

# ***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 #2**

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### General Comments

This study uses both models and observations to investigate mechanisms that lead to cold events in the eastern tropical Atlantic Ocean, focusing on the Gulf of Guinea and Cape Lopez region for the period of 1998-2008. The authors then focus on two specific events in the boreal spring of 2005 and 2006, 2005 having the coldest temperatures in the Atlantic cold tongue and 2006 being a normal year. These oceanic regions influence rainfall off the coast of NE Brazil (in the SPCZ) and the West African Monsoon. Results indicate that cold events in this region are brought on by upwelling processes

due to the wind acting on the ocean's surface, which can depend on the depth of the thermocline, and mixing due to vertical shear. The 2005 event was also influenced by a decrease of incoming surface shortwave radiation.

The processes investigated in this paper are very interesting and enhance our knowledge of coupled processes in the South Atlantic; however, I found it a bit difficult to separate the differences of each event both from the text and from the figures. On many of the figures, it is difficult to see the relationships being discussed in the text. Additionally, the authors mention the NE Brazil in the abstract and introduction, but it is hardly mentioned in the analysis, while the West African Monsoon is discussed in the analysis quite a bit but not highlighted in the abstract. This material in this manuscript is worthy of publication. It just needs a bit of work to make it easier to read and understand.

#### Specific Comments

1. I wonder for many of the plots, especially when discussing the May 2005 event, if it would be better to plot the difference from the climatological mean (an anomaly). It might make the 2005 event stand out. As the figures are, it is difficult to tell that this event is different from some of the other events in the 1998-2005 range.
2. For all figures, it would be helpful to increase the fontsize for the x and y-axis labels. The figures are very difficult to read.
3. It is unclear in the different sections whether the region being discussed is the Cape Lopez region, the equatorial Gulf of Guinea, or the western part of the basin. One confusing discussion revolves around the wind bursts. They are sometimes discussed in the Cape Lopez region associated with southerly winds and sometimes in the western basin as westerly wind bursts associated with Kelvin and Rossby waves. The text mostly just says "wind burst" so it's difficult to tell which is being referenced.
4. On line 13, you say "some particular events iii) a decrease of incoming surface

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shortwave radiation,” but in fact, you only described one event this applied to (May 2005). This can be fixed by changing the word “some” to “one.”

5. Many times in the paper, a season (spring, etc.) is discussed. Please indicate boreal or austral.

6. The paper discusses connections between the South Atlantic and the Cape Lopez region, specifically in relation to the St. Helena Anticyclone. A paper by Bates (J. Clim., 2008) discusses an anomalous low pressure originating in the South Atlantic that migrates northeast-ward, influencing the Southern Trade Winds and thus affecting SST in the Cape Lopez region (though she refers to it as coastal Angola). I don't know if the feature you discuss and the feature she discusses are the same thing. Papers by Bohua Huang and others at the Center for Ocean Land Atmosphere Studies from the 2000s time range also discuss variability in the South Atlantic. You may want to reference these papers if they would add something to your discussion. That is up to the authors to decide.

7. Because you discuss the NE coast of Brazil and the West African Monsoon, it would be nice to have them documented in the seasonal variability section to show how they fit into the normal seasonal cycle.

8. When discussing the thermocline, do you mean shoaling instead of thinning and deepening instead of thickening? You also mention on line 202 that it is at a minimum, I believe you mean “minimum depth.”

9. Figure 1 has no scale for the wind speed.

10. I don't think your discussion of Figure 1d on lines 203-205 reflect what is seen in the plot.

11. When you discuss the surface heat flux, please designate whether it is positive downward (into the ocean) or upward (out of the ocean).

12. The individual events mentioned on line 232 are difficult to see. Maybe only plot

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April-July or change the y-axis.

13. Lines 275-276: Is the reader supposed to be comparing Fig. 3b with 3d to see the correlation between wind stress and Ekman pumping? If so, it is not clear that this relationship is seen. Also, I don't know how we can see  $8\text{degE}$  in this figure. If this correlation is not shown, please say so and let us know what the correlation coefficient is.

14. It might be more telling to try to show the SST/heat content changes in the eastern Atlantic due to each of the processes (upwelling, or even split that into wind stress and vertical mixing, and surface heat fluxes). I'm not sure the best way to suggest this, but perhaps regressions would be suitable. This way, it might be more clear that the May 2005 event was an outlier in terms of short wave cloud radiation.

15. Lines 330-332: I do not see the difference between 2005 and 2006 from Fig. 8. It appears that both Kelvin waves reach the east around the same time and originate in the west around the same time. Figure 6 is also unclear. For 2006, I see many episodes of negative SSH (Feb., Mar., May, June), so why are you only picking the one that occurred in Mar-Apr? I do see a negative value in the east starting a tad earlier in 2006, but not by much. I also see a larger anomaly in 2006 in the east in July-Aug. Why is this not discussed. . .why only the Mar-Apr event? Is it because you are only focused on the boreal spring event?

16. The text on Fig. 7 is nearly impossible to read.

17. Lines 409-416: This discussion is about southerly wind bursts in the eastern basin, I assume along the coast, but in Fig. 8, I do not see many arrows in that region, so it is difficult to make this connection from the figure.

This paragraph also suggests a linkage between SST variability in the Cape Lopez region and the equatorial region. You might explain this a bit further by discussing the climatological behavior of this connection (like when it occurs and how it develops). I

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assume that this is not a feature specific to 2005. I believe that the Bates and Okumura et al. papers might refer to this connection too.

18. Figure 10 is impossible to read, and the features difficult to pick out, especially for the top row and bottom two rows. It would be helpful to mask out the land in all panels and make each panel larger. The text describes a precipitation pattern consistent with a wave train, but I cannot see it because the plot is too small and the arrows seem to be covering the precip pattern.

19. Figure 11: It doesn't seem that you have referred to this figure in the text, though I believe the discussion is on page 21. I do not see what the authors describe in the figure. Perhaps you could be more specific as to the pattern the reader should notice in the plots.

20. Figure 13: It is very difficult to decipher anything from these plots because they are so small and the contour lines are so close together. It is impossible to tell if an event is stronger or not than others. The text says that the 2005 event "appears to be" one of the strongest over the period, but I cannot tell that from this plot. The authors could confirm this by giving the reader a value of wind stress from this period and state that it is confirmed that this is the strongest.

21. Lines 575-577: Is the statement about winds north of the equator relevant to this study? If so, how is this piece of information important?

22. Lines 585-593: Is this relevant to the monsoon discussion? Does the deep convection in the Gulf of Guinea lead to rain and a surface cooling? Is that the impact we should take from this paragraph?

23. Lines 599-602: This paragraph was particularly confusing as to where the wind stress and wind bursts mentioned were located.

24. Lines 716-171: Why exactly does this region need more attention? Because of the effect on the African Monsoon? Please elaborate here to make your conclusion points

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better known.

### Technical Corrections

There are many English/grammar corrections to be made. I suggest the authors have a native English speaker read through the paper with their input so the meaning isn't lost when correcting the text.

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