

Response to Anonymous Referee #1 comments on gmd-2021-2

“S2P3-R v2.0: computationally efficient modelling of shelf seas on regional to global scales”

Anonymous Referee #1

Referee comments are replicated in full in *back italics*.

Author responses to comments are in *blue italics*.

General comments

The overall quality of the preprint is good, and the described developments of the S2P3-R model are suitable for publication in this journal. The manuscript describes novel model updates and evaluations of the model both globally and regionally. The information and data provided will allow others to assess if the model may be appropriate for their use.

We thank the reviewer for taking the time to undertake this review and for their constructive comments. We are pleased to see the reviewer supports publication of the manuscript in GMD.

Specific comments

No comparison is made of regional biogeochemical performance compared to a long reanalysis such as the Copernicus Marine Service NORTHWESTSHELF_REANALYSIS_BIO_004_011 product. This seems like a missed opportunity given the spatial coverage compared to satellite data.

Thank you for this suggestion, we will carefully look into this product and consider how best to make use of it.

Suggested minor revisions

Comparisons to satellite data state data was limited to “case 2 water, i.e. water \geq 70m water depth (Jackson et al., 2019)”. Whether this is meant to be “case 1 water” or “ \leq 70” isn’t clear as the reference “Jackson et al 2019” does not seem to be available. I would suggest a clarification of satellite data selection criteria.

Thank you for highlighting the mistake in the manuscript. This should read “case 1 waters”. This will be updated in the revised manuscript.

We are sorry that that you were unable to access the Jackson et al., 2019 reference. This is a user guide for the satellite product and as such unfortunately does not have a DOI. The suggested link takes you to the repository which now contains more recent version of the documentation. We will resolve this as best we can in the bibliography of the revised manuscript, seeking guidance from the journal about how best to reference such a document.

The data variability in Figure 9A and 9B (and to a lesser extent Figure 18) is difficult to distinguish with a grey background. I would suggest the use of a white background for plots with viridis colourmap, such as in Figure 7. These global plots would also benefit from being larger, single viridis and blue-white-red colour bars could be positioned either side.

Thank you for this suggestion. The grey background was employed to emphasise the data when using a blue-white-red colour palette, but you are absolutely right, it is not good to use it where we have employed the viridis colour palette.

We will change the background colour for plots using the viridis colour palette and make the global plots as large as possible.

Figure 13 would benefit from enlargement and using a log scale may be more appropriate.

We agree that a log scale makes more sense for the comparison. We will do this, thank you for the suggestion. We will also make this figure as large as possible.

Technical corrections

Page 12 Line 21: suggest replacing “other” with “apart from”

This change will be made.

Page 29 line 41: This reference doesn't appear to be available from the url provided.

We are sorry that the link to the Jackson et al., 2019 reference did not work. As mentioned above, this is a user guide for the satellite product and as such unfortunately does not have a DOI. The suggested link takes you to the repository which now contains more recent version. We will resolve this as best we can in the bibliography of the revised manuscript.

Response to Anonymous Referee #2 comments on gmd-2021-2

“S2P3-R v2.0: computationally efficient modelling of shelf seas on regional to global scales”

Anonymous Referee #2

General comments

The paper presents an upgrade to a previously published modelling system. Addressing forcing issues that allow the system to be run over larger areas and longer times. I believe this to be a sufficiently large advance in modelling science to merit publication. The methods are clear and well presented. The protocols appear to be well documented with the supplied code (though I have not tested them).

The document presents an honest accounting for the strengths and weaknesses of the modelling system. In places this is a little too sweeping, or lacking the detail that would permit the reader to make scientific inferences from the results. E.g. to what extent does the exhibited skill over the Patagonian or North West European Shelf imply that later fluxes are not important. But that is not the aim of the paper.

The results support the concluding remarks, except that I would more strongly state the possible value of this tool in education (perhaps to undergraduates?). I also think that the value to policy groups of this “cheap” model is perhaps slightly dangerous if the output are not in some way corroborated with existing data from higher-expense simulations. After all this paper, at length, highlights the gains in efficiency do come with a loss in skill.

We thank the reviewer for their time undertaking the review and providing these valuable comments, and are pleased to see that they support publication of this work.

We will broaden the discussion within the revised manuscript to encompass the two excellent points around the use of the tool in education, and caveating the suggestion that the tool could be valuable for policy groups.

Specific comments

p9. Fig 3 caption: line 6: Without parenthetic commas, the “therefore” comes in the wrong place. E.g. This might be clearer:

“Where this is positive there is a net heat flux into the ocean. So, assuming the system is approximately at steady state, advection of heat is therefore out of this area.”

Thank you for the suggestion, this change will be made.

p9 line 15: should read "... more prevalent at low M2 tidal amplitudes..."

M2 is dominant in the North West European Shelf, in most places. But K1 can be relatively large in other regions, like the South China Sea

This is an important clarification, thank you. The change will be made.

p10. Line 2. Unpack this line. Is it the case? Does Figure 5 exhibit smaller model biases in the summer? Confirm what you think my eyes are telling me.

Thank you for questioning this. On reflection we should have been explicit about what we mean by mid-latitudes. We are considering these to be the regions 30-60 degrees N/S and will specify this in the revised manuscript. Because the eye can easily be drawn to the tropical areas highlighted in blue off northern Australia and Indonesia, we will explicitly mention the key mid-latitude regions which do show summer biases which are smaller than the winter biases (Scotian Shelf), and contrast this with the majority of regions which show little seasonality in the bias, e.g. NW European Shelf and Patagonian Shelf, and areas which appear to show a stronger summer than winter bias, e.g. South China Sea and Bering Sea.