# Response to reviewers – Revision 2

We thank the reviewer for another critical look on our paper. Following their advice, we have revised the manuscript, which has improved in clarity as a result.

**Reviewer 1:**

The authors' responses to my comments are appropriate and satisfactory. It is reassuring to see that the quantitative results presented in the manuscript depend only marginally on the particle integration time.
The model deficiencies in terms of stratification (notably the absence of ISOW and DSOW signatures) remain; however, these limitations are clearly identified by the authors, allowing the reader to form an informed opinion regarding their potential impact on the results.

That said, in their response, the authors tend to downplay the impact of the poor representation of deep stratification in the model by emphasizing that the maximum depth reached by particles within the convection region is about 1500 m. As a result, the particles do not directly sample the deepest layers where the stratification biases have been identified. However, it is important to note that the temperature and salinity properties of the particles within the convection region are themselves biased, because convection mixes water from the surface to the ocean bottom. Following convection, the temperature and salinity properties of the entire water column are therefore affected by deficiencies in the deep stratification. Consequently, the authors' T/S analysis is biased by these stratification deficiencies. This should be made clear in the manuscript.

We agree with the reviewer that the stratification bias in the overflow waters could impact the whole water column, especially on the convection region. This could indeed slightly impact our TS analysis. To make clearer that our result is only valid for our model simulation, we added "in this model simulation" concretely to the text:

Line 18: "*In this model simulation, the majority of those particles (95%) enter the DCA in the upper 1500 m of the water column*."

Line 408: "*Notably, we find that in this model simulation more than 95% of the particles reaching the DCA within six months arrive in the upper 1500 m and hence enter the part of the water column relevant for convection in winter (see DCA MLD definition in Fig. 2c, 3d).*"

In addition, we added the following lines to highlight the stratification deficiencies of the model when interpreting the results.

Line 417: "*We want to note here again that this simulation has a slight bias related to the correct representation of the overflow waters. Especially in the convection region, this could have an impact on the whole water column and therefore impact the mean DCA properties (green dot Fig. 6). This should be kept in mind when interpreting the results.*"