Ocean Sci. Discuss., 10, C248–C250, 2013
www.ocean-sci-discuss.net/10/C248/2013/

Ocean Science
Discussions

Interactive comment on "Coupling of eastern and western subpolar North Atlantic: salt transport in the Irminger Current" *by* A. Born et al.

Anonymous Referee #2

Received and published: 22 May 2013

I have reviewed the manuscript by Born et al. titled "Coupling of eastern and western subpolar North Atlantic: salt transport in the Irminger Current" submitted to the Ocean Science (os-2013-10).

General Comments: This paper is very clearly written and pleasant to read. Authors clearly demonstrate a simple but important fact that the most of the previous papers ignored, i.e. the salt transport rather than surface salinity should be considered in conjunction with the subpolar gyre variability, based on two very different models. This is an important contribution in understanding the North Atlantic climate variability from the climate models and observations. Therefore, I recommend the manuscript to be accepted after a minor revision.

Specific Comments: 1. P556, L20: Authors may cite Frankignoul et al. (2009). Frankig-

noul, C, J. Deshayes and R. Curry, 2009: The role of salinity in the decadal variability of the North Atlantic meridional overturning circulation. Climate Dynamics, 2009; DOI 10.1007/s00382-008-0523-2.

2. P560, L4-10, Fig.1: It would be helpful to directly compare with the previous studies if the SSH EOF-1 & 2 are shown. It is a bit unclear as the PC2-composite barotropic streamfunction anomalies (Fig. 1b) is clearly resemble Hatun et al. (2005)'s SSH EOF-1, while Haekkinen et al. (2004)'s SSH EOF-1 looks more like the PC1-composite in Fig.1a.

3. P560, L27-28: Can we say that the EOF-1 is related to the strengthening-weakening of the North Atlantic Current while the EOF-2 is associated with the north-south shift of the North Atlantic Current? As a related question, is there any lag-correlations between the PC-1 and PC-2?

4. P561, L5: Shouldn't be the lag-composite examined to clearly state whether the freshening in the western basin follows the subpolar gyre changes?

5. Fig.2b,d caption: It would be helpful to state again in the caption that the salt transport is for the mixed layer.

6. P562, L16-18: Again, it would be helpful to show the SSH, as the SSH is more directly comparable to the observation than the barotropic streamfunction. And it would be nice to see how different the MICOM and CCSM4 are.

7. P562, L21-23: It is generally true that the EOFs are sensitive to the choice of domain. However, I cannot agree that the EOFs are so sensitive that different resolutions and grid systems matter. I think the authors can easily test this by just choosing slightly different domain within the CCSM4 for the EOFs. I think the difference is primarily due to differences in simulated climates in the two models.

8. P. 563, L7-8: Why not computing the CCSM4 salt transport for the mixed layer instead to make a clean comparison?

9. Fig.4: It would be helpful to add the mixed layer depths on both sections.

10. P564, L4-6: This does not make too much sense. It could be clearer if a section of density and salinity across the center of subpolar gyre doming is shown for both CCSM4 and MICOM.

11. P564, L20: Authors may cite Straneo (2006). Straneo, F., 2006: On the connection between dense water formation, overturning, and poleward heat transport in a convective basin. J. Phys. Ocean. 36(9), 1822-1840.

12. P565, L1-10: What is the physical explanation of the long time scale of the salinity change in the western subpolar gyre in CCSM4? A related question is: what are the time scales related to the SPGave indices from MICOM and CCSM? Are they similar?

Interactive comment on Ocean Sci. Discuss., 10, 555, 2013.