Ocean Sci. Discuss., 6, C236–C252, 2009
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Interactive comment on "Salinity-induced mixed and barrier layers in the southwestern tropical Atlantic Ocean off the northeast of Brazil" *by* M. Araujo et al.

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Specific Comments:

P561 L7: Section 2.1 should bring a better description on which kind of CTD instrument were used, methods of calibration and precision/accuracy. R: We agree with the reviewer. A better description of CTD profiling is now provided in the new version of the paper.

P561 L18: check "value" twice. R: Ok. The first "value" was omitted.

P561: the Section 2.2, from L16 to L25 needs to be re-organized. It is too confusing.

Maybe it was enough just to go straight to what kind of methodology it was used in the present work. After that or along it, mention previous works. R: Ok, it was re-organized. It now shows the methodology used in the present work, then the previous works.

P562 L19: I personally think the Section 3.1 could be “Water masses in the southwestern Tropical Atlantic” instead. Or simply “Water masses”. R: Ok, the title of Section 3.1 was changed to “Water masses”.

And a better water mass analysis could be provided. However, discussing water masses for the very upper ocean is not appropriated. R: Ok, a better water mass analysis was included in Section 3.1.

Here there is a challenge: How to discuss mixed/barrier layer and water masses together? R: The water masses section was improved and separated from the distribution (vertical and horizontal) of salty water, ZT, ZM and BLT, which was reorganized in the next section (3.2).

Is the South Equatorial Current (SEC) a first order mechanism on setting up the mixed/barrier layers? R: The southwestern tropical Atlantic Ocean has a sensible equilibrium composed by a complex current system (SEC, NBUC/BC currents). Also, at surface, it receives warm waters from the South Atlantic Warm Pool and exchanges heat and fresh water with the atmosphere. Our manuscript indicates that the formation of BLT is associated with the presence of subsurface salty water, not seen in most of climatological data available. Quantifying this contribution is not our intention at this moment.

What about wind and Ekman flow? R: The Ekman flow accumulates surface waters over the western boundary of the South tropical Atlantic. Inside this region, the water transport is more evident in winter, when trade winds are more powerful.

What about radiation? R: Along the South tropical Atlantic Ocean, small differences exist in the radiation flux between the 15°S and 2°S latitudes. Also the seasonal variation

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is practically the same in this region.

P563 L1: The NAW has relatively low O2 concentration. Also, change O2 by “dissolved oxygen (O2)” if it was first time mentioned on text. R: Ok, it was changed in the text.

P563 L1 to 4: Too long sentence with too much information. Maybe you could break this sentence into several parts. R: Ok, the sentence was broken into two parts.

Explain better the South Atlantic Water (SAW) flow from the subduction region to the Brazilian coast. R: The SAW is transported to the Brazilian coast forced by NBUC at subsurface. This current originates from the divergence of sSEC, which reaches the coast and bifurcates into two currents, the NBUC that flows northward at subsurface (its core is located near 180 m), and the southward Brazilian Current, that flows near surface. Figure 4a-b shows salty waters reaching low latitudes at 110 m along the Brazilian coast, being transported by NBUC in different periods.

The evaporation-precipitation unbalance was completely ignored by the authors. It should at least be mentioned, maybe in the introduction. R: It is now mentioned in Section 3.2, where we discuss the formation mechanism of BL.

P563 L12: figs 1b and 1c should be only one as Figure 2. R: Figures 1b and 1c are now Figure 2.

Are the T/S references from Levitus? R: No, the T/S references used to identify the water masses were taken from Wilson et al. (1994) and Bourlès et al. (1999), as mentioned at the first paragraph of Section 3.1.

Which lat/lon? R: The Fig. 2a (old Fig. 1b) is located at longitude 34.500° W and latitude 12.505° S. The Fig. 2c (old Fig. 1c) is located at longitude 37.957° W and latitude 1.674° S. This information is now given in the text.

The transitional T/S should be displayed. R: We agree with the reviewer. The transitional T/S diagram, which is located at longitude 32.135° W and latitude 8.698° S, is now displayed in a new figure (2b).

