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Interactive Comment

Interactive comment on "The contribution of eastern-boundary density variations to the Atlantic meridional overturning circulation at 26.5 N" *by* M. P. Chidichimo et al.

Anonymous Referee #1

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General comments

Comments on "The contribution of eastern-boundary density variations to the Atlantic meridional overturning circulation at 26.5N" by Chidichimo et al.

This paper is an elegant demonstration of how the transport in the Eastern Boundary (EB) of the North Atlantic Subtropical Gyre provides an important contribution to the Meridional Overturning Circulation (MOC) in the North Atlantic. As authors mention, these investigations are interesting as they reveal that the transport at the EB must be continuously monitored in order to determinate the transport fluctuations in the MOC. To find out these results, authors compare the transport from an offshore mooring

(EBC) and a set of moorings approaching the African continental slope (EBH).

My strongest disappointment about the manuscript is that authors investigate three different mechanisms to determine the transport variability at the EB, namely, Kelvin waves, Canary Current and coastal upwelling. Nonetheless, they have forgotten to include another dynamical mechanism that does contribute to the transport fluctuation found by the authors. This dynamical mechanism is the generation of cyclonic and anticylonic eddies at the flank of the Canary Islands. There have been a large amount of papers regarding these eddies in the last 15 years. These eddies were first described using remote sensing images (see, for example, Hernandez-Guerra et al., 1993; Pacheco and Hernandez-Guerra, 1999) and their dynamics has been extensively studied in recent years (see, for example, Sangra et al., 2005; Jimenez et al., 2008; Piedeleu et al., 2009; Sangra et al. 2009). Eddy shedding the islands may explain the stronger density anomaly found in EBH than in EBC and the dominant period of approximately 13 days present in EBH. This doesn't mean that the contribution of the EB to the MOC is not important. The importance is clearly seen in Fig. 15 that resembles other studies carried out in the EB (besides references included in their manuscript, authors may look at, for example, Hernandez-Guerra et al. 2002; Machin et al., 2006).

References

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F., A. Hernandez-Guerra and J.L. Pelegri, 2006. Mass fluxes in the Canary Basin. *Progress in Oceanography*, **70**, 416-447. Pacheco, M. and A. Hernandez-Guerra, 1999. Seasonal variability of recurrent phytoplankton pigment patterns in the Canary Islands area. *International Journal of Remote Sensing*, **20**, 1405-1418. Piedeleu M., Sangra P., Sanchez-Vidal A., Fabres J., Gordo C. and Calafat A., 2009. An observational study of oceanic eddy generation mechanisms by tall deep-water islands (Gran Canaria). *Geophysical Research Letters*, **36**, L14605. Sangra P., Pascual A., Rodriguez-Santana A., Machin F., Mason E., McWilliams JC., Pelegri JL., Dong CM., Rubio A., Aristegui J., Marrero-Diaz A., Hernandez-Guerra A., Martinez-Marrero A. and Auladell M., 2009. The Canary Eddy Corridor: A major pathway for long-lived eddies in the subtropical North Atlantic. *Deep-Sea Research Part I*, **56**, 2100-2114. Sangra P., Pelegri JL., Hernandez-Guerra A., Arregui I., Martin JM., Marrero-Diaz A., Martinez A., Ratsimandresy AW. and Rodriguez-Santana A., 2005. Life history of an anticyclonic Eddy. *Journal of Geophysical Research*, **110**, C03021.

Specific comments

1. Eq. 1 uses depth layers. Density layers should be more convenient.

2. Authors should give the analytic relationship between Ekman transport and z.

3. According to eq. (6), Vc is considered constant in x and z. As Vc is clearly independent on z, that is harder to assume with x. Several studies using LADCP data have provided that Vc is NOT constant on x.

4. "psu" units for salinity should be deleted through the manuscript.

5. Plots of salinity anomalies in Section 4 are missed. They could help to understand the MW/AAIW contribution at mid-depths in this region.

6. EOFs are composed of a spatial pattern (shown in Fig. 11) and a temporal pattern that is missed.

Technical corrections

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Pag. 2510, line 21. It seems that the location of EB1 here matches that shown in Table 1, but both don't match the position as seen in Fig.2a.

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