Point 1: Details of the South China Sea model used in this study

The SCS model (domain: 99-124°E, 2-27°N) used in this study is based on the Princeton Ocean Model (Mellor 2004) with realistic topography and forcing. The horizontal grid size is 1/16° and there are 26 sigma levels in vertical. A larger-scale East Asian Marginal Seas model (Wu and Hsin 2005) is used to serve the open boundary condition of the SCS model. The model is driven by the six hourly 0.5° × 0.5° QuikSCAT/NCEP blended wind product (Milliff et al. 1999). This SCS model has been well validated by the observed temperature from a long-term mooring in the SCS [i.e., the Southeast Asian Time Series (SEATS) station; Wong et al. 2007, denoted as star in Figure 1a]. Current velocity data have also been validated from several mooring stations in the SCS, and a detailed description of the model can be found in Wu and Chiang (2007).

Mellor, G. L. (2004), Users guide for a three-dimensional, primitive equation, numerical ocean model manual. *Program in Atmosphere and Oceanic Sciences*, Princeton University, Princeton, N. J. 56pp.

Milliff, R. F., W. G. Large, J. Morzel, G. Danabasoglu, and T. M. Chin (1999), Ocean general circulation model sensitivity to forcing from scatterometer winds. *J. Geophys. Res.*, *104 (C5)*, 11337-11358, doi: 10.1029/1998JC900045.

Wu, C.-R., and Y.-C. Hsin (2005), Volumn transport through the Taiwan Strait: a numerical study. *Terrestrial, Atmospheric and Oceanic Sciences*, *16(2)*, 377-391.

Point 2: Detail description on the possibility of terrestrial aerosol input to stimulate the bloom

There are three types of terrestrial aerosols that may be brought to the SCS and contribute to its biogeochemistry: fossil fuel burning aerosols from Eastern China, Asian desert dust, and biomass burning from Southeast Asian countries (Lin et al. 2007). To examine this possibility, coarse- and fine-mode MODIS AOD were examined (Kaufman et al. 2002; Lin et al. 2007). According to Kaufman et al. (2002), fine-mode AOD data typically characterises aerosol loading from industrial fossil fuel burning and biomass burning while coarse-mode AOD data typically characterises loading from desert dust or maritime sea salt aerosols.

Based on MODIS AOD observations, fine-mode AOD (Figures A_c and A_d) values at the bloom location were low prior to and throughout the bloom period, typically ~0.0-0.1. Such low values suggest little terrestrial aerosol loading due to fossil fuel or biomass burning was present to stimulate the bloom (Kaufman et al. 2002; Lin et al. 2007). Coarse-mode AOD was also low, typically ≤ 0.1 (Figures A_e and A_f). This was characteristic of a typical baseline maritime sea salt dominant condition with little sign of the presence of desert dust in the bloom area (Kaufman et al. 2002; Lin et al. 2007). If there was presence of other coarse-mode aerosols such as desert dust, coarse-mode AOD would be evidently higher (Kaufman et al. 2002; Lin et al. 2007). From both fine- and coarse-mode AOD observations, the chance of the observed bloom being fuelled by terrestrial aerosols was also low.

