

Biogeosciences Discuss., referee comment RC5
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Comment on bg-2021-185

Anonymous Referee #5

Referee comment on "Oxygen export to the deep ocean following Labrador Sea Water formation" by Jannes Koelling et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2021-185-RC5>, 2021

This is a review of the manuscript entitled "Oxygen export to the deep ocean following Labrador Sea Water formation", by Koelling et al. By using mooring observations within the boundary current at the southern edge of the Labrador Sea and also data from Argo floats the authors investigate the effect of deep water formation and export on the replenishing of oxygen to the deep ocean.

The authors highlight that convection in the Labrador Sea contributes significantly to the supply of oxygen from the subpolar North Atlantic to the deep subtropical and tropical Atlantic Ocean. This supply of oxygen is mainly achieved via the input of newly ventilated Labrador Sea Water into the boundary current which in turn is rapidly being exported out of the Labrador Sea.

Given all the present discussions of the Labrador Sea and its potential role for the Atlantic Overturning Meridional Circulation, these are interesting results that improve our understanding of the high latitude ocean dynamics. The manuscript is well written and easy to follow, yet, there are a few places where it could be improved. Thus, I recommend this manuscript for publication after some minor revisions. Details are given below.

Minor comment

Since the authors discuss the differences between the properties of the Labrador Sea Water (LSW) and the Irminger Water (IW) I would expect a comparison of the temperature and salinity (and maybe oxygen?) ranges of these two water masses with previous studies. Last, it is not clear until almost the end of the manuscript that the authors refer to the water mass that is formed during convection in the Irminger Sea as Irminger Water.

Specific comments

Line 61: (and elsewhere) change analyse to analyze.

Figure 3: The second paragraph within the caption should be moved to the main text.

Line 114: Please add a reference for the definition used to calculate the MLD.

Line 116: The definition of the export of a float is not very clear. Do you define as export when a float crosses the 3000 m isobath and then reaches to a certain location to be considered out of the Labrador Sea or when a float enters and remains into the boundary current?

Figure 4: Would it be better to have all the stations in one plot with different line colors? Otherwise, please keep the same limits on y-axis for each panel.

Figure 7: Do all these floats reach the 53°W section after subduction?

Line 201: Please specify the number of floats instead of mentioning "handful".

Line 235 and Figure 9: I understand that the LSW input into the boundary current is defined based on the float data introduced in section 3.1, but could you specify a bit more the calculation of the LSW input?

Figure 8: Is the separation between LSW and IW in terms of spiciness arbitrary or is it based to previous studies?

Line 348-349: I believe that this explanation should be also mentioned earlier in the text.