Responses to Anonymous Referee #2's *Interactive comment on* "Inter-annual variation of chlorophyll in the northern South China Sea observed at the SEATS Station and its asymmetric responses to climate oscillation" *by* K.-K. Liu et al.

General Comments

The authors present an analysis of the inter-annual variation of chlorophyll a (Chl a) in the South China Sea (SCS) and its relationship with various climate driven factors as measured by both in situ and satellite platforms. They show that Chl a responds asymmetrically to the multivariate ENSO index (MEI) and that under positive MEI conditions (El Nino), this correlation is relatively strong, whilst under negative MEI conditions (La Nina) the correlation is weak or insignificant. These differing responses are attributed to differences in water column structure under the two ENSO regimes that affect the availability of nutrients to the upper water column. The paper is very well written and organised, and offers insight into the climate related dynamics that affect biogeochemical cycles in this region of the SCS. My comments are rather minor in nature and, I think, can be very easily addressed. In particular, the interesting hypothesis that eddies may be partially responsible for suppressed Chl a response during one of the study La Nina years could be strengthened by supporting evidence either from published studies or, perhaps, satellite SST or Chl a. Other minor specific comments are detailed below.

RESPONSE: We are grateful for the reviewer's appreciation of our work and the detailed comments, which are heeded. The satellite SST and sea surface Chl-a data are too spotty to show the complete regional pattern of lowered SST or elevated Chl-a as expected of cyclonic eddies. Instead we will show satellite SSH data that support the occrrence of a cyclonic eddy in December 1999.

Specific Comments

p. 6902, line 10: I don't think WPS has been defined yet. Please define the abbreviation.

RESPONSE: WPS stands for the West Philippine Sea, which will be noted in the text.

p. 6905, eqn. 1: Please provide number of points (N) and some metrics of error such as bias and RMSE for this regression.

RESPONSE: We will provide the information in the revised version.

p. 6905, lines 26-27: What does "compatible with MODIS dataset mean"? Can you re-write this sentence to make it a bit clearer, please?

RESPONSE: The sentence in question will be replaced by "For the data merge the SeaWiFS data were adjusted by removing the systematic bias with respect to the MODIS data according to the linear regression."

p. 6906, line 12: Please provide N and an R2 value for this regression. p. 6906, line 13: Please provide a reference for "the accuracy of the daily data".

RESPONSE: We will provide the information in the revised version and the relevant reference.

p. 6907, line 3: You say here the data were averaged. Do you mean spatially and temporally? Please clarify.

RESPONSE: The data for analysis are monthly mean values in each pixel. Because we use a 2deg x 2 deg area to represent the condition at the SEATS site, the average mentioned here is the spatial average over the study area.

p. 6907, line 23: Please change m S-1 to m s-1 here and anywhere else in the manuscript where relevant.

RESPONSE: We will do accordingly.

p. 6908, line 14: See comment above. p. 69009, line 5: As above. p. 6909, line 15: Suggest changing "pretty" to "relatively".

RESPONSE: We will do accordingly.

p. 6910: Here you discuss the correlation, R, between the various variables and how these correlations compare with the correlations between the EOF modes of the same variables found in a previous study. Can you take a few sentences to explain how these two different correlation analyses are comparable? One is of the variables themselves, while the other is of the EOF modes of the same variables.

RESPONSE: First of all, the correlations discussed here are all between time-series of attributes associated with marine environments. For the SEATS site the correlations are between time-series of variables, while for other parts of the Pacific Ocean the correlations are between time-series of the first EOF modes. Because the SEATS site is a single point in space in our discussion, the time-series of a variable may be considered the time-series of the first and only EOF mode of that variable. It is not unreasonable to compare correlations between time-series of the first modes of different variables. On the other hand, the first modes of a variable in different parts of the Pacific Ocean often do not have the same degree of significance, but the correlations are compared among different parts nevertheless. Such an exercise was not to derive any precise quantity for the discussion but to serve the purpose of gaining insight into the possible causal relationships between different environmental variables in the marine environment. It turned out that we did gain some insight from the sharp contrasts among the correlations for the SEATS site and for other parts of the Pacific Ocean. The lack of correlation between some variables at the SEATS site reflected the different control processes of the variable, such as Chl-a.

p. 6910, line 29: Do you mean “stronger” rather than “strong” here?

RESPONSE: Yes. We will change “strong” to “stronger” in the revised version.

p. 6911, line 24: Please insert “in” between “symmetric” and “that”.

RESPONSE: We will do accordingly.

p. 6912, line 27: Please insert “and” between “(Fig. 9d),” and “the”.

RESPONSE: We will do accordingly.

p. 6914, lines 2-3: Suggest providing the La Nina years in parentheses to make the figure easier to follow.

RESPONSE: We will add the info accordingly.

p. 6916, line 22: Suggest changing this sentence slightly to read, ". . .the intra-seasonal variation is apparent as noise in the main signal."

RESPONSE: We will modify the sentence accordingly.

p. 6916, line 24: Please change this to read, "10 yr statistical analysis. . ."

RESPONSE: We will modify the sentence accordingly.

p. 6916 - 6917: While you cite Xiu et al. to support the existence of eddies in the region over a ten year period, can you provide any evidence of an eddy during the La Nina period you discuss either in the form of an existing study or, perhaps, from satellite SST or Chl during the period of interest?

RESPONSE: The SST and sea surface Chl-a data from satellite are available, but too spotty to show the regional pattern of lowered SST or elevated Chl-a associated with cyclonic eddies. Instead we have gotten weakly SSH data in November and December 1999 and January 2000 in the South China Sea, which will be shown in the revised version. The SSH maps show that there was a depression in the vicinity of the SEATS site in the second half of December 1999, indicating the passing of a cyclonic eddy.

p. 6917, line 2: Please change "contradicting" to "to contradict".

RESPONSE: We will make the change accordingly.

p. 6917, line 10: Suggest changing this sentence to something like, "Therefore, we present a mechanism that could explain the unusually strong Chl peak during. . ."

RESPONSE: We will modify the sentence accordingly.

p. 6918, line 7: Insert “that” between “indicating” and “the”.

RESPONSE: We will make the change accordingly.

p. 6918, line 7: Insert “are” after “processes”.

RESPONSE: We will make the change accordingly.

p. 6918, line 15: Suggest changing to “likely attributable”.

RESPONSE: We will make the change accordingly.