P563: figs 2a and 2b should be side by side. R: Ok, Figs. 2a and 2b are now together in Fig. 3.

Can you really assume sinopticity along this border? The cruise is 3 months longer. This should be mentioned in methodology. R: Along this border, we present Mercator-Coriolis interannual model results for late winter (September -1995) and summer (February-1997) that agree with REVIZEE-NE when easternmost stations were considered. These results and comments were inserted in the manuscript.

P563 L18: instead of “around 10S”, it should be “between 11S and 12S”, not 10. R: Ok, it was corrected in the text.

P564: the figures 3a to 4c should compose only 1 figure (plate). Maybe the graphics would be better if longitudes range from 31.5W to 41.5W. R: Such graphics were re-organized with longitudes ranging from 31.5° W to 41.5° W. We also considered latitudes ranging from 0.5N to 13S.

If it gets too squeezed break it into 3 figures with 2 graphics each, winter and summer side by side. R: The figures 3a to 4c were broken into 3 figures (now called Figures 5, 6, 7) with 2 graphics each, winter and summer, side by side.

P564: Section 3.2 describes results starting from BLT. However, the graphics display a different sequence, starting from Zt. Provide a better description of results, following a linear idea, and following the sequence of graphics presented. R: The description of results now follows a linear idea and also follows the sequence of the graphics (ZT, ZM, BLT, in this order).

Maybe an additional figure showing a map of (BLTwinter minus BLTsummer) would help to display the differences between summer and winter. However the maps have different grids ... R: Yes, this is a good idea. One more figure (Fig. 8) was added showing the spatial distribution of the barrier layer thickness (BLT) difference between winter and summer. All spatial distribution maps are now presented with the same grid.

The authors thank the Reviewer for comments and suggestions, which helped us to improve our manuscript.

Please also note the Supplement to this comment.

Interactive comment on Ocean Sci. Discuss., 6, 557, 2009.

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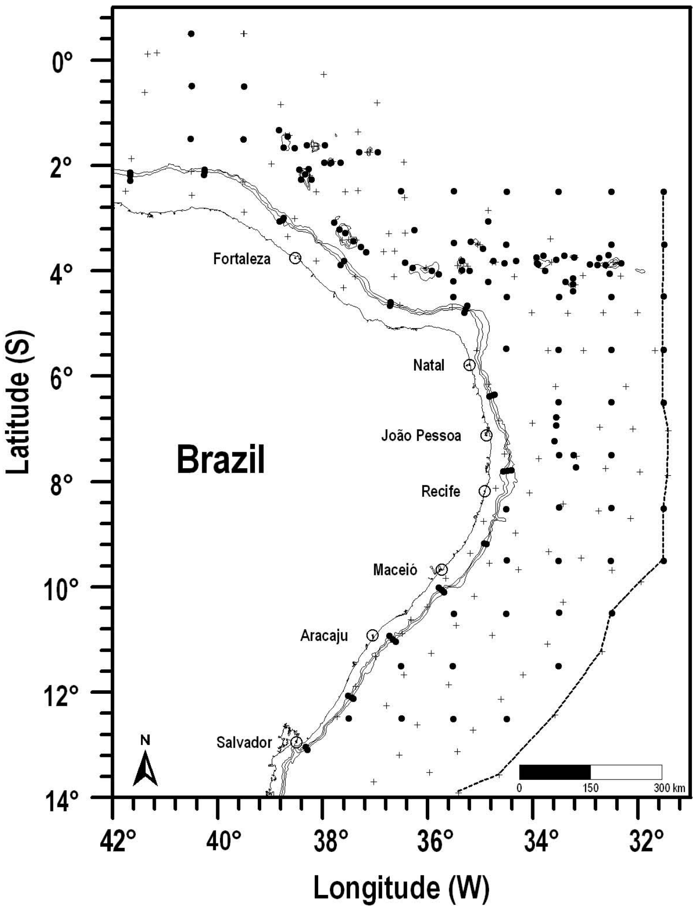

