Ocean Sci. Discuss., 6, C173–C175, 2009
www.ocean-sci-discuss.net/6/C173/2009/

Ocean Science Discussions

Interactive comment on "Frequency-dependent effects of the Atlantic meridional overturning on the tropical Pacific Ocean" *by* L. A. te Raa et al.

G. J. van Oldenborgh

oldenborgh@knmi.nl

Received and published: 19 June 2009

Dear reviewer,

thank you for your positive report. We have addressed your comments on the manuscript as follows.

1. *The title of the manuscript is focused on the frequency-dependent effects of the AMOC on the tropical Pacific SST and ENSO amplitude. However, the different responses in the two sets of ensemble are strongly affected by the very different amplitudes of AMOC changes. The AMOC change is about 20 Sv in the water hosing ensemble, and only a maximum of 1Sv in the ensemble with natural decadal variability. The title of the manuscript might be modified to include the*

amplitude-dependent effect.

You are completely correct, we have modified the title accordingly.

2. *The Caribbean cooling and thus the tropical Pacific response are strongly model dependent. Early coarse resolution models are not able to obtain similar magnitude of Caribbean cooling and the tropical Pacific response even with similar amplitude of AMOC changes. The manuscript should discuss the dependence of the response to the model employed.*

   Indeed, Stouffer et al (2006) found a very similar signal in the AOGCMs, and a very different signal in the EMICS. We added a comment to the effect that the signal we observe is very similar to the AOGCM mean signal of Stouffer et al (2006), and dissimilar to the EMIC ensemble mean.

3. *On Page 481, Line 19-21, the manuscript stated that 'Note that by using only SSTs north of 25N in the AMO index, the inclusion of tropical Atlantic ENSO teleconnections (that could cloud the AMOC-related variability the AMO index is thought to express) is avoided'. At the multidecadal time scale, the observed tropical North Atlantic SST anomalies are highly correlated with the AMO index and higher latitudes North Atlantic SST anomalies, i.e. it reflects AMO signal not ENSO signal. The observed tropical North Atlantic SST anomalies reflect the AMO signal but models can not simulate this feature. The above statement should be modified and the difference between observed and modeled tropical North Atlantic SST multidecadal variability should be discussed. In particular, the model underestimates the AMO-connection to the Caribbean Sea compared to observations and this should be discussed.*

   We consider 5-yr running means, which is still close to the interannual time scale. On this scale the modelled correlation between the Niño3.4 index and tropical North Atlantic SST still is 0.48 ± 0.04, compatible with the observed 0.21 ± 0.41,

OSD

6, C173–C175, 2009

so we considered it safer to leave out the tropical North Atlantic from our AMO definition. A discussion of this has been included.

We have added a discussion of the problems that the model has in simulating the tropical North Atlantic connection and (to a lesser extend) the Caribbean teleconnection. Plots of the correlation of SST/T2m and precipitation with the AMO index have been added as Fig. 3 to show this issue more clearly as the regression plots do not show much signal in areas of small variability such as the (sub)tropical Atlantic Ocean.

Interactive comment on Ocean Sci. Discuss., 6, 477, 2009.