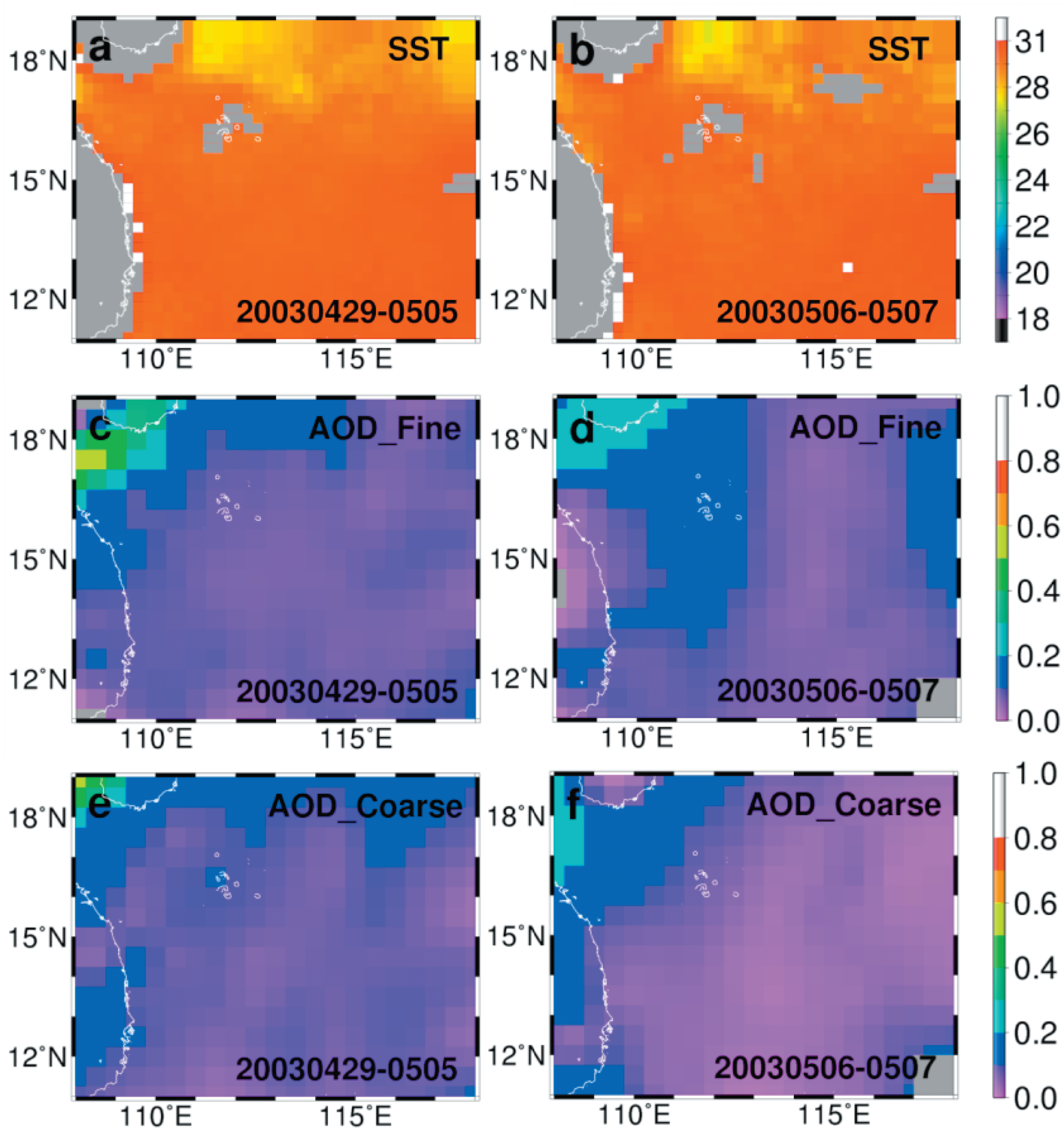

Figure A: (a) Prior (one week before) and (b) during-bloom SST observations of the study area from the TRMM satellite. (c) Prior (one week before) and (d) during-bloom MODIS/fine mode AOD observations of the study area. (e) Prior (one week before) and (f) during-bloom MODIS/coarse mode AOD observations of the study area.

