Satellite observation of phytoplankton blooms related to typhoon in the South China Sea

G. M. Zheng and D. L. Tang

Laboratory for Tropical Marine Environment Dynamics, South China Sea Institute of Oceanography, Chinese Academy of Sciences, Guangzhou, China (lingzistdl@126.com / Fax: +86 20-89023203 / Phone: +86 20-89023009)

South China Sea (SCS) is located in the tropics where typhoon visit frequently in the summer season. In this study, we use Moderate Resolution Imaging Spectroradiometer, Sea-viewing Wide Field-of-view Sensor and other data sets to analyze the biological consequences of Typhoon Damrey that crossed northern SCS from the Luzon Strait to the Gulf of Tonkin in September 2005.

Two phytoplankton blooms were observed after the typhoon. One offshore phytoplankton bloom in the wake of Damrey took a long-tongue-shape, and exhibited a Chlorophyll a (Chl a) peak (1.0-4.1 mg m^{-3} over 5800 km^2) 5-days after typhoon passage. Four-days preceding this Chl a peak at the same location, Sea Surface Temperature (SST) decreased (-5°C), and Sea Level Anomalies (SLA) declined (-25 cm). Typhoon also caused sharp SLA variations in both sides of typhoon track ranging from -194 to 126 cm. Another nearshore phytoplankton bloom off south Hainan Island (HI) appeared like an eddy in which Chl a were up to 1.9 mg m^{-3} over 5500 km^2. Torrential ($>$300 mm) typhoon storm rain poured over south tip of HI before this bloom.

Our analysis show that the offshore phytoplankton bloom is triggered by entrained and upwelled deep nutrients, whereas the nearshore bloom by terrestrial discharge related to typhoon storm rain in HI. The results indicate that typhoon can fertilize the ocean in two phases: Phase I, offshore air-sea interaction injects deep nutrients into upper ocean; Phase II, nearshore air-land-sea chain reaction induces terrestrial discharge. The outcomes of both two phases are the same: increase of phytoplankton biomass. This leads us to a more comprehensive understanding of how typhoon affect marine ecosystem.

The present research is supported by following grants allowed to Professor DanLing Tang: (a), Chinese Academy of Sciences (CAS) (KZCX3-SW-227-3); (b), National Natural Science Foundation of China (NNSFC40576053); (c), “The One Hundred Talents Program” of CAS, China.