**Ocean Science
Discussions**

Interactive comment on "Numerical modelling of POC yearly dynamics in the southern Baltic under variable scenarios of nutrients, light and temperature" *by* L. Dzierzbicka-Glowacka et al.

Anonymous Referee #3

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The paper of Dzierzbicka-Clowacka et. al. "Numerical modelling of POC yearly dynamics in the southern Baltic under variable scenarios of nutrients, light and temperature" applies a 1D model to explore the effects of future changes in water temperature, available light and nutrients. The approach is appealing; however there are several shortcomings that need clarification.

Model concept.

p. 679: The description of the ecological model lacks explanations especially on how nutrient loadings are represented in the model and how temperature, salinity and vertical mixing is incorporated in the 1D model. Apparently the ecological model does not

contain cyano-bacteria (but only "bulk" phytoplankton). Cyano-bacteria can be abundant in the Baltic and have a quite different parameterization compared to "bulk" phytoplankton. By ignoring this functional group model response during scenario runs might be incorrect.

p. 680: It is not clear how the 3D flow field is used as input to the 1D model and the justification of using interpolated outputs from the 3D model as input in the 1D model is rather unclear.

Justify how a 1D model can represent a 3D system. How big is the area that the model is assumed to represent and how is the horizontal transport of nutrients and POC treated?

Apparently the model only covers the top 10 meters (or is it 0-1 meter?) of the water column. What is the boundary condition at this depth?

Explain how the initial conditions was derived (were they based on measurements, guestimates?)

Scenarios.

The assumption regarding future changes in temperature, PAR, wind speed and nutrients (loadings and/or concentrations?) need justification/references.

It is not clear how "nutrients" are increased when making scenarios. Is it an increase in loading (if so, how is nutrient loading represented in the model) or is it the actual nutrient concentration (if so, then nutrients are not a state variable) or is it perhaps the initial nutrient concentration that is changed between scenario runs? Explanation is needed.

It appears that measured chl.a values were used in the model to calculate the primary production (P.681). How is this done and what assumptions/ methods are used?. Modelled primary production is normally parameterized based on nutrient concentrations and light availability and not modelled using measured chl.a data. Explain this.

How is the initial condition for the 2020-2050 scenarios determined? Explain.

Results.

It is not clear if primary production is a model result or based on measured chl.a data as indicated on p. 681 (scenario of future change).

Validation of the model for the different areas is lacking and needs to be included in order to gain trust in the model results and scenario runs.

Detailed comments:

p. 677: Not clear how the DOM fits into the story. Either leave it out or include DOM in the model.

p.680, l. 8-12: section needs to be rewritten

p.680: Apparently there are two different descriptions of $I_o(t)$?

p.681: Are the applied average values for 1965-1998 that are used as starting point (initial condition?) based on measurements and is detritus also measured during that period?. Is it yearly average or monthly average that is used as starting point?

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Interactive comment on Ocean Sci. Discuss., 8, 675, 2011.