



EGUsphere, referee comment RC1
<https://doi.org/10.5194/egusphere-2022-1245-RC1>, 2022
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Comment on egusphere-2022-1245

Anonymous Referee #1

Referee comment on "Joint observation–model mixed-layer heat and salt budgets in the eastern tropical Atlantic" by Roy Dorgeless Ngakala et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-1245-RC1>, 2022

This paper examines the mean seasonal cycle heat and salt balances in the eastern equatorial Atlantic using an observational climatology (PREFCLIM) and a high resolution ocean general circulation model (NEMO). The observational and model results are compared for consistently. In addition, the model is subsampled as in the observed climatology and the heat budget terms recomputed (offline) to examine the importance of submesoscale variability in the model that is not represented in PREFCLIM. The results are generally consistent with previous budget analyses in the region, which builds confidence in our understanding of the key processes involved.

The paper is suitable for publication after major revision taking account of the comments below.

My most serious concern is that there is no discussion of the importance of tropical instability waves in the heat balance of the eastern equatorial Atlantic. The effect of TIWs is hidden in the lateral diffusion term ($D_{\text{sub-L}}$) as well as in the vertical turbulent diffusion term (because of the effects of TIWs on vertical shear, e.g. Heukamp et al, 2022). These important processes are not discussed at all and yet there is a long history of describing their role in the near equatorial heat balance (e.g., Weisberg and Weingartner, 1998; Grodsky et al, 2005; Lee et al, 2014; and many more). I'm guessing the authors have ignored this issue because TIWs have periods of ~ 30 days whereas PREFCLIM is a monthly climatology (although its temporal resolution is never specified—see below). Thus, PREFCLIM does not resolve TIWs. However, the model has no such limitation in terms of temporal resolution. The model is used to assess what is lost in terms of the effects of submesoscale variability in computing the surface layer heat balance from PREFCLIM. The model can be used in a very similar way to assess the effects of mesoscale TIWs that are not resolved by PREFCLIM.

Other.

Introduction. Somewhere around lines 50-70, the paper by Scannell and McPhaden (2018) should be cited and discussed.

Line 85. The PIRATA acronym should be defined and a reference provided (e.g. Bourles et al, 2019).

Section 2.1.1. The temporal resolution of PREFCLIM is not specified. What is it?

Figure 3. The Angola and Equatorial boxes contain areas of very high variability and very low variability. Presumably, the areal averages are therefore representative of much smaller regions within the boxes where the variability is high. This bias should be noted and discussed.

Line 275. What are the implications of the off-line advection correlating better with The Lagrangian estimate of advection? Similar question regarding statement in lines 298-99 comparing offline/online to PREFCLIM.

Figures 5 and 8. I do not see full dotted lines in these figures.

The Rath and Dengler (2016) reference seems incomplete.

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