

Interactive comment on “Towards closure of regional heat budgets in the North Atlantic using Argo floats and surface flux datasets” by N. C. Wells et al.

N. C. Wells et al.

Received and published: 1 April 2009

Referee A (Jan 26 2009)

1. When outlining the general goal of the study in the Introduction, I would suggest to add a para addressing the major processes steering the budgets on this specific space scale for this specific area. Some lines about the circulation mechanisms, increasing ventilation of the upper ocean layer along the NAC, convection in the Irminger Sea and Lab Sea should be mentioned along with the northward inflow and overflows at the northern boundary. It would be reasonable to stress that we know a little about seasonal cycle of these processes from observations (it is worth to mention here say Lamb and Bunker 1982, which was a pioneering study of the upper ocean heat budget

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



involving subsurface data). Since that time mostly model studies have contributed to the understanding. However, they were primarily focused on either climate mean (annual) conditions or interannual variability. Furthermore, in the model simulations, it was even easier sometimes to quantify balances for intermediate and deep waters rather than for the upper layer (probably due to very high noise in the upper layer and strong constraint of the upper layer circulation by the forcing function. Good example of this kind is Boening et al. (1996, see figs 6,9). Other model analyses were focused more on meridional heat transport and the role of different factors in its formation (Eden and Willebrand 2001, Gulev et al. 2003). In this respect regional 10-degree cell analysis performed by the authors would be the step forward.

We have given some more references but we haven't discussed the wider problem of ocean circulation and the formation of water masses as suggested as this is beyond the remit of this paper. Another paper will address these issues.

2. Of course the choice of 1999-2005 period was strongly constrained by the ARGO data availability. Nevertheless some speculations, involving physical thinking on how this period was representative and what were the major air-sea interaction and hydrography events in the NA during this period would be useful.

We have discussed the NAO and its behaviour during the period. This is the major index of atmospheric circulation and is known to have influences on the upper ocean and on its circulation.

3. I understand that MLD averaged over 10-degree cells may be smaller compared to what we expect from a higher resolution data (or model experiments). I think, this be commented upon somehow on p103.

A comment has been added to this effect on Section 3.

4. Surface heat flux fields from NOC climatology and NCEP are quite different (see fig 3, table 1).

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

RMS errors say something, but do not describe the nature of the differences.

First, it is somehow poorly explained whether this was original SOC flux or the tuned SOC flux.

Among the potential reasons for the disagreement, the authors may discuss difference in parameterizations used, but also sampling effect which should be quite pronounced in the SOC/NOC climatology.

For instance Gulev et al. (2007) argued that sampling errors may be up to 60-80 W/m² in the subpolar North Atlantic and that these biases may have a systematic nature in some regions.

More details of the NOC fields have now been provided in the Introduction and potential reasons for differences between NOC and NCEP are discussed in sec 4.1.

5. All wind-driven components of the advection (both NCEP and NOC based) were derived, I guess, from monthly means. If computed from individual snapshots, they may be different. I understand that it is difficult to quantify this effect using the data, but some comments should be given.

The Argo data put a limit on the temporal resolution that we could resolve, therefore we didn't consider higher temporal resolution such a snap shots. However, both NOC and NCEP will have used observations of wind at a higher resolution to produce their monthly means. We could have used 6 hourly wind stress as input to an ocean only model to compare the difference this would have made to the ekman transports, but I believe it would have not made a large difference to Ekman transports at this horizontal scale (figure 6).

A comment on this has been added to Section 2

6. Figures/tables. Although they are informative, but quite different to make an overview assessments. Would it be possible for climate means and say for 2 seasons to perform at least 3-4 figs as geographic maps with 10-degree boxes in which basic components

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

could be given in numbers of different color. This also about using arrows for advection quantification is such a figure(s).

We have focused on the annual mean because the components of the heat budget have all been estimated with their associated errors (Figure 11) for the 7 year period. We do show many quantities and their seasonal variation, and some specific examples for 2 ten degree boxes. We believe this shows sufficient information for this paper.

Interactive comment on Ocean Sci. Discuss., 6, 95, 2009.

OSD

6, S98–S101, 2009

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

