We greatly appreciate the time that Reviewers 1 and 2 took to read and comment on our revised manuscript. As Reviewer 2 had no further comments, we only include Reviewer 1's comments below. Our point by point responses are bulleted just below the relevant comment. Except as noted, we have made all requested revisions to the manuscript as well as checked it for clarity and typos.

Reviewer 1 Comments on the Revised Manuscript
I appreciate the authors' thoughtful and thorough responses to all reviewers' comments. I am satisfied with how they addressed my substantive comments and am convinced by their replies where they did not agree with me. I feel that the result is an article that much more clearly justifies and differentiates itself relative to other major data compilation efforts (e.g., SOCAT, GLODAP). This will be a valuable information product for many end users.

- Thank you for the kind words. Our manuscript benefited significantly from all three reviewers' feedback and we are pleased to hear that the revised manuscript is much stronger. We appreciate your time and willingness to do a close read of the revised manuscript.

However, I have a few remaining concerns, most of them quite basic:

1) Lines 209-213—It would be helpful to spell out which constants they used with seacarb for readers' understanding. If this is elsewhere, no need to repeat, but in the two places I noticed this information, the various constants were not identified, as is standard practice for CO2 system calculations.

- Thank you for the reminder. We have added the constants we used to our methods section discussion of converting pH measurements to *in-situ* conditions for discrete samples in Section 2.2. As there are no longer any calculated carbonate system parameters in this dataset or manuscript (in contrast to Version 1), this is the only step in which they are used.

2) In at least two places, they said "principle carbonate system parameters"—I think they mean "principal," although I'm more used to thinking of it as two of the "measurable" CO2 system parameters.

- You are correct; we did mean "principal carbonate parameters" rather than "principle carbonate parameters." We have corrected this in the revised manuscript. We prefer "principal" over "measureable" in this case because, while

measuring any two of the parameters pH, total alkalinity, dissolved inorganic carbon, and pCO_2 will allow you to calculate the full carbonate system, there are other additional components of the carbonate system that can be measured that do not provide this benefit (e.g., the concentration of CO_2^{2-} ions).

3) They added stars to Figure 3 to illustrate where the locations referred to in the caption are, which is an improvement. It would be great to add them to Figure 1 too, for people like me who like to see things on an actual map.

- We appreciate this suggestion to improve map readability, but ultimately found that it made the figure more cluttered and hard to read, especially given that the state borders are already part of the figure. We have added a light gray background to the land and darkened the state lines to heighten the contrast in the figure and make it easier for readers to orient themselves, however.

4) Table 1—I really appreciate the authors adding citations (and the fair data use statement at the end) to the table. However, I think it's unfortunate to have removed the parameters included in each data set in the table. Could that information be restored? I also think some indication of the intrinsic uncertainty of the various input data sets would be very helpful for end users to have. Would it be possible to go through and flag the data sets in the table with respect to overall uncertainty? I realize this may differ by parameter and is not a small amount of work if they don't already have it somewhere (though I would think they do). If this information is elsewhere (e.g. in the detailed metadata), a simple statement clearly indicating where this info is should suffice for pointing readers to it. I am even thinking a binary indicator added to the table may be adequate—such as a superscript 1 indicates climate-quality vs superscript 2 indicates weather-quality data (where the superscript could either go on the ID column or by parameter if those can be added back in). Information on what I mean by climate vs weather can be found in the GOA-ON principles (Newton et al. 2015), at least for the OA(H?) parameters, if not also for T and S.

- Thank you for these suggestions. We have added back in the "parameters" column as suggested. We appreciate the suggestions of how to add an indication of data quality to the datasets table or supplemental table. However, this is challenging to determine for most datasets in our synthesis, as many datasets are a mix of both data types. As you note, the data quality varies by parameter. It also frequently varies through time within the same dataset. As such, we felt that this

determination was beyond the scope of the manuscript. To alert readers and users to this, we have added a caution about data quality to two places within the paper. In the caption of Table 1, we added "Users need to be mindful of the difference between climate-quality and weather-quality datasets and assess the suitability of these datasets for their needs (Newton et al., 2015)." Secondly, we added the following sentences to the beginning of our "Quality Control" section in methods (Sect. 2.4): "This quality standardization did not extend to raising all datasets to a "climate-quality" standard (Newton et al., 2015). Users of these data should be aware of the difference between climate-quality versus weather-quality data, as both types of data are included in this synthesis and often coexist within the same datasets."

5) I like the rewritten TA-S section and the new figure. Much stronger.

- This comment is much appreciated. We are grateful for this and another reviewer's comments that pushed us to substantially rework this section.

6) There are at least a few places where the word "data," which is always plural, has a singular verb conjugation.

- Thank you for this reminder. We have found and fixed these instances.

7) I've selected data quality "good" above because I am not sure ALL the data included are "climate-quality" (which I'd equate to "excellent", vs. "good" for weather-quality data).

- This is correct and feels like a fair assessment; we do have some weather-quality datasets in our synthesis. For some applications, this will likely increase the utility of the synthesis product since it significantly increases the data available. However, including these data sets comes at the cost of requiring investigators to filter the synthesis product and carefully screen data sources if their work requires only climate-quality data.

8) Finally, I couldn't get all the way through the supplement because some of the figures were bogging my system down (despite having had larger graphics files open earlier today in Acrobat with no problem).

- We have fixed the issue with the way our figures were embedded in the supplement so it should now open without difficulty. We have also taken this

opportunity to add descriptive figure captions and make some minor formatting adjustments to the supplement.

Overall, well-done synthesis and well-written paper. I'll be excited to see this published.