

Interactive comment on “Genesis dynamics of the Angola-Benguela Frontal Zone” by Shunya Koseki et al.

Anonymous Referee #1

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General comments:

I have been following studies in this region and I was always wondering about the generation mechanism of the Angola-Benguela Frontal Zone (ABFZ). As such, I read this manuscript with great interest. In this paper, the authors showed that the strength of ABFZ undergoes semiannual variation with the maxima in Apr.-May and Nov.-Dec., but the mechanism for the two peaks is quite different. The first maximum is due the tilting term, while the second maximum is due to the confluence term.

Although this manuscript presents new insight into the seasonal variation of the ABFZ, there are some issues with their frontogenesis equation. Therefore, I recommend publication of this manuscript after major revision.

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Major comments:

1) Equation (3.4): To obtain Eq. (3.4) from Eq. (3.2), we need to integrate Eq. (3.2) from the surface to the bottom of the OML and divide by the OML depth. If the OML depth were not constant in time and space, terms containing the derivatives of the OML depth should appear, but those terms are missing in Eq. (3.4). Please check the appendix of Moissan and Niiler (1998), for example.

Moisan, J. R., and P. P. Niiler (1998), The seasonal heat budget of the North Pacific: Net heat flux and heat storage rates (1950-1990), *J. Phys. Oceanogr.*, 28, 401-421.

2) Equation (3.5): The assumption that there is “no penetration of shortwave radiation beyond the OML to deeper ocean layers” may not be a good assumption considering that the OML depth could be as shallow as 20 m in the region during austral summer.

3) How is the OML depth determined? Is it based on some density criterion? Also, how is $\Delta\theta$ calculated.

4) Lines 389-392: Since the authors are using a reanalysis product, effects of data assimilation are also included in the residual term.

5) Figure 5b: The tendency term should also be shown.

Minor comments:

1) Figure 1: Label the left panel as Fig. 1a and the right panel as Fig. 1b (Line 169).

2) Although the editor provided many comments on their writing, there are still some grammatical errors etc.

Line 10: Replace “form” with “from”.

Line 11: Delete “, respectively”.

Line 30: Replace “Resason” with “Reason”.

Line 36: Delete “over the southern African Continent” as this phrase is redundant.

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Line 38: Replace “model” with “mode”.

Line 49: Replace “GCM” with “CGCMs”.

Line 57: Replace “insightfully” with “quantitatively”.

Line 62: Replace “at” with “in”.

Line 70: Replace “opposite “ “opposing”.

Line 72: Replace “more” with “most”.

Line 86: Replace “put” with “make”.

Lines 92-93: Replace “National Ocean and Atmosphere Association” with “National Oceanic and Atmospheric Administration”.

Line 119: Replace “current velocity” with “zonal, meridional, and vertical current velocity, respectively,”

Line 129: Add “of” after “exchange”.

Line 138: Replace “3,4” with “3.4”.

Line 143: Replace “velocity,” with “velocity and”.

Line 144: Add “, respectively” after “depth”.

Line 158: Replace “reminder” with “remainder”.

Line 161: Replace “29-years” with “29-year”.

Line 172: Delete “a” before “weak”.

Line 176: Replace “shows” with “showed”.

Line 193: Replace “exceed” with “exceeding”.

Line 227: Replace “One” with “On”.

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Line 238: Add “relationship” after “phase”.

Line 242: Replace “temporal” with “time”.

Line 244: Replace “days” with “day”.

Lines 246 and 247: Delete “respectively”.

Line 247: Replace “month” with “months”.

Line 311: Add “in” after “except”.

Line 321: Replace “form” with “from”.

Line 322: Replace “Figs.” with “Fig.”.

Line 349: Replace “is” with “are”.

Line 356: Replace “are” with “is”.

Line 367: Replace “Fig.” with “Figures” and “shows” with “show”.

Line 387: Delete one period.

Line 406: Replace “a” with “an”.

Line 409: Replace “current” with “Current”.

Line 421: Replace “are” with “is”.

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