Fig. 1. Figure 1

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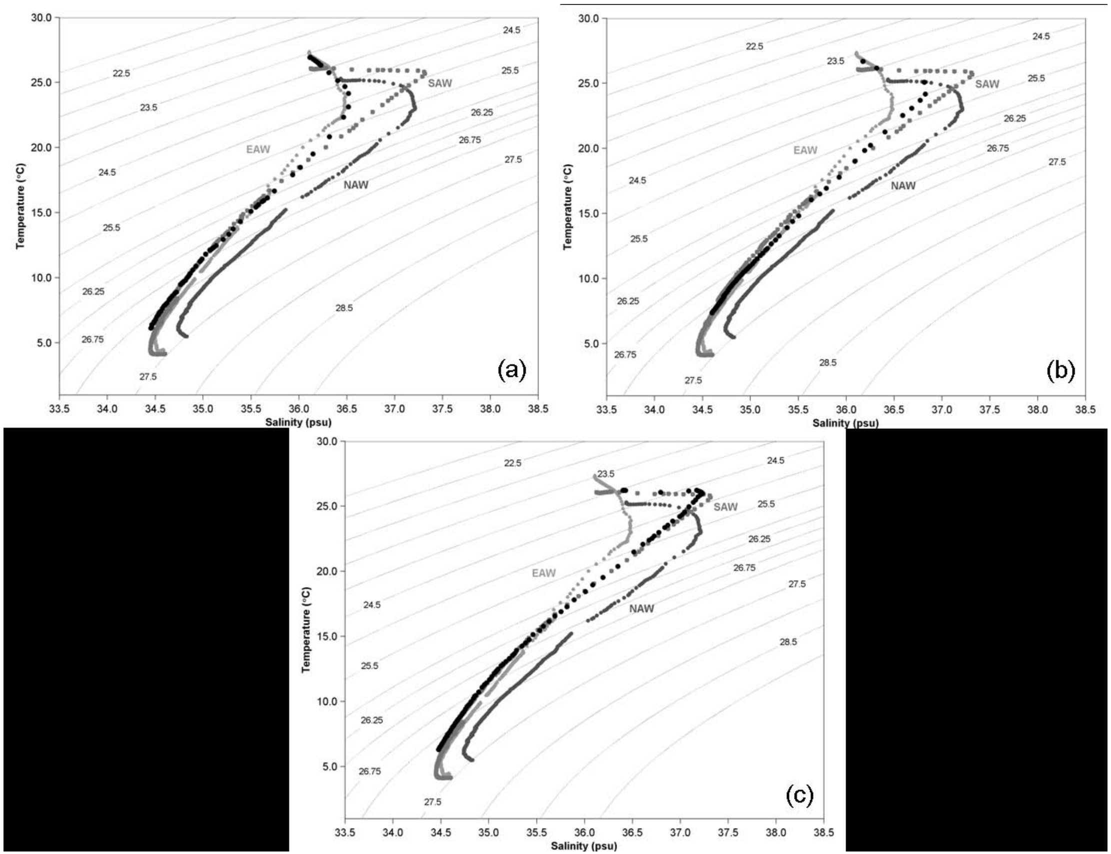