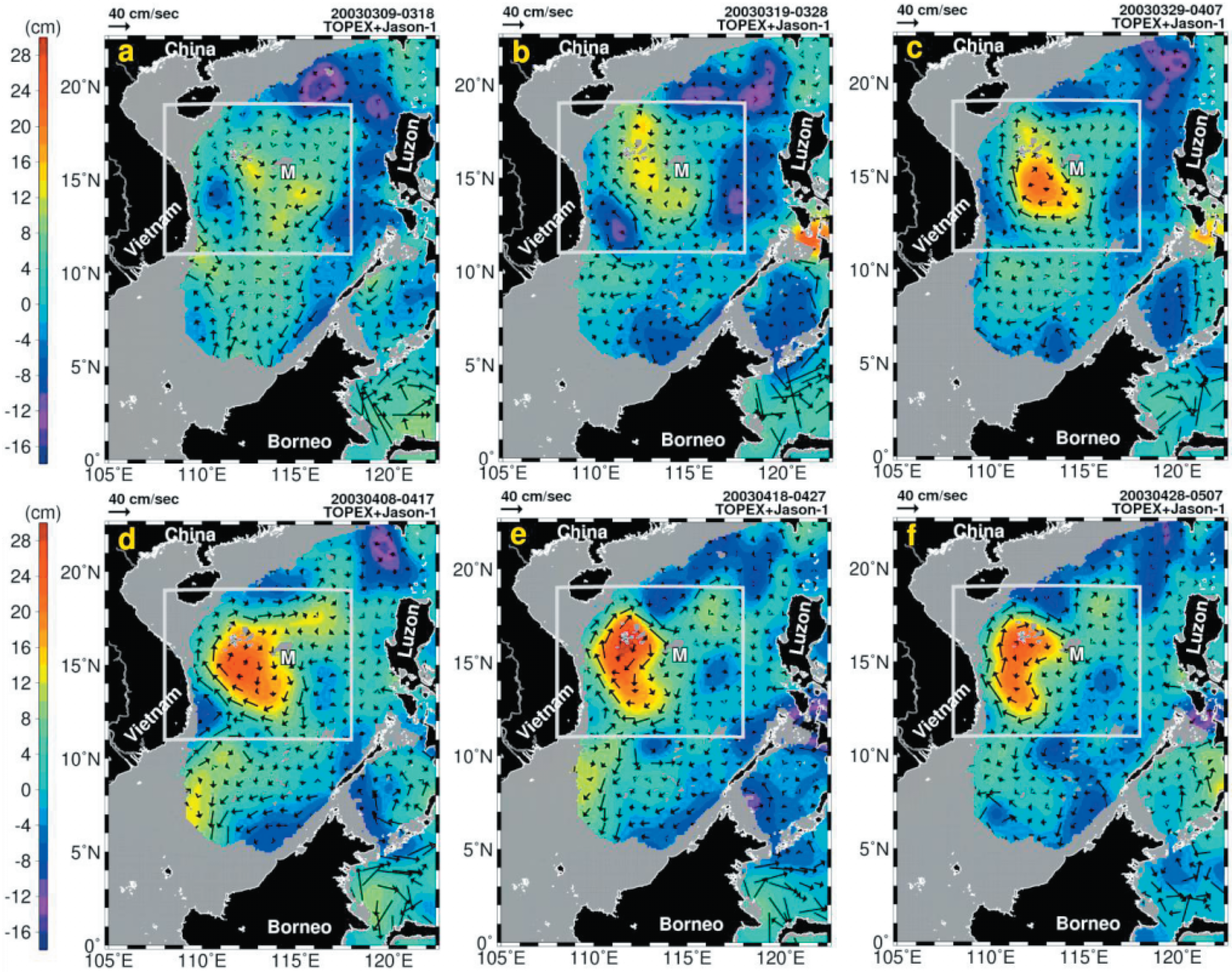

Figure B: (a)-(f) Time series of sea surface height anomaly (SSHA) maps (coloured shaded, unit: cm) of the SCS from six ten-day cycles of satellite altimetry measurements from March to May 2003. The study area is depicted by box. As the current altimetry algorithm is less accurate in the shallow waters (Fu et al. 1994), the SSHA measurements in regions of bathymetry < 200m are not used and are shown in grey. The SSHA-derived geostrophic currents are overlaid by vectors.

