

## ***Interactive comment on “Influence of cross-shelf water transport on nutrients and phytoplankton in the East China Sea: a model study” by L. Zhao and X. Guo***

**Anonymous Referee #2**

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General: The authors present results from a coupled physical-biological model for the East China Sea with particular focus on cross-shelf transports. While this topic should be of interest to the readers of Ocean Science, is obviously very appropriate for the Special Issue on Deep Ocean-Shelf Exchanges, and while I endorse their general approach (i.e. analyzing a coupled model for the region), I have serious reservations about important details of this study. Most importantly, validation of the model results is inadequate, and where model-data comparisons are given the model disagrees markedly from the observations. Especially troubling is the disagreement in the DIN concentrations off the shelf break, to which any estimate of cross-shelf transport is extremely sensitive. Given the wrong off-shelf DIN concentrations the estimates of

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cross-shelf DIN transport cannot be trusted. I have a number of other concerns that are detailed below.

Summary: The study has serious flaws that would need to be addressed before publication can be considered.

Specific points:

Section 2: Not enough justification is given for the choice of the biological model (I find some aspects non-sensible) and not enough details about the model are given either. For example, why do the authors think that zooplankton can be neglected in the East China Sea? Why do they include 3 inorganic nutrient sources (DIN, DIP and silicate) when they appear to have observations for only DIN? How was the satellite-derived extinction coefficient for photosynthetically active radiation (p. 1409, line 24-26) determined? What are the model equations and the model parameter values chosen? With respect to the model equations the authors refer to a technical report that is not peer-reviewed and not widely available.

The authors state that monthly values for surface wind stress were used (p. 1410, line 8-9). This makes no sense (the authors may have used daily wind stress and made a mistake here).

Section 3.1: The authors show model output in Fig. 3 and refer to a paper for relevant observations. That is not adequate. The observations that they are comparing their model with need to be included here as well, and ideally some quantitative metrics of the agreement between model and observations should be given.

The model-predicted surface chlorophyll should be quantitatively compared with satellite observations.

Fig. 5: The nutrient concentrations off the shelf are wrong in the model. For example, in autumn the observations show DIN concentrations of 1 and 3  $\text{mmol m}^{-3}$  at 100 m and 150 m depth respectively, while the model shows 8 and 10-15  $\text{mmol m}^{-3}$  at those

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depths (an order of magnitude higher). The other seasons do not look any better.

Fig. 6: The simulated chlorophyll patterns are very different from the observations, especially in winter, spring and autumn.

The authors acknowledge some of the discrepancies (page 1414, lines 20ff). I would argue that these problems have to be corrected before estimates of cross-shelf transport can be made with this model.

Section 3.3 The authors talk about estimating the onshore flux of water and nutrients. More details about how these fluxes were estimated are needed. The fluxes presented in Fig. 7 show a continuous import of volume. This cannot be correct based on continuity considerations. A sustained on-shore flux of water would imply a sustained rise in sea level in the East China Sea. On page 1416, they refer to this flux as total volume flux. There should be no net volume flux over a 1-year time scale. Flux estimates are given for DIP and silicate although the authors did not present any observations to validate the model predictions.

Minor points:

P. 1407, line 5f: "oceanic nutrients [are] mainly driven by climate change" – What does this mean?

Fig. 2: The schematic is very confusing. Why are the model state variables drawn multiple times? What do the dashed arrows represent? Maybe sinking? If so, why doesn't SIS sink? What happens to biological and chemical species at the bottom? Why are DIA and FLA drawn inside the sediment?

Fig. 3: Labels on color scale bar and isolines are much too small.

P. 1413, line 13: What does JMA stand for?

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