

1 Reviewer 2:

2 The authors have done a reasonable job responding to comments from the referees. The  
3 focus of the paper has been significantly improved since the initial submission, however  
4 there are some meaningful revisions to the presentation of and description of the results  
5 that should be made before the paper can be published.

6

7 Please use a different colourbar for d18O than for Longitude, the use of only a single  
8 colourbar throughout makes the figures much more difficult to interpret than they need  
9 to be. Choose one colourbar for d18O, another for longitude, and use those throughout.  
10 If possible, the same scale should also be used each time. As currently presented, using  
11 same colourbar for every variable makes the figures much more difficult to interpret  
12 than they should be.

13

14 In all cases, a continuous colourbar should be selected. The red-blue colormap creates  
15 the artificial impression of a split between the data. Perhaps this is the author's  
16 intention, with regards to isotope values above/below 0‰ vs VSMOW, however they do  
17 not indicate any significance of 0‰ as a meaningful 'threshold' so a continuous  
18 colourbar would still probably be more appropriate. In this case, I don't think it's  
19 important that the scale runs from (e.g.) -1‰ to +1‰. If the range in d18O values being  
20 presented is from (e.g.) -0.5‰ to +1.25‰, that would be a more helpful range to see  
21 represented by the colourbar.

22 Au: As recommended, on figures we now use another color scale for the longitudes than  
23 for the water isotope. We also slightly changed the 'water isotopes' color scale, with the  
24 less intense near 0‰ values been now greyer and not too light. This might have  
25 contributed to the reviewer's comment on the split in the distribution. The choice -1‰  
26 to +1‰ was motivated indeed by the 0‰ value versus VSMOW being an expected near-  
27 average ocean value. An additional reason for that choice was to have a nearly similar  
28 scale on figure 1a than on figures 2, and 3 (the only change for that scale is that it  
29 extends to +1.25‰ which is nearly reached for some North Atlantic data). We agree that  
30 the data distribution implies that there are few values below -0.5, but occasionally this  
31 happens, and thus the scale extending to -1‰ allows us to plot such lower values.

32

33 The manuscript should be carefully copy-edited, as there are several inconsistencies  
34 throughout, e.g.:

35 -“pss” is still used several times throughout

36 Au: We removed the two remaining cases of pss. We agree that once we signify that we  
37 use practical salinity, we don't need to repeat it further.

38 -Language is inconsistent regarding directions (South-East, southeast, Southeast, south-  
39 west)

40 Au: Thank-you. We unified the notations with the use of southeast (or southwest)  
41 throughout.

42

43 Specific comments:

44

45 L148: Please add a legend to Figure 1 defining the colored lines, back dots with error  
46 bars, and magenta dots. A legend will greatly improve the readability. The d180 scale on  
47 Figure 1 is -1.0‰ to +1.25‰, while in all other cases the d180 scale is -1.0‰ to +1.0‰

48 Au: The only change between the color scale for different figures is that in Fig. 1a, it was  
49 extended from +1.00‰ (i.e. the upper limit on Fig. 2-3) to +1.25‰. The reason is that  
50 there are a few data in the North Atlantic over +1.00‰, which would not be plotted  
51 otherwise. We have added a legend in Fig. 1b-e plots to clarify what is  
52 presented: 'LOCEAN' added over the indicated periods on the left side, and 'P15-17' and  
53 'V2023' on the lower right corners for the Polarstern averages and the Voelker et al  
54 (2023), respectively. In the caption, we have replaced 'curves' by 'lines' and have added  
55 the panel letters.

56

57 L211: Please describe and make explicitly clear why you decided to draw a regression  
58 through points between 35 and 36 salinity, and why this line was used to split data. A  
59 fairly strong linear relationship can be seen in Fig 3a down to salinity 34, and it's not  
60 clear why the regression was only drawn for salinities higher than 35, or why you  
61 exclude data from above the regression line in subsequent Figures. In L209 you mention

62 'scatter' above the line – and subsequently exclude data above that line. Has this data  
63 been excluded because of compromise, or is it a geographical exclusion drawn by  
64 salinity? Is it just to make Figure 4 look nicer? What is the reason for the regression  
65 through those points, or for focusing on only those data below the line?

