Mesoscale Dynamics and Transport in the North Brazil Current as revealed by the EUREC4A-OA experiment

1 General Comments

This paper investigated the dynamics North Brazil Current (NBC) rings and computed volume and heat transports of the surface and subsurface NBC rings. Their computations relied on the recent in situ observations from the EUREC4A-OA field experiment and satellite altimetry. Compared to previous studies, their computations utilized the vertical structure of the eddies provided by the unparalleled vertical and spatial resolution of the EUREC4A-OA field experiment. Previous studies emphasized surface rings as the dominant force of water transport in this region. They estimated that the subsurface brazil current rings transport water mass between 0.4 Sv and 9.7 Sv, and the surface rings transport about 1.5 Sv. Their estimates cast doubt on previous estimates, but their estimates of subsurface ring transport still has large uncertainty. The drift velocity and transported volume can depend on factors like surrounding flow, topography etc, which I think the paper should remind the reader of those factors. Heat transport of the surface and subsurface rings were estimated to be lower than previous estimates. I find Methods and assumptions are clearly explained, and their computations support their conclusions.

2 Specific Comments

The followings are my detailed questions and suggestions.

1. The paragraph starting from line 344 does not have enough data to support the statements. Is it appropriate to include the paragraph?

2. The section on Cyclonic eddy seems to be isolated in the paper. I don't see the connection of this section with the rest of the paper.

3. In section 4.2, eddy boundaries are determined using $|\Delta EPV_z|/|EPV_x|$. However, section 3.2 line 215 says eddy boundaries are identified using a chosen isoline of ζ. I get confused which method is used for the calculations in section 4.2 and what are the purposes of the two methods of identifying eddy boundaries.

4. On line 397, eddy boundaries are determined using $|\Delta EPV_z|/|EPV_x| = 30$. How sensitive is the volume estimate to this criteria?

5. The drifting velocity of $NBC_{sub}2$ is used to estimate transported volume. What about also using the drift velocity of $NBC_{surf}1$ to make a lower estimate of transported volume of surface rings? It seems that the transported volume of both surface and subsurface rings can have large variability due to factors like background flow, topography, seasonality etc.

3 Technical Corrections

1. In Figure 12 panels (c) and (d), the x-axis extents are different from panel (a) and (b). I think it will be better to have the same x-axis limits if you have the data.

2. In figure 9, it seems that WNACW and ENACW are shaded, but not mentioned in the caption.

3. Line 303 and 332 mention "Section 1", but it's not clear which section they are referring. Similarly, "Section 4" on line 341 is also confusing.

4. Line 225 should delete word "used".

5. In equation (7), Δz is the layer depth. I find it confusing it to express it as $z_{sup} - z_{inf}$, which is the depth of the whole eddy.

6. Add space on line 421 between "km" and "captures".

7. Add space on line 440 between "section" and "3.3".