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Ocean Science
Discussions

Interactive comment on "Transport of AABW through the Kane Gap, tropical NE Atlantic" *by* E. G. Morozov et al.

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The authors thank referees for their useful remarks. We joined our replies to three referees in one file. The file is attached. In the attached file: the comments by referees are in bold face; our replies are in regular face.

Reply of the authors to the comments of referee 1

P541: The bottom temperature at the entrance of the Chain Fracture Zone should be updated according to Mercier and Morin (1997, their table 1) who reported a bottom temperature of 0.682_C at the entrance of the Chain Fracture Zone, a value very similar to the bottom temperature found at the entrance of the Romanche Fracture Zone (0.674_C)

We updated the temperatures, referenced the publication and added our recent measurements in the Romanche FZ in 2011 (0.508°C).

P541: An AABW transport of 0.4 Sv through the Vema Fracture Zone is in the lower bound of published estimates. This should be reported.

It is reported, special thanks for a list of references. We missed some of the papers.

P541: Most studies on AABW transport in the eastern North Atlantic haven chosen to define AABW as potential temperature less than 2_C. It would be better to systematically give the transport estimates for this temperature limit as well as for potential temperature less than 1.9_C. (eg in a table summarizing all transports values).

We present such a summary in our book (Abyssal Channels in the Atlantic Ocean, Springer, 2010). This is indicated in the text. Sometimes it is not possible to calculate the transport below 2°C isotherm because there are no solid boundaries that constrain the flow. Another option is to introduce vertical liquid boundaries, but in these cases we selected the 1.9°C isotherm as the upper boundary.

P541, last paragraph: This is an oversimplified view of the AABW dynamics. The fact that the colder temperature observed at Kane Gap is 1.85_C does not necessarily mean that AABW with potential temperature less than 1.85_C away from the Kane gap does not flow through the Gap. It could also be that it warms up while flowing.

No doubt warming due to mixing takes place as the waters approach the Kane Gap, but only the waters warmer than 1.85ïĆřC exchange over the sill. We wrote that only the warmest part of Antarctic Bottom Water can exchange over the sill of the Kane Gap.

P542: Some explanation about the choice of the mooring deployment location is needed. Why on the western side of the Kane Gap (and not in the middle or on the right side)?

When we were deploying the mooring in 2010, we had much less information about the

bottom topography compared to the later surveys. We though that we were deploying it approximately in the middle. There were no special ideas to displace it to the western side.

P542, the dataset is made of 5 CTD/LADCP sections. Only one CTD/LADCP is shown

We added the text and figures with the profiles in May 2009 and temperature and velocity sections in 2009-2012.

P542: I suggest a stand-alone section for the technical presentation of the data set and not to mix it with the scientific discussion of the data set.

We added a special technical section describing the data

P543, l28. The bottom potential temperature value of 1.8_C should be indicated in Figure 2. We excluded this text portion.

P544, l1-3: This assertion should be documented by a study of the evolution of the vertical temperature profile along the bottom water path. Also, it seems from Figure 2 that the bottom potential temperature in the Gambia Abyssal Plain is very close to the one observed at the Kane Gap, which is in contradiction with your statement.

Unfortunately we do not have profiles of the evolution along the pathway of AABW

P544, l5-9. Since the LADCP section is not shown in Morozov et al. (2010d), it should be presented in this paper.

The temperature and velocity profile in May of 2009 is given.

P544, l9-11. The coldest bottom water is also found at the western side of the Kane gap in Figure 4. Again it is necessary to show all the CTD and LADCP sections such that the reader can makes its own opinion on the cross-channel variability of the flow. The statement on the role of the Ekman frictional boundary layer should be substantiated by (at least) adequate reference to literature.

We give all sections of temperature and velocity and cite the paper by Speer and Zenk 1993 where the authors write about the displacement of the cold core to the eastern wall of the Vema Channel in the Southern Hemisphere.

P544, l11-19: please show the data!

We present the sections of temperature and velocity.

P545, l1: Thierry et al. (Ocean Dynamics, 2006) have shown that the seasonal signal which is observed in the Romanche Fracture Zone was caused by the vertical propagation of equatorial Rossby waves generated at the eastern boundary. This signal is thus likely to be confined to the equatorial band.

We interpret it as a remote response to an increase in the eastward velocity and transport in the Romanche FZ. This could increase the amount of AABW in the Guinea Basin that could partly discharge to the Sierra Leone Basin through the Kane Gap and the northerly flow in the passage could be a remote response to the seasonal signal in the Romanche Fracture Zone.

P545: The vertical structure of the flow should be discussed based on the three current meter records obtained in 2010-11.

We present the figures with the rose of directions and transport for three current meters

P545, l6: Was this transport computed using the three current meter records?

Yes, and we indicated this in the text

P545, l22: Bottom potential temperature does not reach 1.92_C in Figure 5.

The figure is based on the daily average data, while 1.92°C is the measured temperature with a time interval of 10 min

P545, l19-20: This statement is true only for waters in the vicinity of the Kane Gap.

This is added

P546,l4: This transport variability of +/-0.3 Sv should be presented before. The conclusion is not the place where presenting a new number (especially without any explanation on how it was obtained).

Yes, we changed it

P545,l7-8: This statement was not proven (and I believe it is false).

We added the explanation in the text, which values are daily average and the other (wider range) are measured ones.

Figure 2: The oval is too thin on the plot and I can hardly distinguish it from the background.

We made a heavy square

Figure 5: Indicate that those are daily values.

We did this

Figure 6: Add confidence intervals. It might be interesting to average the highest frequency to reduce the noise.

We added confidence intervals. Averaging of high frequencies is not necessary because in this study we are interested only in the low frequency signal

Please also note the supplement to this comment:
http://www.ocean-sci-discuss.net/10/C336/2013/osd-10-C336-2013-supplement.pdf

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Interactive comment on Ocean Sci. Discuss., 10, 539, 2013.