

Interactive comment on “GLODAPv2.2020 – the second update of GLODAPv2” by Are Olsen et al.

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General Comments:

This is an update to the GLODAPv2.2019 by adding 106 new cruises from 2004-2019, expanding the coverage of GLODAP to 946 cruises over 47 years, 1972–2019. Most of the new cruises are from the western North Pacific and the Davis Strait, with a few from the Atlantic, South Indian, and U.S. West coast. The methods for primary and secondary quality control (QC) are essentially the same as in the earlier version. However, there has been no full consistency analysis of the entire data product as was done with the original GLODAPv2 product. A full consistency analysis will be performed in the future for the next GLODAP update (will be termed “GLODAPv3”) which is set to occur after the completion of the third GO-SHIP survey around year 2023. The researchers have also fixed some minor errors in the GLODAPv2.2019 dataset.

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Throughout the manuscripts the researchers discuss alternate ways of adjusting the dataset, and tend to take a conservative approach, saving any major changes for the next full GLODAP update, i.e., GLODAPv3. As such, this update could be considered by some to be incremental, but it should be noted that incremental and timely updates to GLODAP are critical to advancing ocean observing. GLODAP, and other such data products that have come before it, forms the backbone for studying large-scale changes in water column properties and has also become increasingly important as autonomous platforms and sensors rapidly begin to fill the world’s oceans. Many autonomous biogeochemical sensors are prone to drift and rely on GLODAP data and methods such as linearly interpolated regressions (LIRs; Carter et al. (2016, 2018) or machine-learning methods such as CANYON/CONTENT (Bittig et al., 2018, Sauzède et al. 2017) for ongoing quality control after deployment. GLODAP also serves as a benchmark for background concentrations in ocean and earth system models.

Where available, the researchers have also added isotopic data for $\delta^{13}\text{C}$, $\delta^{18}\text{O}$, and $\Delta^{14}\text{C}$ which are not quality controlled/adjusted in the same way as the core GLODAP variables but can provide context for the other data.

They have also added discrete $f\text{CO}_2$ values which will be useful in addressing inconsistencies in the carbonate system variables. Importantly, $f\text{CO}_2$ has not been subjected to any secondary QC. There has also been more extensive use of CANYON-B and CONTENT predictions to evaluate offsets in nutrients and CO_2 data.

One important change that has been made to this version is that there is no internal consistency evaluation of seawater CO_2 chemistry variables to evaluate pH. This leads to an inconsistency between the pH data for cruises added in this version, and pH data in previous versions of GLODAP. My understanding is that this will likely manifest as a bias, and not a random uncertainty. This potential bias is indeed encompassed by the stated consistency of “0.01 to 0.02 pH units,” but will be critically important for those using this dataset and should be explained more clearly earlier in the manuscript, and perhaps even in the abstract. I also do not think that the consistency for pH should be

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stated as a range. Yes, it varies by region but unless each region/cruise/data point has its own uncertainty estimate, the overall consistency should be stated as ± 0.02 pH units. If it is the case that there is only one region where the consistency is ± 0.02 pH units, and the rest of the ocean is closer to ± 0.01 , then that region should be explicitly defined.

The original and adjusted data, a detailed adjustment table, and a “known issues” document are available online at the links provided in several formats, and as both global and regional subsets. The “known issues document” is updated regularly and users are encouraged to consult that document when using the data products and identify new issues when they find them.

I was also expecting to hear if/when the next GLODAP gridded product will be produced. Will it always only come with “major” GLODAP updates or are there any plans to do incremental updates?

Specific comments:

Line 249: An adjustment of $-3 \mu\text{mol/kg}$ is made for a cruise which has a mean offset of $3.68 \mu\text{mol/kg}$. Are adjustments always whole numbers? If so, do you always round down?

Line 251: Because they are an exception, provide more detail about how these eight Japanese Sea cruises were adjusted.

Line 319-320: Needs editing for clarity

Lines 280-282: While it is stated that TAlk estimated from 67 times salinity is sufficient for such pH conversions, it would be useful to explicitly state the amount of uncertainty introduced to pH by such a TAlk approximation.

Lines 427-429: Why was this decision made to replace measured values with calculated values?

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Lines 537-541 and 558-559: It is acknowledged twice in the summary that the surface data are both seasonally biased and not examined for consistency in GLODAP. This is an important caveat and should be stated in the introduction.

Figures 3, 5, 8, 10: Include a legend for the colors

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