

Interactive comment on “Cyanobacteria Blooms in the Baltic Sea: A Review of Models and Facts” by B. Munkes, U. Löptien, and H. Dietze

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Dear Justus Van Beusekom,

thank you very much for your interesting and useful comments. We will include all of your comments in the revised version of our manuscript:

Justus Van Beusekom: In this paper, the authors discuss Cyanobacteria blooms in the Baltic. These blooms may cause environmental problems including toxic events or large biomass productions leading to coastal anoxia. A correct modelling of such blooms is important to check measures to combat eutrophication. The authors aim to bring together both a modelers view and a biologists view. They compare 5 models that are used for political decision making regarding the approach to model cyano-blooms. Against this background, the factors that determine the cyanobacteria blooms in the real world are discussed. Based on the comparison of models and field/lab studies, the authors conclude that modelers tend to keep models simple (with good reasons), whereas in the real world cyano-blooms are complex with several species each with their specific requirements responding differently to changes in drivers (like nutrients, light, temperature, grazing).

Justus Van Beusekom: The paper is well written, but the discussion and outlook needs more substance. It does not come as a surprise that modelers tend to (have to) keep models simple and that biologists have an eye on complexity. Given this, I expect a more in-depth discussion on the next steps to be taken to overcome this schism. For instance, given the focus on those models that are used for policy purposes, the limits of using these models should be discussed and suggestions should be made how this dilemma can be solved. Could for instance the combination of “simple” biogeochemical models and conceptual models be a solution? And are examples available?

The authors: We find your suggestions very constructive and will revise discussion and outlook accordingly. Specifically, we aim to assess the possible impact of the formulation of cyanobacteria on future projections and make suggestions on how to proceed to solve the dilemma in our revised manuscript. Combining “simple” biogeochemical models and conceptual models might indeed be helpful and we will consider this line of thoughts.

Minor comments:

The authors: Thank you for your careful and detailed review of this manuscript.

Justus Van Beusekom: P1L12, delete commas around “: : :severe”

The authors: Thanks

Justus Van Beusekom: P2L4. This sentence is not very clear but very important. I would add a sentence, that explains the main question: How will future, management-induced changes in nutrient loads affect the blooms and how does this interact with expected warming?

The authors: We agree that the revised manuscript will benefit from an elaboration of this aspect. We will revise accordingly.

Justus Van Beusekom: P2L11 Phosphorus (not ..ous) P1L19: Sedimentary processes: this needs some explanation. Especially feedbacks between cyanos and P-release should at least be mentioned.

The authors: Thank you for your suggestion, we will include a paragraph about sediment processes and P-release in our revised manuscript.

Justus Van Beusekom: P3L4. Alternatives: so, in the end I expect suggestions on how superior alternatives can be developed.

The authors: Thank you for your comment, we will take these suggestions into account and will add some suggestions towards the development of alternatives.

Justus Van Beusekom: P4L6: prognostic variables: add s

The authors: Thanks

Justus Van Beusekom: P5L31: Typo in .19_C? (dot 19)

The authors: Thanks

Justus Van Beusekom: P6L32 PAR instead of RAR

The authors: Thanks

Justus Van Beusekom: P11L30 PO_{subscript4}, superscript 3 (you swapped both)

The authors: Thanks

Justus Van Beusekom: P13, header: You discuss P_{max}, but no mention is made of alpha. I suggest to add at least some words to this.

The authors: You are right, we will include alpha in our revised manuscript.

Justus Van Beusekom: P13L13 for Nodularia: space between the words

The authors: Thanks

Justus Van Beusekom: P14L11: Should this be Table 10?

The authors: It's great that you noticed this. We will correct the number.

Justus Van Beusekom: P15L18: Claessen et al describe (no s)

The authors: Thanks

Justus Van Beusekom: P18L9 Inline -> In line ? (see also P21L33)

The authors: Thank you for this note. We will correct all wrong "in line" in the revised version.

Justus Van Beusekom: P18 L28: hamatusarexs ->hamatus?

The authors: Thank you for this note. You are correct with this species name.

Justus Van Beusekom: P19L24: exceed -> exert?

The authors: Thanks

Justus Van Beusekom: P21L31: specie ->species

The authors: Thanks

Justus Van Beusekom: P21L32: add space after (2002)

The authors: Thanks

Justus Van Beusekom: P23L27: processes on the Baltic. (delete respectively

The authors: Thanks, we will do so.

Justus Van Beusekom: P25L33: politic->policy?

The authors: That is right, thank you.

Justus Van Beusekom: P25L14: "A comparison of". Do you refer to the present study?

The authors: Yes, we refer to models and field experiments studied in this manuscript. We will change the sentence, so it will be easier to understand.

Justus Van Beusekom: P25L17ff: an unclear sentence. Maybe delete at the end "of which"?

The authors: That is right, thank you.