

## ***Interactive comment on “Model study on horizontal variability of nutrient N/P ratio in the Baltic Sea and its impacts on primary production, nitrogen fixation and nutrient limitation” by Z. Wan et al.***

**Z. Wan et al.**

zw@dmi.dk

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The authors agree with most of the reviewer’s statements. However, we don’t think these statements should become the rationales to argue against the subject of this manuscript. The reviewer might not have noticed that it is a common practice to use a fixed NP ratio in ecological modelling and operative oceanography. The key point of this manuscript is to demonstrate that a horizontally variable NP ratio is better than a fixed NP ratio in the Baltic Sea. The authors do not propose any other universal ecological hypotheses.

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We completely agree with the reviewer on his/her statements:

1. The DIN/DIP ratio is governed by a wide variety of processes and is certainly not only governed by phytoplankton uptake. 2. We can not make the hypothesis that only the phytoplankton uptake is responsible for this unbalanced ratio in external DIN and DIP. 3. The external DIN/DIP ratio can not be considered has an accurate N/P ratio of phytoplankton uptake.

Again, we agree on your statement “model simulations do not justify the use of a variable NP ratio derived from external nutrient data”. In fact, we were not aiming to justify that the NP ratio of observed nutrient changes during any periods is always consistent with the NP ratio of biological nutrient removal (gross uptake and remineralization). It was concluded by Wan et al (2011) that the NP ratio of observed nutrient changes before and after spring bloom is an indicator to the NP ratio of biological nutrient removal, where they validated at three offshore stations. Actually, it was noticed that this indication is effective for most of offshore stations, but ineffective for some estuarine stations. Obviously, this manuscript is not aimed to justify this indication as a finding nor a new ecological knowledge.

The reviewer obviously missed the core point. We did not claim a theoretical contribution. This manuscript mainly documented a technical advance relative to a common practice using a fixed NP ratio for the whole model domain through all seasons. The contribution of this manuscript to ecological modelling and operative oceanography is that a horizontally variable NP ratio ( for example, the distribution showed in Figure 3) is better than a fixed one. Certainly, a technical advance, especially the type of parameter optimization, do not always mean a large improvement of model results. The improved statistical results document that the new parameter scheme (horizontally variable NP ratio) is systematically better than the old parameter scheme (a fixed NP ratio), nevertheless the improvement extent is limited.

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