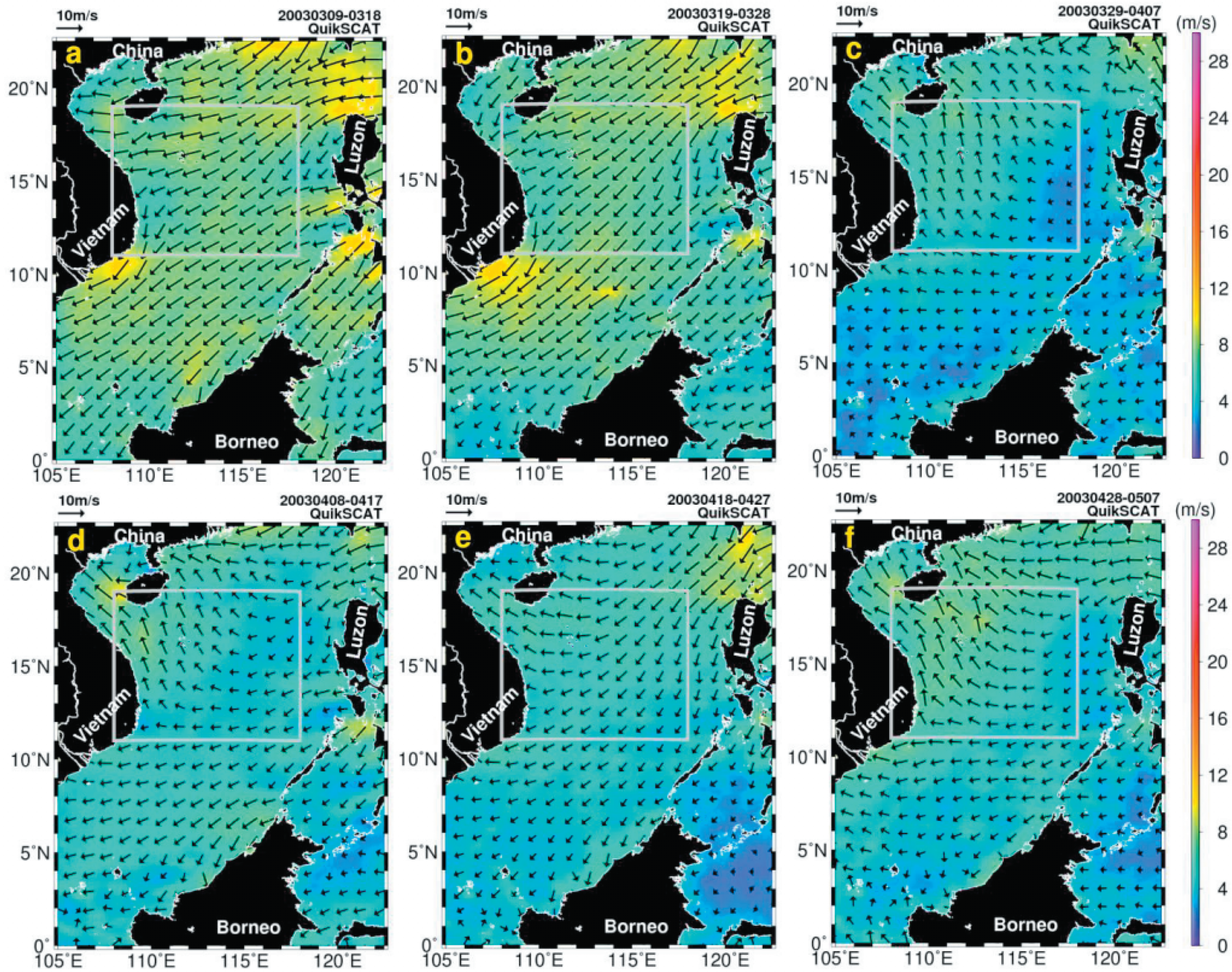

Figure C: (a)-(f) As in Figure B, but for the corresponding ocean surface wind vector observations of the SCS from the NASA/QuiKSCAT scatterometer.