

## ***Interactive comment on “How to use mixed precision in Ocean Models” by Oriol Tintó Prims et al.***

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Received and published: 10 May 2019

We are thankful for the referee's positive feedback and the valuable comments that helped to improve the quality of the manuscript. Specific answers for the major comments follow this lines. The minor comments have been addressed and the corrections are included in the manuscript.

**Referee:** Overall assessing quality of simulations using RMS (or similar as used here) is a good approach. However it is useful to pair this with some representative map plots (or other data representation) which can give the readers a sense for the locations and scales of the errors. I would recommend the authors introduce these figures, particularly for the NEMO section.

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**Answer:** We have added a paragraph in section 3.1.3 explaining how the magnitude of the differences is below the thresholds defined and therefore inappreciable in a regular plot.

**Referee:** The authors reference multiple simulations for the NEMO runs. Could they clarify when they use multiple initial conditions and how sensitive the tests are to the initial conditions.

**Answer:** As it is explained in section 2.3, we were using different initial conditions to double-check the results. During the analysis, whenever an experiment was positively evaluated with the first set of initial conditions, it was re-evaluated with a second set of initial conditions to increase the confidence on the results. It has been clarified in the text.

**Referee:** The paper is hindered by its length, there are many points where too many words are used to communicate the necessary information. Cutting space can be a challenging task but the final product will be a paper where readers can easily digest all the information that the authors wish to communicate. Ideally the authors would run through the text and ask themselves whether there is a more concise way of communicating each point or whether the information needs to be communicated. I have highlighted just a few examples in my minor points below.

**Answer:** The authors have done an effort to reduce the length of the document. This included rephrasing several parts all along the document and the reviewed manuscript is three pages shorter. We believe that the quality of the document has improved and many parts have been simplified.

**Referee:** P7:S2.2 Designing accuracy tests. What is the purpose of this section? This question is more thoroughly discussed in the model-specific sections. I would advise removing this section.

**Answer:** Being able to determine if a result is accurate or not is a basic requirement for the analysis. The purpose of this section is to show a simple example that tries

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to illustrate that not only the actual results but also how we evaluate them will impact the method outputs. We consider that it is important to keep it in the manuscript but however we shortened it.

**Referee:** P8:L3-7 Unsure of the purpose of this example. Suggest removing.

**Answer:** The example was provided because in a previous review it was considered useful to show a simple case in which a result of an arithmetic operation was wrong only when both variables involved were using reduced precision. We consider it illustrative for audience without an extensive experience in the field.

**Referee:** P9:L15 Do you have a citation for this?

**Answer:** This affirmation is based in our own experiments but the results have not been published.

**Referee:** How are the quartiles defined? Over space?

**Answer:** For each output variable and for each time-step the quartiles are computed using the data of the full spatial domain.

**Referee:** \* How does the ratio of RMSD and IQR vary as a function of time generally? Are failed simulations more likely to exceed the threshold for early/late times?

**Answer:** Since the simulations with reduced precision start with the same initial conditions than the reference, the RMSD at the beginning is very small and grows with time. The specific trajectories depend on the output variable analyzed, the variables which precision is being reduced and other casuistic. There is interesting information that can be learned from the results of a precision analysis, for instance the specific impact of each variable that is determined to require double-precision. These kind of analyses, however, go beyond the scope of this manuscript and might be part of future work.

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-20>, 2019.

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