Fig. 2. Figure 2_abc

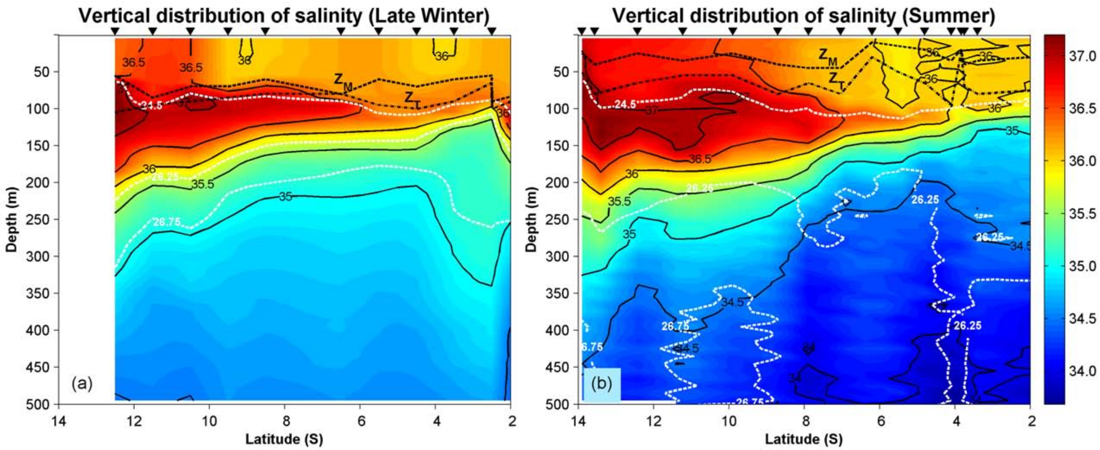

Fig. 3. Figure 3_ab

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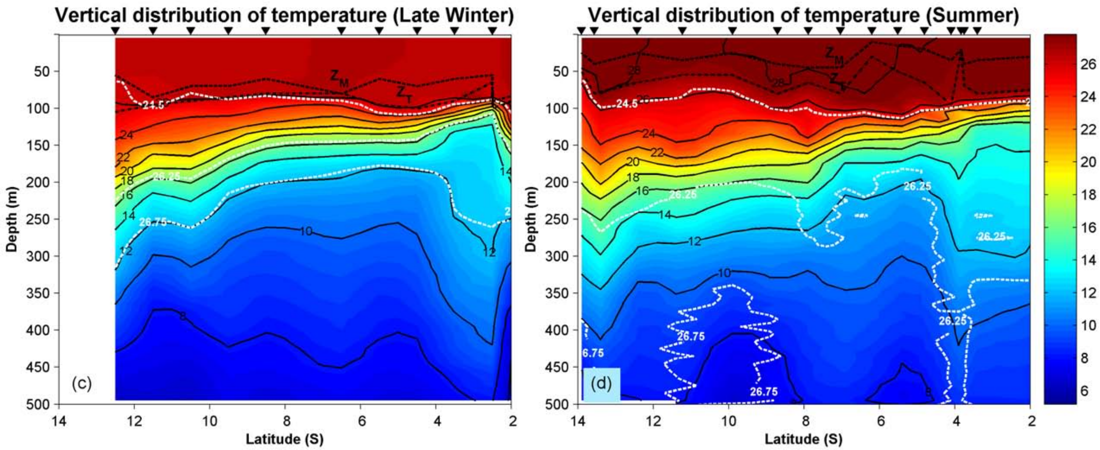

Fig. 4. Figure 3_cd

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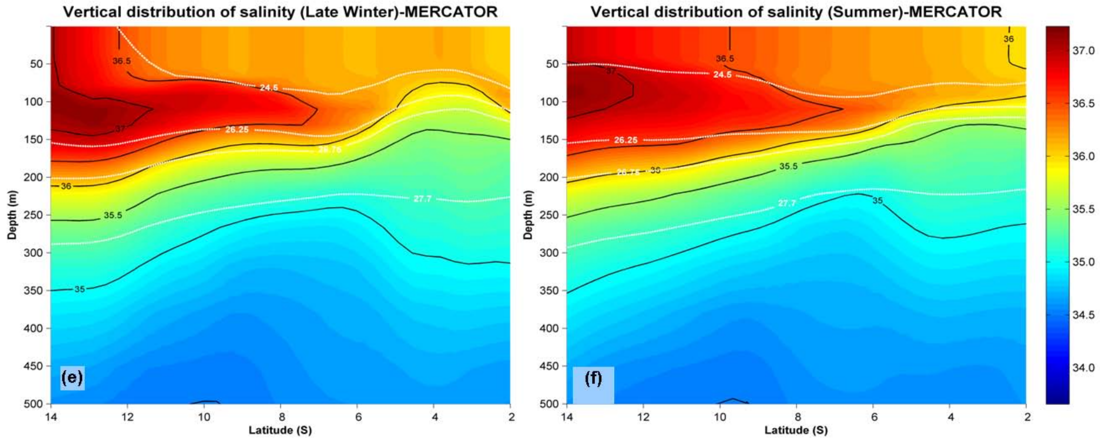

