Earth Syst. Dynam. Discuss.,
https://doi.org/10.5194/esd-2017-58-RC2, 2017


Earth System Dynamics
Discussions

# *Interactive comment on* "Equatorial Atlantic interannual variability and its relation to dynamic and thermodynamic processes" *by* Julien Jouanno et al.

**Anonymous Referee #2**

Received and published: 21 August 2017

The paper by Jouanno & colleagues investigates the role of thermodynamics and dynamics in the Equatorial Atlantic interannual variability, namely Atlantic Nino events. They use a suite of well-designed simplified ocean-ABL experiments together with a mixed layer budget to analyze the different contributions in the heat content budget.

The paper is well presented and relatively easy to follow. The design of the numerical simulations for the present study is appropriate, and the addition of the mixed layer budget is necessary to draw conclusions about the physics of the interannual variability. I recommend the paper for publication, however only after the authors revised several parts of the analysis and their interpretation.



1) The numerical simulations attempt to explore the role of dynamics by replacing the interannual wind variability by its climatology. I find myself wondering how much does the temperature/moisture adjust to this change? The conclusion that dynamics is the number one factor in setting the variability cannot be concluded this way. I would like to see the ML budget analyzed for the REF-tauclim, and most importantly how much is the thermodynamics forcing changed between the two simulation due to the changing winds.

2) The explanation of the ML budget is a bit confusing to me. I might have missed this somewhere but the contribution from the forcing to the ML tendency is positive, yet the authors keep saying that it acts as a damping (and vice versa for the mixing). Looking at the plots, I am not entirely convinced by the explanations for either set of runs (REFs or BIASEDs). It might be a wording issue, but this needs to be clarified.

3) The difference between Ninos and Ninas events are fairly small in all the plots (especially in the BIASED runs - about 1m change in isotherms!). We cannot clearly distinguish the changes between the events when the seasonal cycle is so dominant. The authors should concentrate on the variability, remove the seasonal cycle, this might give us confidence that the changes seen between the events are significant, and a better way to interpret the changes in the ML terms.

Some minor comments:

* introduction line 33: should be Bjerknes

* simulations page 2 line 33-35: which variables are forced? any issues due to the adjustment of the flow?

* simulations page 3: see comment 1) - T and q must adjust to the wind, so there is a thermodynamical adjustment due to the changes in dynamics which might mask the true response.

* page 4: Qns and Qs definitions are cryptic, please specify which fluxes they repre-

sent; also make sure you use subscripts where appropriate

* page 4, line 31: long living = long-lasting ?

* page 5, line 10: can you precise what is an acceptable range in term of variance to be more quantitative.

* pages 5-7: see major comments 1, 2 3 above. In addition, you might want to avoid the use of “most probably”, “could also” when building your argument.

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