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Interactive comment on “Consequences of artificial deepwater ventilation in the Bornholm Basin for oxygen conditions, cod reproduction and benthic biomass – a model study” by A. Stigebrandt et al.

Anonymous Referee #1

Received and published: 8 August 2014

General comments:

The paper begins by presenting the issue of anoxia within the Baltic Sea and introduces previous work investigating the potential use of vertical pumping to promote a return to hypoxic or even normoxic conditions. It is followed by a very detailed and clear description of the model which supplements the model developed by Stigebrandt and Kalen. It then develops into a comparison of the model to observations and then draws conclusions on what potential effects may be on cod recruitment and benthic biomass.

I found the paper to be both very interesting and enjoyable. It is very detailed and well

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justified however I found the final discussion to be lacking slightly. Discussions of cod recruitment and benthic biomass seemed disjointed after such a solid start. Output from models indicated changes in habitable volume/surface area for cod and benthic biomass, but deeper conclusions debating longer term effects, stability of observed changes and interactions were limited. Almost no mention was made on impacts on the surface layer and what this may have seasonally, particularly in the nutrient limited summer surface waters and how this may then impact cod recruitment and benthic biomass.

As the reader is also likely to not be fully acquainted with the original model, the reader needs a bit more convincing that the tuning was successful. 10% error in salinity between hydrographic profiles and pool model seems a bit high. Can the authors justify that this is a negligible difference? How robust are the model results when inflow is not low-pass filtered or with a different buffer volume? Could an additional figure like 4 and 5 be added describing temperature or density?

Despite these two points, I would recommend this paper for publication in Ocean Sciences following these moderate corrections.

Specific comments:

P1794 L26-27: A sentence detailing the density in time and space of observations would be beneficial here or indicating to the reader that this will be detailed further on.

Eq. 11: More justification is required to explain why you use the 1.5mL L threshold specifically. Whether B is constant or variable throughout the interval and why this is no longer necessary in anoxic conditions.

Sec. 2.2.1: The review of macrofaunal tolerance of hypoxia may serve better within the introduction to keep background information and methods separate, although this is more a matter of personal preference.

P1796 L6-9: I'm not sure I agree with this statement. I would avoid saying animals are

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adapted to living in anoxic conditions within the OMZ. Species diversity is reduced and the majority of macrofauna cannot survive within the region but instead uses the OMZ either as a refuge or hunting ground. And some macrofaunal species have begun to adapt to the hypoxic conditions within the Baltic.

P1801 L21: Comparisons of additional variables may help increase reader confidence in relevance of the model output.

P1803 L23: Sentence does not read well.

P1806 L19: Again, it may help to have a few panels in figures showing other variables – at least temperature.

Sec. 4.6 and 4.7: These two sections feel disjointed from the previous parts. Numbers are provided for potential increases in benthic biomass and community changes, but these are not discussed in terms of impacting on cod recruitment. A small paragraph discussing or suggesting how this new biomass could affect cod recruitment, how the potential lack of diversity would affect recruitment, and how this would be different to a stable mature community would be interesting.

Two other aspects which I felt would be interesting to mention as the questions often came up when reading were the feasibility of pumping such volumes and what effects it may have on surface waters. Namely, what would the impacts of pumping more nutrient rich water to the photic zone during the summer be? Has anyone assessed the impact of surface production? Neither require much depth or discussion, but indicating relevant material or showing what work may (or may not) have been done would be nice.

Technical comments:

Author details: Lousanne in Switzerland should be Lausanne

Abstract L3: “By pumping. . . new oxygen-rich deepwater” sentence should be split or simplified for the abstract.

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Abstract L11: “since it has been much less in certain years”

P1784L14-17: Evidence?

P1784L24-26: Citation may be helpful here.

P1790 L19: Avoid abbreviating “e.g.” in text.

P1794 L16-18: The sentence could be clarified and developed slightly.

P1796 L19: I would suggest “pre-pollution levels” instead of “pre-pollution times” .

P1803 L23: I would suggest listing the value in mL L in the text and providing the mg L value in parenthesis. As it stands, the reader must make the mental calculation to obtain the mL L value and compare it to others in the paper.

P1806 L17: “beneficial” as opposed to “beneficiary”

Fig. 2 and 3: It seems to me the captions have been mixed around.

Figs.: Red and green can be a very awkward color scheme for some colorblind readers.
Fig. 6 in particular.

Interactive comment on Ocean Sci. Discuss., 11, 1783, 2014.

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