66 Au: The reason we focused on the 35-36 practical salinity range for defining a mixing  
67 straight line in the southwest Indian Ocean is to select data in the subtropical gyre. It is  
68 within this range that Glaubke et al (2024) suggested that there were different water  
69 masses with fresher contributions originating from either further south or further north.  
70 Taking the slope of this straight line in the limited 35-36 range avoids being overly  
71 influenced by the very large number of points in the LOCEAN dataset for the southern  
72 fresher surface waters. The distributions of LOCEAN data above and below this 'mixing'  
73 line (which we extrapolate outside of the 35-36 range) end up not overlapping in the  
74 eastern and far western or northern parts of the Indian Ocean, while there is a large  
75 overlap in the southwestern Indian Ocean (this is the 'scatter' we were referring to), due  
76 to different surface water masses. This is why afterwards on figure 4 we only show the  
77 data points below this line which are the only ones of the LOCEAN dataset for the  
78 regional domain of the CROCCA-2S and Richardson et al (2019) data sets. We have  
79 rewritten this paragraph which obviously was not clear enough, based on the comments  
80 received.

81 L212: By nature of how the regression is drawn, it would be impossible for data falling  
82 above the line to have a lower salinity than 35, so this shouldn't be mentioned as a  
83 result. This could be described further while addressing the regression in above  
84 comment on L211.

85 Au: the estimated mixing line was extrapolated outside of the 35-36 domain (now  
86 plotted with a dashed line). Thus, the statement that there is no data above the line for  $S$   
87  $< 35$  is not a given and worth mentioning. Indeed, if data further north had been  
88 included in the data set, it would have probably included points with  $S$  lower than 35  
89 above the mixing line.

90

91 L223: The use of the same colourbar for different variables on different scales makes  
92 Figure 3 hard to read. Please select different colourbars for each variable.

93 Au: We agree and have changed the colorbar of Fig. 3.a with a yellow to green scale.  
94 Similarly, we have slightly changed the colorbar for water isotopes (from blue to red through  
95 grey)

96

97 L230: The 'gradual lowering' would be much more clearly illustrated with a continuous  
98 colourbar. As currently presented, it's hard to see anything in those figures other than  
99 the stark north-south divide between positive and negative d18O values – it's very  
100 difficult to see the east-west trend that you're highlighting, when the red-blue divide is  
101 so much more prominent.

102 Au: The comment on the 'gradual lowering' was referring to figure 4, not figure 3 (where it is  
103 hard to identify it as salinity also changes spatially). We expect that this lowering on Fig. 4 is  
104 now clearer with the yellow to green scale (we have also removed 'gradual' from the  
105 sentence).

106

107 L234: Please add a legend to Figure 4 describing each of the lines. It could also be helpful  
108 for context to plot the 35-36 salinity regression line on this figure.

109 Au: Thank-you. The lines are explained in the figure caption, and we added in the lower right  
110 corner of the plot a legend for the two types of lines.

111

112 Reviewer 1

113 The authors have addressed the technical points raised in the first round of reviews in  
114 an adequate way. I would say that they've done a fairly minimalist job of revision. The  
115 key substantive point from the first round of reviews, to my mind, was the question:  
116 what is this paper for? The paper highlights a data intercomparability issue, which  
117 people who use such data are (I think) already quite aware of. I had thought the paper  
118 could serve as a "call to arms", to spur the community into taking the issue more  
119 seriously and addressing it via e.g. an IAPSO working group, or a GO-SHIP activity. But  
120 the revised paper and responses indicate that both of these are already underway  
121 (which is good to know). So, I'm left wondering even more what the purpose of the  
122 paper is. I don't mean to sound overly negative, I just struggle to understand what the  
123 *raison d'être* for this paper really is.

124 Au: Thank-you. Our experience is that not every user of sea water isotopic data or of  
125 products derived from the data is aware of the issue. Although this is taken seriously by  
126 a large part of the data producers and some of the users, we selected these two examples  
127 to illustrate why it remains an important issue. The Glaubke et al (2024) paper is  
128 actually a case in hand for this being sidelined. The other comparison in the surface  
129 Atlantic Ocean stemmed from our interest to merge the LOCEAN and Polarstern data for  
130 further investigations, which lead us to find out that there had been some internal  
131 standard issues and that more work was required before merging the two datasets.  
132 Indeed, the original GISS *Global Seawater Oxygen-18 Database* is a wonderful assemblage  
133 of datasets and the mapping based on it by LeGrande and Schmidt (2006) is a valuable  
134 first guess in many world regions (albeit not in the deep Southern Ocean waters).  
135 However, although there were already efforts to adjust some of the individual datasets  
136 combined in this data base, this is still rather inhomogeneous with offsets in some  
137 subsets of a similar nature to the ones described here.

138

139 That all said, I believe that what the paper says is true, and I agree that the general issue  
140 is an important one. So I don't think publication would cause damage, or mislead  
141 anyone, and I guess it would be one more small piece of evidence explaining why things  
142 like the IAPSO group are important, albeit retrospectively. But is that enough to warrant  
143 a publication in *Ocean Science*? I am not sure.

