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Ocean Science Discussions

Interactive comment on "Tropical Extra-tropical thermocline water mass exchanges in the community climate model v.3 Part I: the Atlantic Ocean" *by* I. Wainer et al.

Anonymous Referee #1

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In this study the authors documented tropical-extratropical exchange processes in the Atlantic Ocean in the NCAR CCSM3 and compared the results with observations and an ocean-only forced run. They found that in the CCSM3, water ventilating the tropical thermocline comes exclusively from the Southern Hemisphere whereas in observations and the forced ocean model run contributions are from both hemispheres (although the NH contribution is weaker). While this study covers an important topic for understanding tropical climate and its variations and the approaches taken are reasonable, I found the presentation confusing. In particular, many analyses were done on isopycnal surfaces, but the isopycnals chosen seemed random (see specific comments below). This makes it hard to digest the conclusions. I also feel that the authors showed what was

happening in the coupled model, but did not give explanation on what processes might be responsible for the model behavior. Overall, tropical-extratropical ocean interaction is an important topic for understanding tropical climate and its variability and investigating this topic in a coupled framework should be appreciated. However, given its current form, I recommend a major revision before considering its publication on Ocean Science.

Specific Comments

page 61, line 9, "Black contours ...":

You mean, white contours representing isopycnal surfaces are also superimposed? Fig.1 vectors near the equator are very hard to read even when the plot is magnified. Is it possible to use a different scale for the stronger flow?

page 61, line 24 onward, "The wind field itself is predominantly zonal..., the weak upwelling ...are a direct result of the too-weak winds" :

I am guessing by 'weak upwelling' you mean equatorial upwelling, not the upwelling at 8S, is that right? Although up until then the paragraph was about the unrealistic upwelling and wind stress curl at 8S. I am not sure I understand the message of this paragraph.

page 62, line 7-8, "Only waters less or near the 26.5 kgmˆ-3... EUC":

How do we know? 26.5 isopycnal was not shown on Fig.1. Is this true for POP2, T42, T85 respectively or for all cases?

Page 62, line 13, "...22.5 kgmˆ-3 for the T42...":

Again, 22.5 sigma-theta was not even shown so I can't judge if this is correct or not.

page 62, paragraph starting with line 20,

line 21: change "core level" to "EUC core level"

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line 25, Fig.2f,g, "...model bias...":

It may be better to show difference plots of T42-Levitus and T85-Levitus. There are similarities between Fig.2e, 2f and 2g, implying some resemblance between T42, T85 and Levitus.

page 63, line 2, "...poleward of 20N":

22N is more accurate. A negative anomaly is centered at 20N.

Page 66, second paragraph:

It was stated here that PV contours and salinity were plotted on different isopycnal surfaces for T42, T85 and POP3. Fig.5 caption doesn't reflect this.

page 66, 4th paragraph:

Why are the streamlines shown on different isopycnals than those for PV contours and salinity distribution (Fig5) for the POP3 and T85? (T42 uses 24.3 sigma-theta consistently for PV, salinity and streamline) I understand EUC core density differs between the different runs, but for each run, why do you use different densities for PV/ salinity, and streamline distributions, respectively?

Page 69-70:

The Lagrangian floats were lunched on yet another isopycnal surface. Why is that?

page 70, line 10, "...averaged between 24.5 $<$ sigma_theta$<$ 26.5 ...":

Where do "24.5" and "26.5" come from? Streamlines (Fig. 6) were shown on isopycnals ranging from 24.3 to 25.0. You don't just pick up these numbers randomly(!), especially considering that the study region has complex circulation pathways and water mass characteristics.

Interactive comment on Ocean Sci. Discuss., 3, 55, 2006.