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Ocean Science Discussions

Interactive comment on "Water masses and zonal current in the Western Tropical Atlantic in October 2007 and January 2008 (AMANDES project)" *by* A. C. Silva et al.

Anonymous Referee #2

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Review of "Water masses and zonal current in the western tropical Atlantic in October 2007 and January 2008 (AMANDES project)" by Silva et al.

Summary: This paper examines the upper ocean (0-800 m) zonal circulation and water mass characteristics off the coast of northern South America (5N-8N, 48W-51W) during Oct 2007 and Jan 2008. This is a region with complex ocean circulation and the convergence of several water masses. A strong eastward-flowing N. Equatorial Countercurrent is found between 6-7N between 48W-49W during fall, peaking at a depth of $\sim$50 m. Farther west the NECC is much weaker, and there is a strong North Brazil Undercurrent flowing westward at 5.5N, centered at a depth of 250 m. These results

generally agree with previous observations in the region. Water mass analysis reveals the strong influence of Amazon outflow (warm and fresh water mass) and salinity maximum water from the subtropics (warm and salty) in the surface layer (0-400 m). Fresher and cooler Atlantic Central Water is beneath the Amazon water and salinity maximum water. Intermediate water (400-1200 m) consists of Antarctic Intermediate Water (cold and fresh) and Atlantic Central Water (warmer and saltier). The oxygen concentration in the AAIW is lower than expected based on previous analyses. This new water mass is labeled "AAIW-Guyana." It is concluded that the lower oxygen in AAIW-Guyana is due to mixing with Atlantic Central Water and Upper North Atlantic Deep Water.

Overall, the paper is well written, clear, and easy to follow. The analysis makes use of new in situ measurements, and the results generally agree with previous analyses in the same region. It is important to understand the circulation and water mass characteristics in this region because of implications for the AMOC and tropical Atlantic climate. The paper would benefit from better description of the "big picture" to put the observations into context, and a paragraph or two stating the new results in the paper and their implications for understanding ocean circulation and the region and in the Atlantic Ocean in general. For example, why was this region in particular chosen for a process study? Is this the first set of measurements in this particular region for these times of the year? What are the broader implications for the presence of AAIW-Guyana water and the mixing of water masses needed to create this water mass?

In addition, there are several minor edits that would be helpful for clarifying the analysis technique and results:

1. p. 1955, line 4: "Trade Winds." Are they northeasterly in this region?
2. p. 1955, line 21: Add "(WBUC)" after it is mentioned for first time.
3. p. 1955, line 22: "NEUC" What does this stand for? It hasn't been mentioned yet.
4. p. 1958, line 7: "advecting waters from the Southern Hemisphere" How do you know

OSD
7, C770–C772, 2011

it's from the S. Hemisphere?

5. p. 1958, line 13: "a portion of the NBC..." How do you know it's only a portion of the NBC? Based on previous observations of a stronger NBC in this region?

6. p. 1958, lines 14 and 17: "northwestward" and "southeastward" You only show zonal velocity, though. Maybe plot meridional velocity in the figures?

7. p. 1959, line 26: "relatively high O2 concentrations" Looks like low O2 based on Fig. 3b.

8. Section 3.2.1: What about Eastern Atlantic Water? Does this play a role in the surface water mass characteristics?

9. p. 1961, lines 1-4: Why are intermediate water masses characterized by curved profiles? It's not clear how weaker currents lead to this.

10. p. 1962, line 2: "NADW is warm" Warm compared to what? Looks cold in Fig. 4c.

11. Fig. 2: Show meridional component as well?

12. Figs. 3, 4, 5: Label panels with (a), (b), etc.

13. Fig. 7: Label top plot with "depth" and "latitude"

Interactive comment on Ocean Sci. Discuss., 7, 1953, 2010.