Fig. 5. Figure 3_ef

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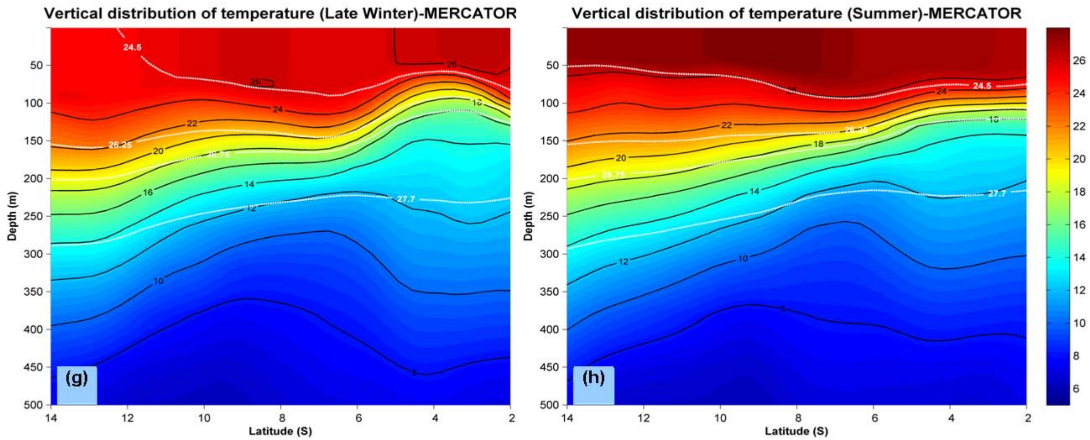

Fig. 6. Figure 3_gh

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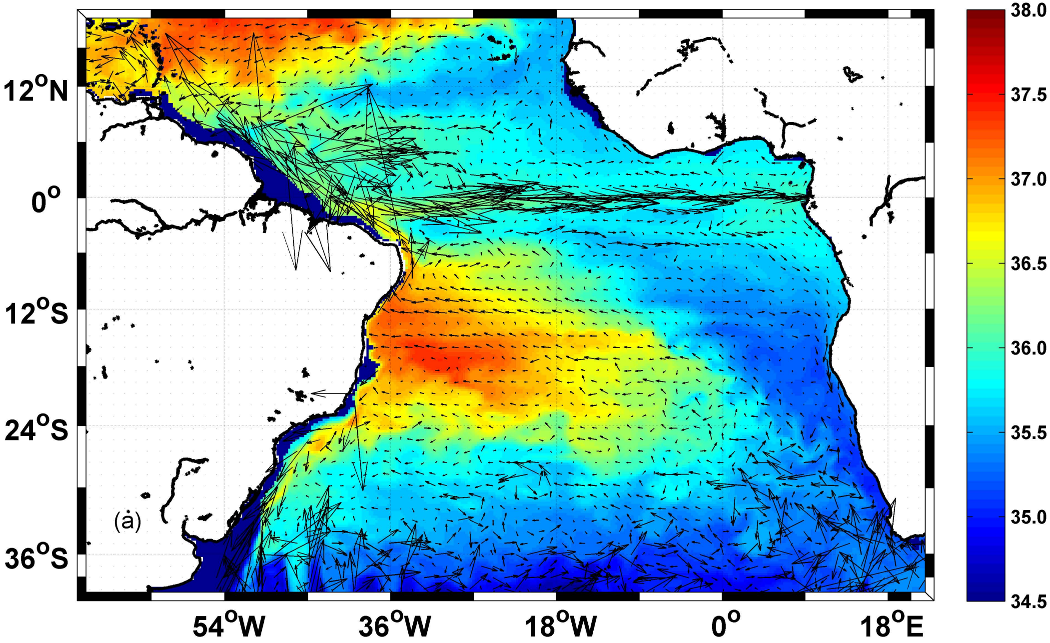

