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Interactive comment on "A new global interior ocean mapped climatology: the 1° × 1° GLODAP version 2" *by* Siv K. Lauvset et al.

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Dr. Dunne,

Thank you for your kind comment on the value of this mapped product. I've tried to briefly answer your comments and concerns here:

1. The poleward elongation you mention is partly an artefact a coordinate transformation which is necessary in order to include the Arctic. If you project the maps onto a circular globe this elongation is much smaller (though not completely gone). However, several people have noted this artefact and no one is particularly happy with it, so the GLODAPv2 team has decided to redo the maps without the coordinate transformation. This implies having to do the Arctic Ocean separately.

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Discussion paper

2. You are probably right that choosing 180° E/W as the boundary was unfortunate. This is easy to remedy, and using 20° E as you suggest is a good idea.

3. I tried duplicating data over several different distances across the boundary, and more than 10° actually created more artefacts. The discontinuities visible in your map are also partly due to the duplication not only being an overlap but also, in part, a mirroring of data. I apologize for not catching the artefacts this created, and will make sure to fix this in the updated version.

4. Please note that the "structure", by others called "blotchiness" in the equatorial Pacific is not significant when the error fields are accounted for. I agree it is not a very appealing visual image though. Choosing the best correlation length is not a simple task, and there are restrictions in the method and software that I have to abide by. In DIVA it is not possible to set two different length scales for the N-S and the E-W. I have to define one and use mathematics to increase the correlation zonally. This will be easier if I do not perform the coordinate transformation mentioned in 1), so the updated version will have an E-W correlation length scale approximately 2x the N-S.

5. The reason the "structure" in the equatorial Pacific is greater in the 2000-2013 is because there is considerable lower data density in this time period, and very far between cruise lines in the Pacific Ocean.

In addition to the above comments I want to inform you that there is ongoing discussion and work as to further improvements to the GLODAPv2 mapped product. The statement below will be posted at the GLODAPv2 site at CDIAC to inform our users of the most recent developments.

Sincerely, Siv K. Lauvset and the GLODAPv2 team

Statement posted at CDIAC:

In the GLODAPv2 mapped climatologies there are some discontinuities, and other artifacts of the method, in the Pacific Ocean. We are aware of these and, except in cases

at the very high latitudes, they do not have a significant effect on the product – meaning that when accounting for the mapping errors the effects disappear. In the cases where these discontinuities are significant they result from a lack of data on both sides of the boundary. We do, however, realize that these issues make the mapped climatologies less visually appealing. We are working on an updated version of the climatologies, which we will call GLODAPv2_MAPPED.2016b. The planned changes are outlined below:

1. The boundary will be moved from $180°$ E/W to $20°$ E because there is much less ocean at $20°$ E.

2. The zonal correlation length scale will be lengthened.

3. The Arctic will be mapped separately using input variables optimized for this basin. The results will then be stitched together with the global map.

Points 1 and 2 are expected to remedy the issues in the Pacific Ocean and Southern Ocean, but are also expected to increase the discontinuities in the Arctic, which is why we plan to map this basin separately. We expect the Arctic remapping to yield a better climatology for that area. Until this remapping is completed we encourage use of the posted versions and request users to report any difficulties or inconsistencies once the inherent errors have been considered.

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