Variation of phytoplankton distribution in the South China Sea affected by El Nino and typhoon

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The South China Sea (SCS), located in the western Pacific Ocean, is one of the largest marginal seas in the world. The present study analyzes the variation of phytoplankton/Chlorophyll-a (Chl-a) distribution in the SCS affected by El Nino, typhoon using satellite remote sensing data. High Chl-a concentrations in the southwestern SCS in summer season (June to August) may be related with strong Ekman Pumping, whereas a jet-shape high Chl-a region offshore in western SCS was associated with coastal upwelling driven by offshore Ekman transport and Vietnamese offshore current. In 1998 summer, Chl-a concentrations in the SCS were the lowest among 7 years, and significantly low in the western SCS; the jet-shape Chl-a region offshore of southeast Vietnam almost disappeared, and southwesterly monsoon winds and offshore current were relatively weaker in this year. This anomalous low phytoplankton biomass in the SCS coincided with an El Niño year in 1998. Phytoplankton biomass response to Typhoon Damrey in the SCS in September 2005 was also studied. Chl-a concentration increased in 2 locations after the typhoon. (1) An offshore phytoplankton bloom along Damrey's track exhibited a Chl-a peak (1 to 4 mg m-3) over 5800 km2 5-d after the passage of typhoon. This was preceded by both sea surface cooling (-5°C) mainly in the right side of the typhoon track and sea level decrease (-25 cm) along the typhoon track 1-d post-typhoon. The offshore bloom may be triggered by deep nutrient uplifted by vertical mixing and upwelling. (2) Another nearshore Chl-a enhancement appeared in an eddy near Hainan Island. This feature, with high levels of suspended sediments, phytoplankton, and colored dissolved organic matter, succeeded typhoon storm rain in Hainan Island. The results suggest that typhoon can affect ecosystem by 2 mechanisms: (1) air-sea interaction inducing an offshore phytoplankton bloom; (2) storm rain inducing terrestrial runoff discharge, which might be rich in nutrient, phytoplankton, and carbon; These substances were thereafter transported seaward by typhoon-induced current.