Author Response 2:

Gap-filled subsurface mooring dataset off Western Australia during 2010–2023

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We would like to thank the reviewer's constructive comments. Below, we provide our detailed point-by-point responses to the review comments. The reviewer's comments are in black, our response is in regular blue colour, and our revisions in the manuscript are in ***bold orange italics***.

Reviewer #2: Anonymous Referee

Q1: The authors addressed the concerns raised on the previous version. The number of figures in the Supplement is now 12, more than in the main document. I suggest to consider if really all of them are needed or they can be rearranged (e.g. merge S4/5). Moreover, for all line plots I would avoid using green/red combinations; blue/red as used elsewhere is preferable.
A1: The Supplement had 14 figures. We merged Fig. S4/5 and removed Fig. S13, so there are now 12 figures. We changed to blue/red combinations for all line plots in the Supplement and manuscript. We also updated the colour schemes, which allow readers with colour vision deficiencies to interpret our results correctly.

Q2: I have checked the netCDF file metadata, and variables latitude is misspelled. Authors may want to double check this and add an errata file on the website.

A2: Thank you for your comment. We added an errata file on the website (https://doi.org/10.25919/myac-yx60).

Q3: L117 This sounds repetitive.

A3: We rephrased the text to avoid the repetition.

" The velocity observations on the IMOS mooring array are recorded by various RDI and Nortek ADCP instruments, typically sampling at 15-minute intervals, mounted in an upward-looking configuration above the seabed (Table 1)."

Q4: Fig 2 caption: referent or reference?

A4: We updated the text, and only used the term "referent" in this caption.

Q5: Table 2 the crosses should perhaps be substituted by N/A or similar.

A5: Fixed.

Q6: Eq 2 the square brackets seem unnecessary; however you should add the bounds of the summation for clarity.

A6: In section 2.2 SOM method, we updated Eq 1 and 2 as follows:

"Firstly, we estimated the local correlations in the data space, represented by a $cor^{u}_{i,j}$ ***matrix.***

$$cor^{u}_{i,j}=1+\sqrt{\sum DAT\_cor^2}, \quad (1)$$

where DAT_cor is a correlation matrix among each normalized input vectors within a SOM unit; $cor^{u}_{i,j}$ ***is the local correlation matrix between the missing and the mean of all the observed training data within the SOM unit u.***

Given with local correlations in the data space, we then calculated the minimum Euclidean distance between a normalized input vector X containing missing and non-missing components and the referent vector of the SOM unit, ref^u using a similarity function (Chapman and Charantonis, 2017). The similarity function is defined as:

$$sim(X, ref^u) = \sum_{i \in non-missing} \left(1 + \sum_{j \in missing} \left(cor_{i,j}^u\right)^2\right) \times \sqrt{(X_i - ref_i^u)^2}, \quad (2)$$

Where X_i is the non-missing data in X, ref_i^u is the mean of all training data in the SOM unit u.

Reference:

Chapman, C. and Charantonis, A. A.: Reconstruction of subsurface velocities from satellite observations using iterative self-organizing maps, IEEE Geoscience and Remote Sensing Letters, 14, 617-620, https://doi.org/10.1109/Lgrs.2017.2665603, 2017.

Q7: Fig S7: the caption, especially the last part, reads repetitive.

A7: We kept the last part because we wanted to clarify the climatology estimate, and we do not have this sentence in the manuscript.

Q8: Fig S9: I would avoid adding comments/conclusions in the captions, these should be in the main text.

A8: We removed the conclusions in the captions.

Q9: I suggest to perform some formatting changes but I do not have other major comments, except perhaps stressing in the text the limitations of the SOM-derived product (some systematic biases may exist, see comments below).

L210 I have the impression the SOM tends to have some warm bias, e.g. the extent of extremes is smaller. This should be discussed.

A9: We added one paragraph in Section 6 Summary and discussion to address these comments.

"There are weak biases in the SOM-derived product, such as a warm bias at WATR20 during the validation period from January 1 to May 30, 2020 (Fig. S6c). It is noted that this period experienced multiple marine cold spells (Fig. 7b). This systematic bias is likely due to the nature of the SOM algorithm, which tends to underestimate the magnitude of extreme events while effectively capturing broader patterns. Future work could explore bias correction techniques to enhance accuracy."

Q10: L251 have you introduced Categories already?

A10: We added two sentences in the last paragraph of Section 3 Data application to introduce Categories.

"In this study, different categories of MHWs are defined based on multiples of the local difference between the climatological mean and the 90th percentile (Hobday et al., 2018). The magnitude scale descriptors classify MHWs as moderate (between 1–2 multiples, Category I), strong (2–3, Category II), severe (3-4, Category III), and extreme (>4, Category IV)."

Reference:

Hobday, A. J., Oliver, E. C., Gupta, A. S., Benthuysen, J. A., Burrows, M. T., Donat, M. G., Holbrook, N. J., Moore, P. J., Thomsen, M. S., and Wernberg, T.: Categorizing and naming marine heatwaves, Oceanography, 31, 162-173, 2018.

Q11: L332/3 These very short sentences are strange; is something missing?

A11: This is the journal's standard format. Nothing is missing.