

Interactive comment on “A global climatology of the ocean surface during the Last Glacial Maximum mapped on a regular grid (GLOMAP)” by André Paul et al.

Anonymous Referee #1

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The paper presents **GLOMAP**, a new climatology for SST and sea-ice extension for a specific period and which covers the World Ocean. According to the journal guideline, my overview is as follows:

Scientific significance: the manuscript represents a substantial contribution in the terms of data (i.e. a new climatology) and application of a method (DIVA) to a specific type of data. The final products (climatology) will certainly be useful to other scientists and employed in different contexts.

Scientific quality: the scientific approach and applied methods are valid: the data pro-

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cessing is well described, the limitations and the uncertainties on the data are clearly presented.

Presentation quality: the manuscript and the figures are clear, the document is concise and well structured.

General comments

The authors state is that the *Data-Interpolating Variational Analysis* method is also capable of analyzing much sparser data. In the paper there is no real comparison or assessment of other methods that would allow the author to make this statement. So I would encourage the authors to add a few lines explaining their choice, maybe by adding some details on the methods that could justify their choice for the present study would be relevant and comparing with the methods employed to create **CLIMAP** and **GLAMAP** climatologies.

Data availability: it would be useful for the reader to have the direct URL to avoid searching within the PANGAEA database. I searched using "GLOMAP" as keyword (<https://www.pangaea.de/?q=GLOMAP>) but that request did not return any result, so I guess the data will be published once the paper is published. What is the format of the climatology?

Some parts of the processing workflow (Section 2) were not totally clear to me, for example

lines 89-109: why are the two steps necessary, and why not use all the data at the same time for the monthly interpolations?

lines 94-94: To each sea-ice covered data point we assigned an error of 2°C

→ does this mean that measurements taken where it is supposed to be sea ice are used for the gridding? From line 80, it seems that the finite-element mesh is based on

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a coastline from a glacial topography, so the measurements on ice would not influence the analysis.

Could you add the figure of the coastline and the finite-element mesh in the Appendix?

Minor comments and typos

39: This method allows to take → allows one to take

39: the uncertainty on the reconstruction → the authors probably means the uncertainties on the observations (instrumental errors, representativeness errors etc).

40: or for assessing the data-analysis mismatch.

→ independently of the interpolation technique, the data-analysis mismatch is not always a relevant metrics: one can obtain a very small mismatch by forcing the analysis to be close to the observation. This would result in a "noisy" or "patchy" interpolated field, which may not represent what a climatology should be.

line 49: "we digitized sea-ice edges"

→ can you explicit what is the process to digitize? For Xiao et al. (2015, Fig. 7a), the panel a of their figure did not display any coordinates, how was that solved? Does this also means that no other publication provides the sea-ice edges in digital format?

65 is associate with → associated with

72-73 the magnitude of the data (anomalies) themselves as well as on the gradients, the variability and data-analysis misfits

82 We fitted the covariance function to the foraminiferal data

→ indicate how many data points were considered for the fit.

84 estimates of the correlation length of 9.2° and 10.2°

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→ is there a physical explanation to this difference, or do you attribute that to numerics?

94 To each sea-ice covered data point we assigned an error of 2°C

→ is it necessary, since you defined a coastline and mask using "glacial topography GLAC-1D"

103: new (artificial) diatom and radiolaria data

→ what is the source of these data? (and why "artificial"?)

141 South Alantic → South Atlantic

169-170 DIVA may be used to more accurately estimate the spatial covariances as described by the non-diagonal terms

→ Beckers et al. (2014) may be relevant for this aspect

Beckers, J.-M.; Barth, A.; Troupin, C. & Alvera-Azcárate, A. Some approximate and efficient methods to assess error fields in spatial gridding with DIVA (Data Interpolating Variational Analysis) (2014). *Journal of Atmospheric and Oceanic Technology*, **31**: 515-530. doi:10.1175/JTECH-D-13-00130.1

224 may allow to first smooth

→ may allow one to first smooth

Figure 2:

- indicate the meaning of the yellow-brownish area close to the Antarctica (rectangles in the attached figure)
- Analyzed SST anomalies
→ with respect to what reference or background are computed the anomalies? (also in text, line 97).
- the size of the dots representing the data is a little bit to large, so several dots overlap, especially in the northern part of the domain. In Figure 4 the dots are

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smaller.

334 WOA: World Ocean Atlas 1998 → why not use a more recent version of the World Ocean Atlas?

Figures for the monthly fields: having 6 (or maybe 12) sub-figures seems possible and won't cause problem to the readability of the plots.

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-154>, 2020.

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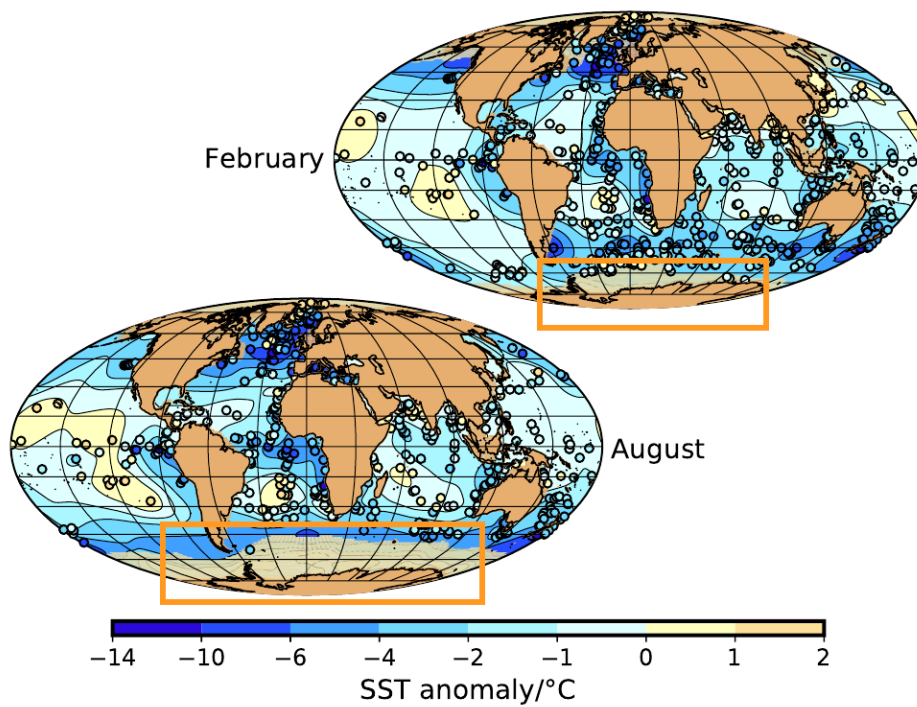


Fig. 1.

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