

## Review #2

This is a well-written and thoughtful opinion piece. The abstract presents a nice layout of goals. I applaud the authors for this effort, as it is a useful contribution. I have only a couple of suggestions.

It is noted that the focus is primarily on climate modeling. Several caveats are given in the interpretations about the nature of the respondents and how this may influence the findings. Still, I think the piece would benefit from brief thoughts on how to engage stakeholders and how the results may vary by audience. What aspects are expected to change if the focus were shifted to seasonal to subseasonal scales? Models are tools, and it would be interesting to get broad stakeholder engagement and find out what they want from SO models. The responses depend on what the user's goals are, and it was telling that 40% of the respondents said ice sheet/shelf-ocean interaction is the key SO science topic.

*Thank you very much for your overall positive response to our survey and this manuscript. While we agree that a broad stakeholder engagement is desirable, we find it very difficult to speculate what the outcome would have been if the group of respondents would have been different. However, we have included a small paragraph on lessons learned in the conclusions section. This may not match exactly what you suggest here but provides some insight for future surveys.*

The discussion distinguishing in situ vs gridded products is off-putting:

*We agree with your interpretation and have rephrased several sentences in this section. Maybe our interpretation has been too simple and our wording misleading.*

Line 217: 'less valued' is a poor word choice. You can't have gridded products without in situ data and the respondents know this.

*Following criticism and another suggestion by Reviewer #1, this sentence and the next are changed to "Data from ship-borne instruments, moorings, and floats appear to be used less often directly [10-13%]. We acknowledge that observational data of all kinds, in particular including in-situ data, feed into the gridded products though."*

Line 244: 'lesser use': same thing as line 217. They are using it in gridded format, but they are using it.

*rephrased along with other statements in this paragraph*

Line 246: Maybe I am misunderstanding your inference here because I am struggling to link this to the survey questions, but I disagree with the interpretation. People know that gridded products are derived from in situ data. For example, it seems you are distinguishing between the Roemmich and Gilson mapped Argo product and Argo data, but not between the AVISO-mapped altimetry product and altimeters. I interpret the acknowledgement of the importance of in situ data as meaning they think the gridded products are important, not that they only want to have process study data. Respondents know they can't have gridded products without in situ data.

*This is a very interesting interpretation which we now have included in this section as follows: "Figure 3a shows observations desired for bias mitigation with in-situ observations clearly dominating over remote sensing data. This preference can be interpreted as a need for better process understanding in which in-situ data are considered actual "ground truth" and often provide higher resolution in space and time, which is useful in several aspects, such as model validation, identifying of processes resolved at a given grid spacing, improving model parameterizations, etc. Another interpretation is that modellers are well aware of in-situ measurements being crucial for better quality gridded products. And while such products are preferred in the actual validation process, the dire need for more ground truth data in a changing climate is acknowledged and its collection valued. "*

Line 217: I would drop 'The latter' as all data go into many of the gridded products.

*Changed to “We acknowledge that observational data of all kinds, in particular including in-situ data, feed into the gridded products though.”*

Line 220-227: Maybe this is more of a call for publishing open-source validation packages that incorporate data and help modelers use these data.

*Great thinking. We have included this in the revised text.*

**More specific comments:**

Line 134: is the problem unique to “coarse-resolution” models?

*It is not exclusive to but predominantly present in models not resolving continental shelf processes. We changed the sentence to “... in many climate models, specifically those of coarse resolution, with consequences for ...”*

Figure 2: The figure implies carbon uptake is in the pie explicitly, but the caption implies it is counted as ‘other’. Please reconcile this.

*Thank you for spotting this. The list of “other” topics in the caption did not match the latest, actually shown figure. We corrected the caption.*

Line 181: Please clarify this. Did you mean ‘supporting model parameterization development’?

*This could be development of parameterizations or hybrid models with AI elements or else. We prefer to keep this more general by just saying “model development”.*

Line 200: I would change the wording here. These physical processes are fundamental prerequisites to address the ‘big questions’. You can’t address ice-ocean interactions without understanding ocean heat transport.

*Good suggestion. We rephrased: “The results suggest that oceanic processes themselves, such as dynamics from mesoscale eddies to large-scale circulation, tides, waves and mixing are not “big questions” by themselves anymore despite remaining issues and their important role in current “grand challenges” like ice-ocean interaction, warm water intrusion onto the continental shelf and biogeochemical modeling.”*

Line 253: I don’t see how caring about shelf processes (i.e. the main bias) is independent of calling for year-round observations. (Maybe I am getting lost comparing Figure 1 and Figure 3b, but regardless I don’t see desiring year-round obs being independent of any model bias.)

*This was misleading. We meant that biases are equally connected with the year-round observations—not independent thereof; connecting lines to left side in Figure 3b have similar thickness for year-round obs. We rephrased: “The strong desire for winter observations and year-round monitoring in the Southern Ocean [29%] is linked nearly equally to all major biases identified (Figure 3b).”*

Line 260: This may not be justified as these (e.g. ‘sea ice’ or ‘radiative processes’) weren’t given as choices in the ‘most problematic ocean model bias’. I think sea ice - ocean interactions is a huge source of model uncertainty, but my response wouldn’t reflect my concern based on the questions asked. In fact, I may pick ‘mixing’ because that is related to sea ice - ocean interaction. I would give a caveat here that some of your impressions here may be due to the options given and the wording in the survey. (And this is a bit in conflict with Line 282-283, which seems to say sea ice is important.)

*This is a valid point. We have addressed this by changing the two sentences following this statement: “This is likely owed to the limited choice of pre-defined answers we provided and the behavioral bias of the respondents preferring to tick one of those rather than entering individual answers. Nevertheless, we take this as an opportunity to point out the need for improved fundamental understanding and acknowledgement of coupled mechanisms and feedbacks within and beyond the focus group.”*

Line 289: Why only early-career?

*Valid remark. We removed "early-career".*