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Interactive comment on "Characteristics and causes of Deep Western Boundary Current transport variability at 34.5° S during 2009–2014" *by* Christopher S. Meinen et al.

S. Elipot

selipot@rsmas.miami.edu

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This paper is a valuable contribution for the observation and understanding of MOC processes in the South Atlantic. Here, I present some comments with respect to the spectral analyses, and provide some suggestions for improvement (Figures 8 and 13 and spectral analyses starting on line 456):

For comparison to other spectral estimates for large-scale oceanic transports, it would benefit the oceanographic community to use the best methods currently available for conducting the spectral analysis of the DWBC time series presented in this paper (observed and modeled). It has been demonstrated that the Welch's averaged periodogram method is generally outperformed by the multitaper method. In one go, the

multitaper provides an estimate of the spectrum from the Nyquist frequency to the Rayleigh frequency corresponding to the longest period of the time series, without the need to divide up the time series and thus to increase the Rayleigh frequency. As the authors have worked very hard to produce this time series of climatological importance, it is a pity not to investigate the transport variability up to the longest period.

Using the multitaper method would simplify figure 13: a single panel could show the mutitaper estimate for the entire OFES time series in addition to the multitaper estimate for the observations. Depending on what the authors find is the most illustrative, the results could be presented on a x-linear/y-linear scale, or a x-linear/y-log scale, or x-log/y-log scale.

If presented on a linear-log or log-log scale, the average multitaper has a constant confidence interval (independent of frequency) which could be applicable for both estimates if evaluated with the same spectral parameters. In addition, one could also show spectral analyses of the relative and reference contributions to better understand their dynamics. The choice made by the authors to present their spectra in variance preserving form is likely to lead to misinterpretation of possible outstanding periodicity in the data, so-called peaks. The analyses would benefit from conducting a formal test for periodicity in the data, that is a test on significance of peaks. So far the confidence intervals seem to indicate that there is no such significant peak, despite what is stated in the conclusion of the paper. In addition, there may be something wrong in the calculation or display of the 95\% confidence intervals for the spectra, as these inexplicably sometimes go to zero (clearly visible in Figure 8).

References:

-Percival, D. B., and A. T. Walden, Spectral Analysis for Physical Applications: Multitaper and Conventional Univariate Techniques. Cambridge, UK: Cambridge University Press, 1993.

-Wunsch, C: "Time series analysis. A Heuristic Primer", Classroom notes (January 22,

2010), http://nrs.harvard.edu/urn-3:HUL.InstRepos:15217585

-To calculate multitaper estimates, if using Matlab signal processing toolbox https://www.mathworks.com/help/signal/ref/pmtm.html?searchHighlight=multitaper or JLab free toolbox: http://www.jmlilly.net/doc/mspec.html

Some other comments:

Line 418: how is the statistical significance of correlation assessed? why is the correlation reported if it is not significant? low correlation values are not necessarily not significant, but maybe only not relevant.

Lines 437-441: “This observed annual signal is very weak and is highly influenced by other time scales and aliasing.” these claims appear here unsubstantiated. The spectral analysis should appear first, then the seasonal cycle estimate second.

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