144

145 I don't feel I can do much more as a reviewer to help boost the likely impact of the paper.

146 The authors chose not to follow up my suggestion of conducting a broader study

147 incorporating all publicly-available datasets, performing crossover analyses, tracking

148 down likely causes of individual offsets etc - which I agree would be a much bigger job,

149 but could be done as a contribution to the IAPSO working group etc. and would

150 genuinely be what the community needs.

151 *Au: We agree that what the reviewer proposes is a very valuable but much larger job*

152 *that needs to be undertaken with the support of a wide community. We hope that the*

153 *SCOR WG and other ongoing efforts (such as for GO-SHIP) will contribute to that, and we*

154 *added a summary in the conclusions on how this could take place.*

155

156 I think it is now probably an Editorial decision to determine whether to accept or not – I

157 kind of feel that it's now a binary yes/no choice, with the direction of the decision

158 depending on how useful to the community this paper is likely to be.

159

160 Editor

161 Your technical note was returned to both reviewers. Reviewer 1 remains sceptical about  
162 the value of the paper, whilst not disagreeing with any of the conclusions. Reviewer 2  
163 finds the message of the paper worthwhile, but has some further recommendations to  
164 improve the clarity and impact of the paper (e.g. different colour scales for O18 and  
165 longitude); I would like you to consider these carefully.

166

167 I have read the paper myself as an O18 person myself. I share some of Reviewer 1's  
168 concerns that we knew much of this already, however I appreciate the nice comparisons  
169 that you have undertaken with the two published papers. In many ways this technical  
170 note provides a valuable commentary on those papers, and a cautionary note about  
171 taking any oceanographic data set at face value.

172 *Au: thank-you very much.*

173

174 I think you could further strengthen the paper by being more specific about what people  
175 can do now to improve the reliability of O18 data – the “call to arms” that Reviewer 1  
176 mentions – whilst awaiting the deliberations of the SCOR working group. For example,  
177 are there any recommendations for collection or storage of samples that you could  
178 make? Or how regularly intermediate standards should be monitored or stored?  
179 Although this technical note is clearly not intended to be a “best practices” paper (as  
180 might be an outcome of the working group), some forward looking suggestions might be  
181 helpful.

182 *Au: (GR) I am personally very sensitive to the issues that you mention on collection,*  
183 *storage, and the monitoring of intermediate standards and storage, having myself*  
184 *stumbled on issues with them in the last thirty years. (all Au) Based on the material*  
185 *already existing, we trust that the SCOR WG just been established will provide useful*  
186 *guidelines. It is our plan for the next three years to work on those, provide ‘best*  
187 *practices’ to be submitted to a wider community, and actively initiate intercomparison*  
188 *efforts. We have expanded on this in the conclusion section, as follows:*

189 “The working group MASIS (Towards best practices for Measuring and Archiving Stable  
190 Isotopes in Seawater) of the Scientific Committee of Oceanic Research (SCOR) has newly  
191 been established to contribute tackling these issues, both for water isotopes and the  
192 isotopic composition of inorganic carbon in sea water,  $\delta^{13}\text{C}$ -DIC. For that, it aims to  
193 actively involve the international community in establishing guidelines for data  
194 production (collection, storage, measurement) and quality control, as well as for  
195 validating the data and comparing well-documented archived data originating from  
196 different laboratories. It will review the methods to estimate errors and offsets between  
197 the different datasets. An important step for this effort is to directly intercompare  
198 measurements by the different laboratories of shared well-preserved water samples  
199 distributed quickly, as was done earlier for  $\delta^{13}\text{C}$ -DIC (Cheng et al., 2019). This, together  
200 with enhancing interaction within the scientific community needs to be actively  
201 pursued, in order to reduce the errors when merging different datasets and increase the  
202 potential use of the water isotope data.”

203

204 However I recognise that the main message of this paper is not towards those  
205 generating data, but more towards those who download such data from data bases and  
206 assume them to be “correct”. If you are able to strengthen this message in your  
207 revisions, that would be beneficial, and may go some way to allaying Reviewer 1’s  
208 concerns.

209 Au: Thank you.

210

211 Some minor things:

212

213 Line 45 I would capitalise Southern Ocean as a name

214 Au: Thank-you. Done

215

216 Please remove pss in line 271

217 Au: Done

218



219 There are a few references referring to something “in” a reference; please replace these  
220 to “by” since references are to the authors (e.g. line 261)

221 AU: thank-you. Done.

222