Fig. 7. Figure 4_a

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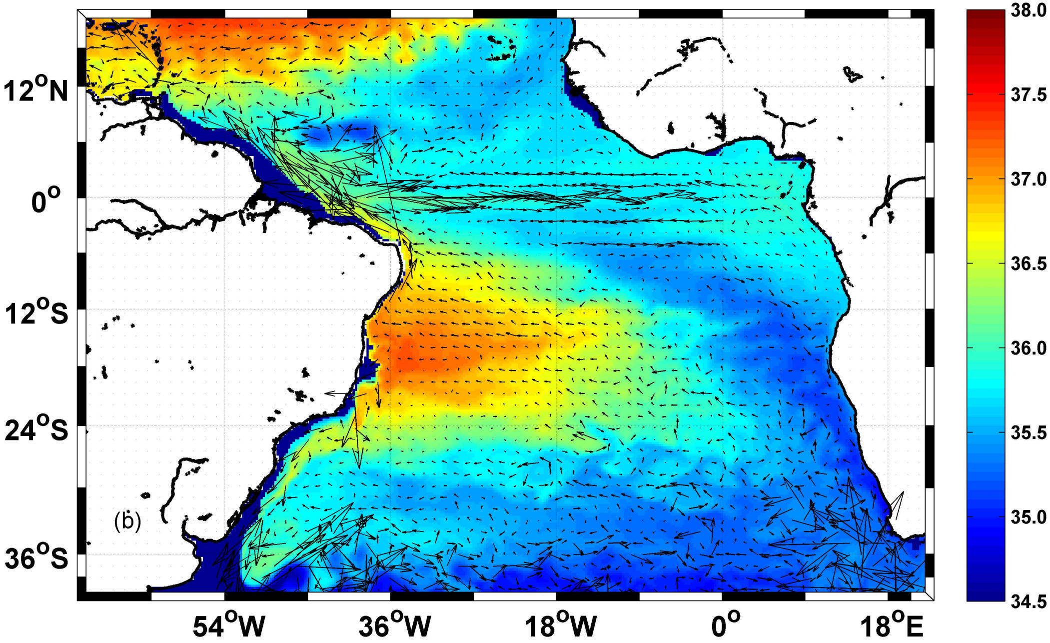

Fig. 8. Figure 4_b

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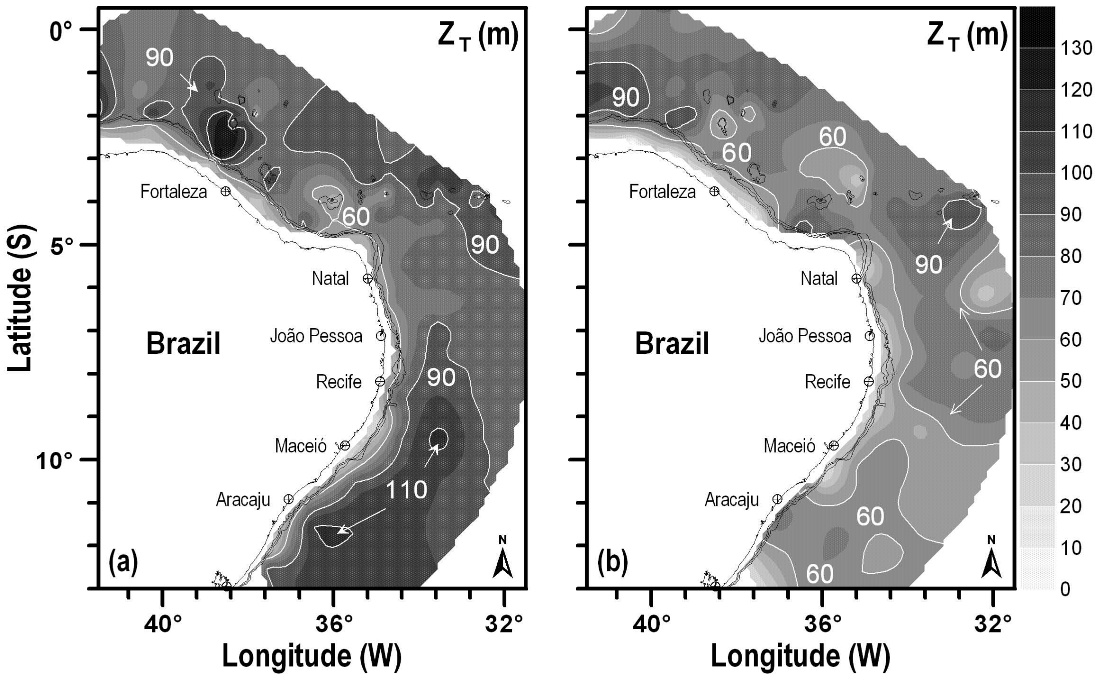

