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Discussions

Interactive comment on "Impact of intraseasonal wind bursts on SST variability in the far eastern Tropical Atlantic Ocean during boreal spring 2005 and 2006. Focus on the mid-May 2005 event" *by* Gaëlle Herbert and Bernard Bourlès

Anonymous Referee #3

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This manuscript describes conditions in the far eastern equatorial Atlantic during 2005 and 2006. These are interesting years, with strong anomalous cold event in the equatorial Atlantic in 2005 and near-normal conditions in 2006. The main result is that subsurface ocean preconditioning (shoaling of the thermocline through remotely-generated Kelvin waves) and local intraseasonal wind variations caused the strong anomalous cooling event in 2005. A number of processes are proposed to have played important roles, including vertical mixing driven by current shear, surface heat fluxes, and horizontal heat advection by the wind-driven currents and through Rossby wave reflection

at the eastern boundary.

The study is potentially interesting, but is not well organized and is mostly descriptive, with little in-depth analysis. Many topics are discussed briefly, and it's often not clear how they are related to the big picture. Examples are the southward shifts of the ITCZ noted in both years (section 4.2.2b) and precipitation and atmospheric gravity waves (sections 5.1.2 and 5.1.3). It's difficult to follow the main narrative of the manuscript, which I think is the importance of pre-conditioning from equatorial waves and intraseasonal wind-induced mixing and advection and their impacts on SST. It's also unclear how important the chosen region is for local climate and how the changes in that small region are correlated with other indices like the Atlantic cold tongue. As examples of the lack of in-depth analysis, on lines 333-337, preconditioning, local mixing and upwelling, and surface heat flux are mentioned to be important based on brief discussions of equatorial waves, winds, and current shear. This could be quantified better with the model. Similarly, lines 448-450: advection, vertical mixing, and wave propagation are mentioned as factors that extended the SST cooling westward, but no quantification is given. There are many different factors considered, and ultimately it's not clear what is most important. The manuscript would benefit from more in-depth analyses of those mechanisms that are most important and elimination (or reduction) of less important ones.

In general, the figure quality can also be improved significantly. Axis labels are difficult to read. Proper smoothing should be applied to emphasize important time/space scales (this applies to almost all figures). It is also difficult to absorb all the information from the long sequence of map and lon/lat-time contour plot figures. In many cases, the information could be conveyed more clearly and compactly with line plots (possibly Figs. 10-14) of averaged quantities or by combining figures (SSH anomalies with contours of wind anomalies plotted over them).

Other specific comments:

Why focus on this particular region? Is SST in it important for rainfall in a given region?

How are conditions in the CLR related to the cold tongue farther west? What is the correlation between SST in the eastern box and in cold tongue box, for example?

It is difficult to see the differences between Figs. 3 and 4. I suggest replacing with a figure showing differences, or adding a new figure.

How are the results different (or confirm) previous studies of cold tongue variability? It's not clear.

Negative values in Figs. 3c, 4c to me mean shallower than normal thermocline, but it seems you are using the opposite sign so that positive values mean shallower. This is a little confusing. I recommend switching signs or making it clear in the Fig. 3 caption that negative means deeper. Also indicate in the caption that Ekman pumping values >0 indicate upwelling (I assume this is the case?).

Lines 279-292: Do zonal or meridional current variations dominate for the vertical shear, and are they driven by the anomalous meridional winds?

Lines 317-318: What do you mean by "steeper thermocline slope?" Do you mean stronger dT/dz within the thermocline, or shallower thermocline, or stronger horizontal gradients of thermocline depth...

Data/methods section: How are anomalies calculated? It is not stated anywhere, yet shown frequently in the figures. Was the mean seasonal cycle (monthly mean climatology) removed before making Fig. 5, Fig. 6?

I don't see a good correspondence between Figs. 5 and 6. Maybe plotting anomalies from the seasonal cycle would help (if not done already). Otherwise, another method to validate the model's Z20 anomalies is needed.

Line 386: Do you mean Fig. 7c instead of Fig. 6c?

It's difficult to follow the discussion and reasoning on line 380-390. A figure show-

ing spatial patterns of wind anomalies might help to visualize the changes in Ekman pumping and ITCZ shifts.

What is the main result of the analysis discussed on p. 14-15? Why is it important that the southward movement of the ITCZ was more abrupt in 2005 and the winds following the event were different compared to 2006? Please state at the end of the section or mention that it will be discussed in later sections. If it didn't clearly affect later conditions, it should not be shown.

Lines 414-415: How does Fig. 8 show an enhancement of SST cooling after May 10? It only shows SST averaged for May and for May 1-10.

Figure 10: Why not show anomalies for all fields instead of only for winds?

It seems like sections 5.1.2 and 5.1.3 are not essential and could be eliminated.

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