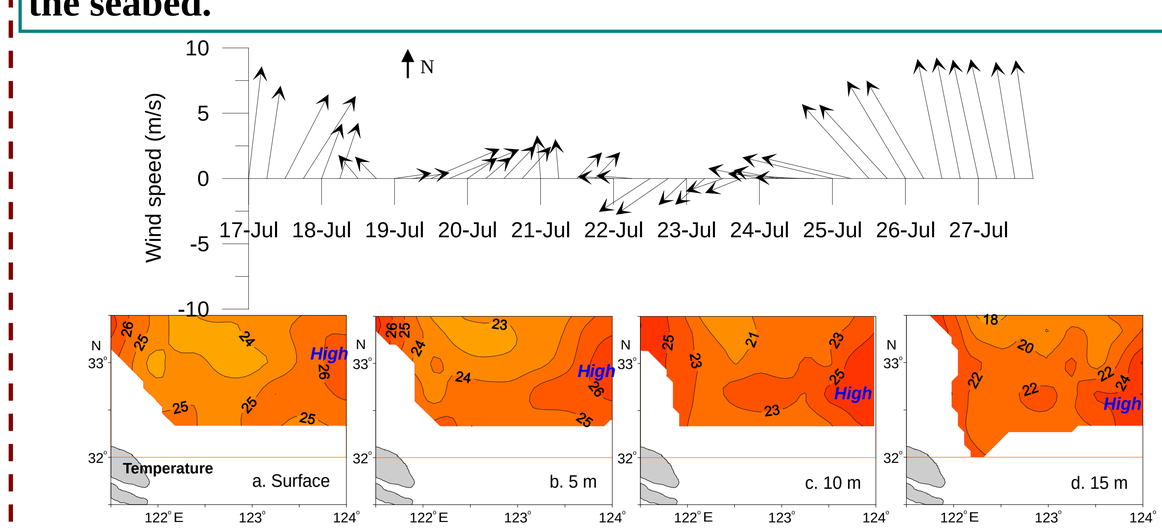
2. Distributions of related ecological parameters within the offshore low-salinity water



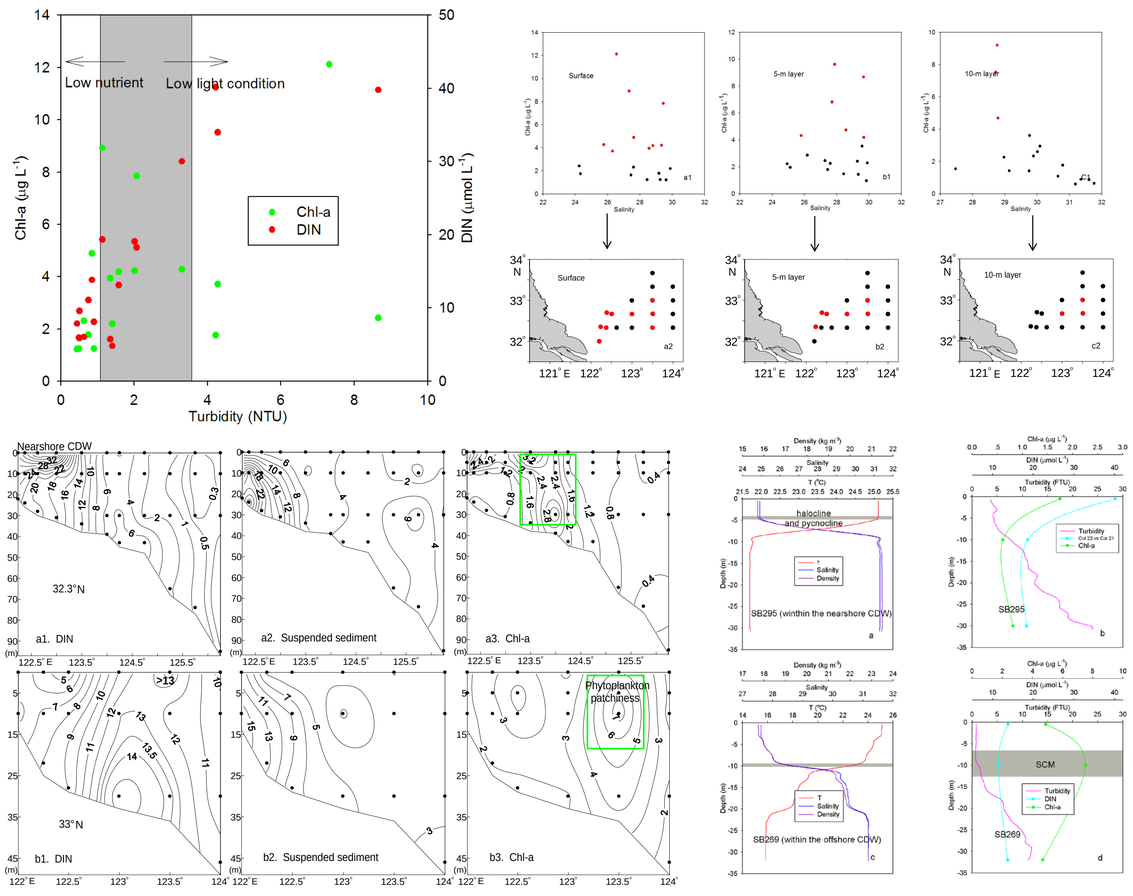
The high Chl-a core (123° E, 32.7° N) in the surface, 5-m and 10-m layers was located in the northeastern frontal area of the nearshore low-salinity water, which was the transitional zone from the nearshore CDW to the offshore CDW. While the other high Chl-a core (123.5° E, 33° N) in the 10-m layer generally appeared in the offshore CDW. The area with high primary productivity was roughly consistent with the zone occupied by the offshore low-salinity area.

3. Potential factors inducing the detachment of the CDW

The double-upwelling system (formed by tide-induced mixing around the western boundary of the cyclonic eddy located in the northern East China Sea/south area of the Yellow Sea, and induced by the northward progression of the inshore branch of the TWC, respectively; indicated by the vertical distributions of hydrological parameters) might paly a role in isolating part of the low-salinity water from the CDW plume. And the wind field can spread plume waters offshore and lead the offshore edge of the plume to mix, and transport the water offshore as well. The anticyclonic eddy (featured by high temperature) in the southeastern part of the study might be responsible for the local presence of low-salinity water along the seabed.



4. Ecological impacts of the offshore low-salinity water



This study demonstrates that the patch of high Chl-a can be induced by the offshore CDW, and the significant correlation between the enhanced Chl-a concentration and the moderate nutrient as well as the good light condition exists in the offshore low-salinity water. In addition, the offshore detached CDW may lead to the variability in vertically spatial distribution of Chl-a off the Changjiang Estuary, and the distinct SCM as well as the peak of primary production, can be formed within the offshore CDW.

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