I appreciate the authors' efforts for clarifying the reviewers' concerns and refining the manuscript. This study will be reconsidered for publication as soon as the **remaining issues** are fully addressed.

General comment:

The point is not to highlight the use of any specific type of pCO2 measurements over the others for the estimation of global maps of pCO2. For instance, float-based data provides indirect observations of pCO2 and thus high uncertainty for pCO2 estimates. However, the suggestions learned from the previous works [Bushinsky et al. (2019), Denvil-Sommer et al., 2021, Djeutchouang et al., 2022, Hauck et al., 2023, Landschützer et al., 2023] are to obtain more accurate (precise) estimates of pCO2 by extending the observing systems or considering additional data sources available in space and time. Besides, many of the existing works have exploited the sensitivity of pCO2 and flux estimates to the data sparsity over the Southern Ocean.

However, I agree that Thea Hatlen Heimdal et al have contributed a new finding about different USV sampling strategies to the global reconstruction of pCO2. It's worth to add few sentences in the last paragraph in Section Introduction to bold the new contributions as complements to the previous works. A summary of Section Methods would be enough: e.g. one-latitudes and zigzag sampling, … which differ from the SOCAT+SOCCOM or Argo-float ideal sampling over the global ocean by Hauck et al., 2023).

Specific comments:

I do not support the following arguments of the authors in their responses to the reviewers:

"*We do find the study by Hauck et al. (2023) interesting, but note that it was not published when we submitted our initial manuscript. In the revised version we have added a paragraph discussing this study and comparing their results to ours (lines 933-954). A key point made is that both Bushinsky et al. (2019) and Hauck et al. (2023) show an overestimation of the ocean sink with current sampling, while we show the opposite – an underestimation of the ocean sink.*"

First, I am not aware whether the initial manuscript was submitted to other journals or not. But as tracking the MS record in Biogeosciences, this study first appeared for review in September 2023 while Hauck et al. (2023) was published in March 2023. Second, it has a level of confidence of an overestimation of pCO2 based on present-SOCAT sampling as tested by Bushinsky et al. (2019) and Hauck et al. (2023). pCO2 generally increases over time and mapping methods tend to underestimate pCO2 (thence overestimate fluxes) based on sparse training datasets which have not covered the full range of realistic pCO2 values (many regions with high pCO2 values are unobserved). It's questioning about the distinction between the results in this study and the previous.

Lines 846-854 (in the manuscript with track changes) will need to be revised (or excluded). For such sensitivity tests, one would not expect to see the comparison in performance of different mapping methods but of a fixed method to different sampling scenarios. Even in this study, an ensemble of model output or the methods based on SST-removal effects from pCO2 would add more uncertainty to statistics such as bias, RMSD,... That's why I have suggested analyzing further differences in fluxes' variability (trends, seasonal cycles,...) with respect to different sampling strategies.

The discontinuity in Figures 3 and 7 still persists: we have obviously seen the gradients in RMSD at (SOCAT or zigzag) sampling tracks versus the "unobserved" areas. Therefore, I expect the authors to verify whether their mapping method put much higher weights on sampled locations than "unobserved" regions ('overfitting': i.e. over-exploitation of the entire available data for model training). From a statistical point of view, different mapping methods learned on different model testbeds (i.e. different training data have different data ranges) probably result in different magnitudes of RMSE or Bias. It is not convincing to mention that their mapping method has error values in line with those in the previous study.

Again, in the following sentence and others in the text, please be careful using the phrase “Observation-based data products”. Precisely, “mapping methods” have been developed to estimate pCO2 and generate global “Observation-based data products”.

Lines 50-52 (in the manuscript with track changes):

“Observation-based data products have been developed to estimate full-coverage surface ocean pCO2 across space and time by extrapolating to global coverage from these sparse SOCAT observations.”