



Interactive comment on “How should sparse in situ measurements be compared to continuous model data?” by L. de Mora et al.

Anonymous Referee #2

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Summary:

This paper demonstrates the difference between comparing numerical models to data by sub-sampling the model in time and space the same way as the in-situ data was collected as opposed to comparing spatial and temporal averages where all the model data have been used. This is demonstrated using a biogeochemical model and in-situ data from the North Sea. It demonstrates that some variability in the area-averaged mean of the in-situ data may arise from the sampling and if the model is not sampled the same way it may appear to not reproduce this 'variability'.

The method is just demonstrates for one particular model, not for models in general. The material is however presented in such a way that it should not be problematic to apply the model to another model/dataset, however that does not guarantee its suc-

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cess.

Overall the paper is well written and the subject clearly presented, but I miss a more in-depth discussion of the results. I find the presentation of the method straight forward and easy to follow, however the result-section is mostly a description of the figures and not much discussion is provided. After that there is only a short conclusion.

I think the paper is appropriate for GMD and the method potentially very useful to the earth science modeling community, but because of the shortcomings mentioned above I recommend this paper for publication only after a major revision has been performed. Below are more specific points for the authors to address.

Specific comments:

Abstract:

"The application of the point-to-point method showed that the model was successful at reproducing interannual trends". Should it not be 'interannual variability'. If the variability only shows up because the system is sampled a certain way how can we know that this is actual interannual variability and not just a result of the way the system has been sampled? This is touched on this later in the paper.

"we advocate greater transparency in the publication of methodology.", I agree, but this is never mentioned again, so unless a paragraph about this is added it should not be in the abstract.

Section 2:

It says that the model is run from 1965 to 2004, why are the figures from 1970 only, is this because there are no ICES data before 1970 or is there some other reason for excluding the first 5 years of the run? I thought the ERA40 reanalysis stopped in mid 2002, how come the run could go to 2004?

Section 4:

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Page 2317, line 11: "These values ..." This sentence does not make sense to me, is something missing?

Has any vertical interpolation of the model or in-situ data been done? What is the vertical resolution of the model compared to the in-situ data?

Section 5:

In this section I miss more discussion of the methods and results - for example:

- There are many salinity and temperature measurements and few nutrients and chlorophyll measurements - is there a difference in how the method perform in relation to how many measurements there are?

- In the introduction it is mentioned that when a region is well sampled, interpolation can also be used, but what qualifies as 'well sampled' and what is 'sparsely sampled'? Additionally at the end of section 5.2 it is mentioned that a more diverse and regular dataset of chlorophyll is needed to use the point-to-point method, but isn't this precisely the kind of dataset this method is supposed to accomodate?

- Is there a lower limit to how sparse the dataset can be in order to use the point-to-point method?

- How does the spatial and temporal sampling bias affects the calculated means?

- For which other types of models may the method be useful?

- What challenges may other models face when using this method for model comparison?

I find it a bit odd that the sub-chapter are named after the figure-type rather than subject.

Page 2318, line 13: "The high density ..." I agree that from the density plots temperature are well reproduced by the model, but I cannot agree with that for salinity.

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Page 2319: Are the modeled sea surface temperatures actually relaxed/nudged towards SSTs from the ERA40 dataset or just forced with ERA40 heat and momentum fluxes? In any case it seems the model does a good job with the temperature, I think it is unnecessary to give ERA40 so much credit for this. Perhaps rather add a sentence or two about how the SST forcing is done in the model description.

Tables:

Is there any particular reason why autumn not included in the tables? I don't understand what is the difference between 'Full' and 'Annual', they have exactly the same N, but somehow get different linear regression parameters.

Figures:

It would be helpfull to see a map of both the model region and the ICES subdivision IV. When variables are shown from the entire model in the figures, is it the entire model or just the all the model data in ICES subdivision IV?

I don't understand what the gray area in the figures 4-9 represents, what is the meaning of plotting the area and not just a curve? In the text it says that is the value averaged over the mixed layer, if so, this should also also be what it says in the figure label, not 'depth integrated'.

Technical details/suggestions

Page 2313, line 16: delete 'of'

Page 2316, line18: "forced into the same grid as the model " it sounds a bit like the data points are being moved, would it be better to say "collected according to grid cells" for example.

page 2317, line 8; delete "as the AMM is the Northern Hemisphere domain" and add "defined as" after "was".

page 2318, line 4: Whys do nitrates and phosphates have the subscripts 3 and4?

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page 2318, line 7: 'nitrates' should be 'nutrients' I guess.

page 2318, line 20-21: remove the 'd' at the end of 'overestimated' and 'underestimated'.

page 2318 line 20: instead of using "extreme" indicate if it is fresh/salt water or high/low nutrient values the model misses.

page 2319, line 19: "larger" should be "higher temperature".

page 2321, line 12. Find a better word than 'performant'. As far as I understand performant means efficient.

page 2323, line 10: delete 'simple'.

page 2324, line 7: 'more large and long-term'=> 'larger and longer '.

page 2324, line 5: delete 'hidden'.

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