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Discussions

Interactive comment on "Phytoplankton dynamics driven by vertical nutrient fluxes during the spring inter-monsoon period in the northeastern South China Sea" *by* Q. P. Li et al.

Anonymous Referee #1

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General comments:

Using field survey data from the coastal upwelling zone to offshore area of the northeastern South China Sea during an inter-monsoon period together with the remote sensing data, the authors analysed the hydrographic / biogeochemical properties, phytoplankton growth / microzooplankton grazing, and the vertical nutrient fluxes contributed by turbulent diffusion and curl-driven upwelling. This study revealed a generally increasing role of turbulent diffusion but decreasing role of curl-driven upwelling on vertical transport of nutrients from nearshore to offshore regions, which regulates the biological activities in this area. This is a preliminary study and provided the first evaluation of the relative importance of turbulent diffusion and upwelling to nutrients

vertical fluxes and the corresponding biological responses in this region. In general, this manuscript is comprehensive and well organized, the main findings have scientific value for our understanding of the nutrient and biological dynamics in this region. However, what I concern about is the accuracy and representativeness of the calculation in this study. That is, the studied region is affected by curl-driven upwelling, Kuroshio intrusion, and probably the Pearl River plume, these processes are all highly time dependent (have strong temporal variability), calculations based on these data may lead to considerable error. In addition, it is dangerous to say the one-time observation in this 3-day cruise actually represents the entire spring inter-monsoon period. Therefore, discussions on calculation errors and the overall uncertainties of the results will make the findings more meaningful. In conclusion, I suggest that the paper can be published after properly address these issues.

Specific comments:

P6732, L10-13: "Upward transport of the deeper water with lower temperature ... observed during the survey (Fig. 3a and b), giving direct evidence for wind-induced coastal upwelling". Actually, the low temperature coastal water is separated from the low temperature deep water by the relatively high temperature water located in between (near the shelf break), so it is hard to attribute the low temperature near shore water (Fig. 2a) to the result of deep, cold water upwelling along this section. Recent studies revealed that the cold dense water near Shantou was originated from the shoreward upwelling in upstream and advected along coastline by coastal current.

P6733, L4-11: "As suggested by the satellite geostrophic current data during the survey ... Prevailing wind stresses in the northeastern SCS ... (vectors of Fig. 2b)", as introduced in section 2.1, the study period is 14 to 16 May 2014, but the data of Figs. 2a and b are from 15 May 2014, should keep consistency.

P6733, L21: "Sea surface chlorophyll a in the northeastern SCS during May 2014 was very high in the coastal upwelling zone", the corresponding salinity, temperature and wind field should be presented to support that the high chlorophyll is a result of coastal upwelling, especially during a "spring inter-monsoon period" when coastal upwelling is not a typical phenomenon.

P6734, L1-3: ". . . decrease of surface nitrate concentration from . . .", the Fig. 3d should be adjusted to clearly show the decreasing trend from near coast to offshore.

P6737, L1-2: "with much higher temperature and salinity . . . (Fig. 6)", there is no salinity in Fig. 6.

P6738, L1-2: "with a much slower rate of nutrient consumption at station B (0.46 d-1) than at station A (1.03 d-1)", firstly, the unit of nutrient consumption rate is not correct (should be something like mmol/m3/d); secondly, it seems the PO4 consumption rate is higher in station B according to Fig. 8 during the entire incubation period.

P6738-6739, the first paragraph of section 4.1: should be moved and incorporated into section 1 (Introduction), some duplicated.

P6740, L10-11: "The largest diffusive nitrate flux found at station B". The vertical flux of diffusive is calculated by vertical diffusivity times nutrient gradient, then the gradient is very important in determine the vertical flux, but how to get an accurate and representative gradient? The gradient itself is a result of turbulent diffusion and/or Ekman pumping.

P6740, L23-29: "Our results suggested that it was the fluxes of nutrients that were responsible for the observed chlorophyll a difference . . .", assuming that other conditions are all the same (e.g., species, temperature, light, etc.), the phytoplankton biomass (or chlorophyll level) will be higher in the environment with higher nutrient concentration, because higher nutrient concentration can support higher phytoplankton growth rate. Nutrient flux can be used for estimating biological production during a period of time, however, it cannot be correlated with chlorophyll level at some point.

P6742, L11-14: "Indeed, the area of the phytoplankton bloom decreased substantially

within two weeks . . .", any figures or data? At least the data source should be indicated.

Figure 2, I would suggest the authors to plot the SST, curl-driven upwelling velocity, surface geostrophic currents and wind stresses from 14th to 16th May, 2014, since the field survey was conducted during this period. Actually, monthly mean data for the above variables are better to keep consistent with the monthly chlorophyll.

Figure 8, I suggest to add NO3 in the figure, or replace PO4 with NO3, since it is generally P-limited in these areas.

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