Fig. 9. Figure 5_ab

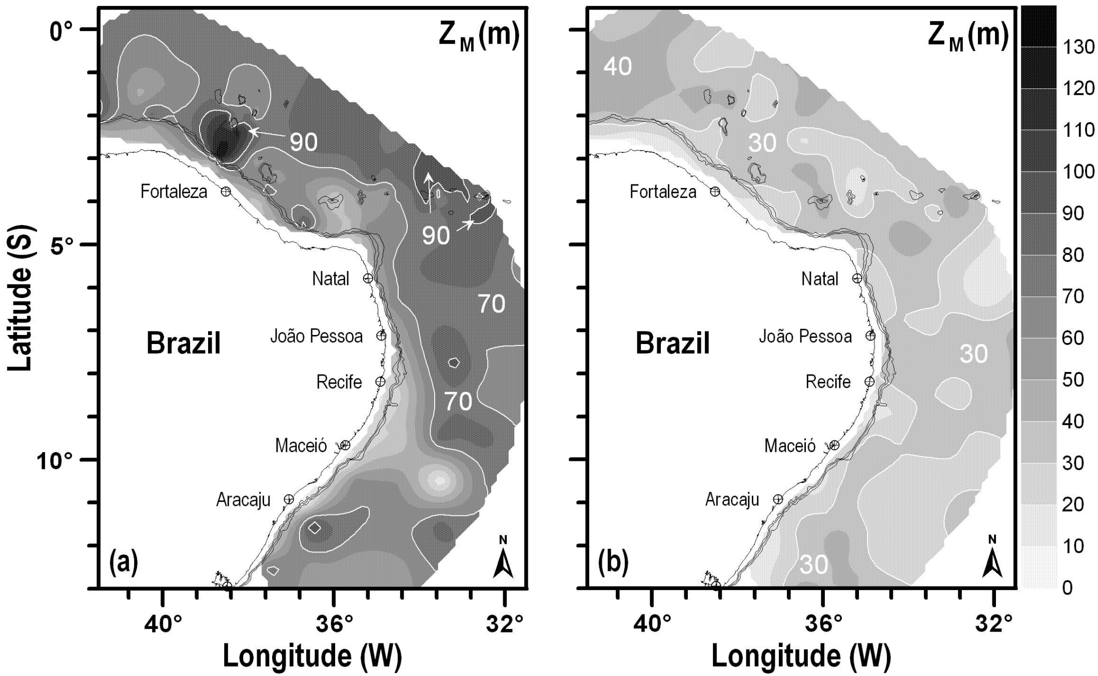

Fig. 10. Figure 6_ab

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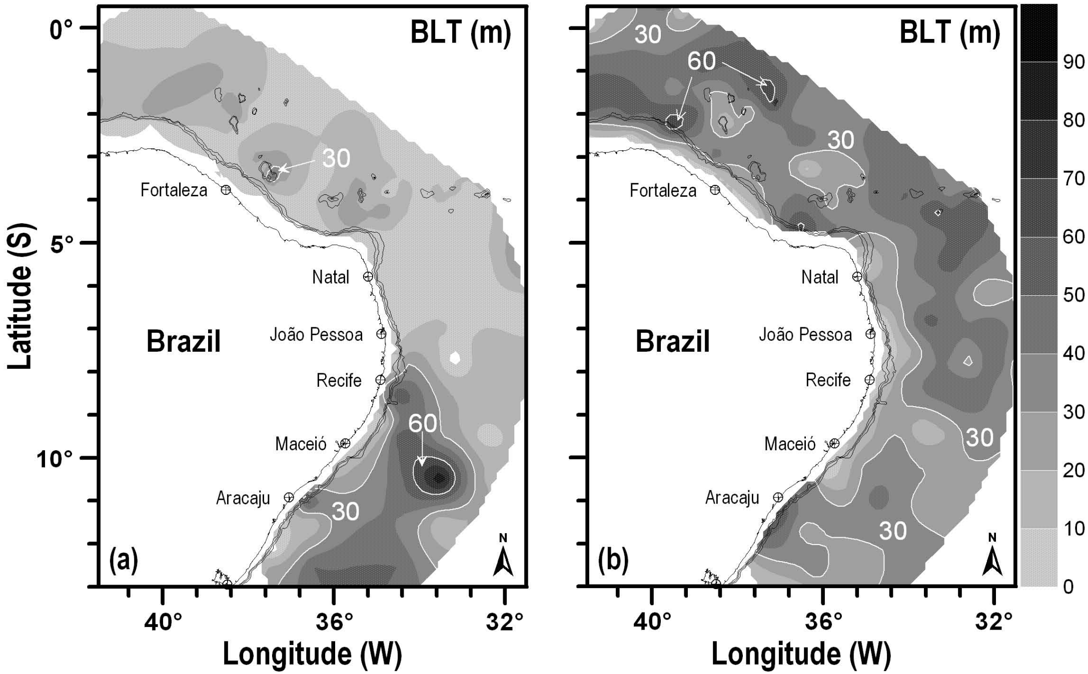

