

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2022-11

Anonymous Referee #2

Referee comment on "Pronounced seasonal and spatial variability in determinants of phytoplankton biomass dynamics along a near-offshore gradient in the southern North Sea" by Viviana Otero et al., Biogeosciences Discuss.,
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The authors of this manuscript have attempted to calibrate and validate their NPZD model with open-access time series data of temperature, nutrients and plankton. The researchers then utilized the model to determine the factors that drive the phytoplankton abundance in the North Sea. Following are the observations and recommendations upon review.

The GAM time-trends show low R^2 values for nutrients, while SST is fairly simulated (Table E1). Model validation with observations (Fig 4/F1) show good agreement for offshore region but progressive overestimation closer to the shore, a common caveat in the numerical models. However, the model simulate lag between primary and secondary productivity which is more pronounced near to the shore and also peaks at higher magnitudes (Fig 5 & F2). The model shows nutrients as less limiting factor nearshore (reverse for PAR) for the phytoplankton biomass and the same increases with distance to the shore which is in the agreement with general understanding of the BGC (Appendix G). Inclusion of Appendix H is helpful in depicting seasonal nature of the diatom blooms in the region.

As another referee has covered many important points, I avoid repeat of the same and would rather add to the "discussion" that this journal offers. The North Sea waters are one of the highly contested regions in recent times, and studies on this region could address

one or more larger objectives either in terms of robust validation of the model, or addressing climate and/or maritime usage applications, or both (see references). It seems that the authors are well aware of the applications since these are discussed, albeit very briefly.

While divergence of simulation from the observations is common occurrence for the numerical models, the authors could include additional validation such as remote sensing or in-situ observations. Similarly, there is an opportunity to the authors to add a section to depict implications of their findings without listing it as future scope. These implications (relevant to the regional needs) could be in terms of fishery, HABs or maritime use conflict/hazards e.g. issue of invasive species. While these questions are important to address, it would be great value-addition to have it incorporated in the revision of this very manuscript, rather than listing out for the future scope.

Finally, it is appreciable that the authors have presented in commendable English despite not being native speakers.

References:

Chakraborty, K., Nimit, K., Akhand, A., Prakash, S., Paul, A., Ghosh, J., Bhaskar, T.U. and Chanda, A., 2018. Modeling the enhancement of sea surface chlorophyll concentration during the cyclonic events in the Arabian Sea. *Journal of Sea Research*, 140, pp.22-31.

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