

Interactive comment on “Impact of a 30 % reduction in Atlantic meridional overturning during 2009–2010” by H. L. Bryden et al.

Anonymous Referee #2

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General comments: In this paper H. Bryden and coauthors analyse data from the RAPID Array and focus on the period 2009–2010 which showed a pronounced slow-down of the AMOC. They analyse the impact of the reduced thermohaline circulation in terms of heat transport and relate the changes to atmospheric variability and changes in ocean circulation.

The paper is well written, has a clear structure and gives concise conclusions.

Specific comments:

1. Introduction: The reference to the paper by McCarthy et al. 2012 states that the observed variability of the AMOC is extraordinary compared to model results. Could you please be a bit more specific, without having read the paper it is not clear what is

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meant.

2. Size of the Event: The first 4.75 years of the observations are considered to be normal and all anomalies are calculated regarding to that mean. I think that statement Needs more justification. Is that in agreement with the McCarthy et al. 2012 study?

Just based on Fig.2 it is not so clear why the authors calculate the accumulated deficit only until June 2010, while the curves continue to decrease. The reference to the Smeed et al. 2014 indicates that is is part of the long-term decline of the AMOC. But if that is the case, what makes the 2009–2010 event so specific. Is it too rapid, too large?

It would be nice if the Colors in figures 1 and 2 could remain the same and same acronyms are used in the legend/figure caption.

I am having difficulties locating some of the events in the graphs. It might be nice to add arrows in the Graphs and also use a shading to indicate the 2009–2010 event clearly in all figures for better crossreferencing. Specificalling I am not able to see any strengthening of the mid-ocean recirculation in early 2009.

3. Impact of the slowdown The Analysis of heat Content anomalies based on the argo data is noisy in space and time because of the uneven distribution and large scales and it is hypothesized that argo profiles within eddies could have large effects on the heat content. This is clearly stated in the manuscript, but is that only treated by smooting the resulting time series and calculating the error budget (Appendix) or did the autors examine the 30 day maps produced in the OA for anomalies?

The lack of argo data in the Gulf of Mexico is stated as one of the problems in the analysis because a large area south of 26 N can not be accounted for. But since there is a surface signature of the temperature anomaly (even if the maximum is at 50 m, based on fig.5) couldn't you use SST data to check for anomalies?

The temperature anomaly curves in Fig. 5 have very different structure for the area North of 24 N and south of it. What about the large middepth (200–800 dbar) Signal?

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4. Role of air-sea heat flux anomalies This section is not as well written as the rest of the paper and could need some revision. for example the statement that the anomalies in ocean-air heat exchange are small is given before the data are discussed.m

On page 796, line 13 should it read Maximum cooling instead if Maximum warming?

If the heat Budget is not closed for the regions north and south of 26N, how does that affect the conclusion about small atmospheric changes compared to the oceanic?

I don't understand the last sentence in section 4 at all.

6. Conclusions

Again the authors state that the slowdown is unanticipated in Magnitude compared to models. I would like to see some numbers at this point.

Interactive comment on Ocean Sci. Discuss., 11, 789, 2014.