Fig. 11. Figure 7_ab

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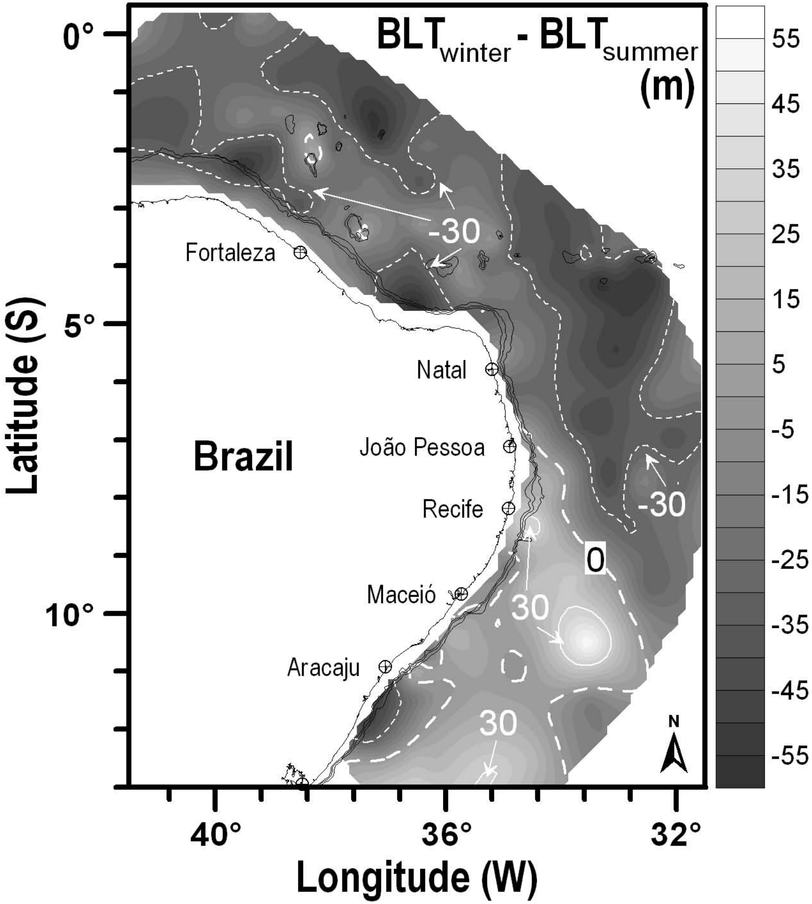

Fig. 12. Figure 8

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