

## ***Interactive comment on “Assimilating water column and satellite data for marine export production estimation” by X. Yao and R. Schlitzer***

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We thank Referee 2 for his/her constructive comments and suggestions that help to improve the manuscript. The poor English in parts of the manuscript will be improved before resubmission.

1. Chapters 3 and 5.1 will be revised. We will include a separate paragraph to describe the cost function results of Exp A and Exp B individually and also the difference between the two. The English in chapter 5.3 will be improved.
2. The term ‘variety’ will be changed to ‘variability’. Indeed, the North Pacific is not the best example to highlight seasonal differences in surface phosphate concentrations, whereas other regions, such as the North Atlantic or the Antarctic high nutrient belt

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clearly show the seasonal effect in Figure 1. We will change the text accordingly.

3. In the original satellite-derived NPP dataset there are no data in the polar regions typically for some months during winter time, yet, a complete NPP field is required by the model. As fill-in strategy we take 10% of the maximum NPP value over the given box surface area. This seems to be a reasonable strategy as winter-time productivity values are expected to be much smaller than during bloom periods. Text will be changed accordingly.
4. The reviewer is right that computational cost cannot be seen from Figure 5. However, we describe the details of the forward and adjoint runs in chapter 4 below leading to the conclusion of about equal costs. We will change the sentence in line 20 and refer to the more detailed description below.
5. Agreed, text will be changed.
6. Yes it is 99.8%.
7. Agreed, text will be changed.
8. p.2064 line18. What we mean are situation where structures in the phosphate and POC data at a given location are conflicting in the sense that the model has no way to satisfy both. This will be described in the text and an example will be given.
9. In Fig. 6a and c, small negative values occur in some parts of the Atlantic subtropical gyres, where the color is almost white. The respective text will be changed and improved.
10. Agreed, will be changed.

We accept all minor comments. These issues will be fixed in the manuscript.