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Interactive comment on "Antarctic Circumpolar Transport and the Southern Mode: a model investigation of interannual to decadal time scales" *by* C. W. Hughes et al.

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Reviewer's comments repeated here; replies in bold font.

I would not have any hesitation to recommend accept as is, if not for one question that I am left with after reading the manuscript: how is the /horizontal/ structure of transport variability modified on longer time scales? For short time scales the variability seems trapped on the continental slope; but at some point this variability has to project onto the jet structure of the ACC, not only in the vertical (as recognized in the manuscript) but also in the horizontal plane. If this is indeed a valid question, would correlations between DP transport filtered for certain frequency bands on SSH fields provide such a spatial picture?

We have tried various ways to address this question, and the clearest of them is presented in a new Figure 7 (Fig. 1 below) which shows how the time series of total transport south of each grid point relates to Drake Passage transport. This shows that it is only on the continental slope region that there are transport changes related to the Drake Passage flow, and the relationship becomes stronger at longer periods. Presumably there must be a component which flows in the body of the ACC, but the presence of other intrinsic local variability swamps the signal making it meaningless to ask where such a current might flow. The following addition to the text has been made at the end of Section 3: "This analysis supports the conclusions based on Figure 6: at longer periods, higher percentages are accounted for by flows on the continental slope. There is some geographic variability, with higher values in the Atlantic and Indian Ocean sectors than in the Pacific sector. Once off the continental slope the percentage of variance explained rapidly drops, becoming large and negative (white) in the body of the ACC. Presumably some part of the long period transport variability is accounted for by flows in the body of the ACC, but the presence of strong, slowly-meandering jets make it impossible to identify where this component of the transport flows in a meaningful way. It is worth remarking that, after detrending, these long period transport variations are rather small. Standard deviations are (6.26, 1.75, 1.55) Sv in the (short, medium, long) period bands respectively". These bands represent period shorter than 2 years, 2–6 years, and longer than 6 years.

p.2088, l.6: Not clear (yet) what is meant by boundary pressure.

Added in parentheses: "bottom pressure on the Antarctic continental slope" by way of explanation.

p.2089, l.25: Maybe state that those anomalies are indicated by a prime.

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Added in parentheses: "indicated by a prime, e.g. T'"

p.2092, l.17: Maybe worth emphasizing that these are bottom pressures.

Changed "pressure" to "bottom pressure" where relevant

Interactive comment on Ocean Sci. Discuss., 10, 2085, 2013.

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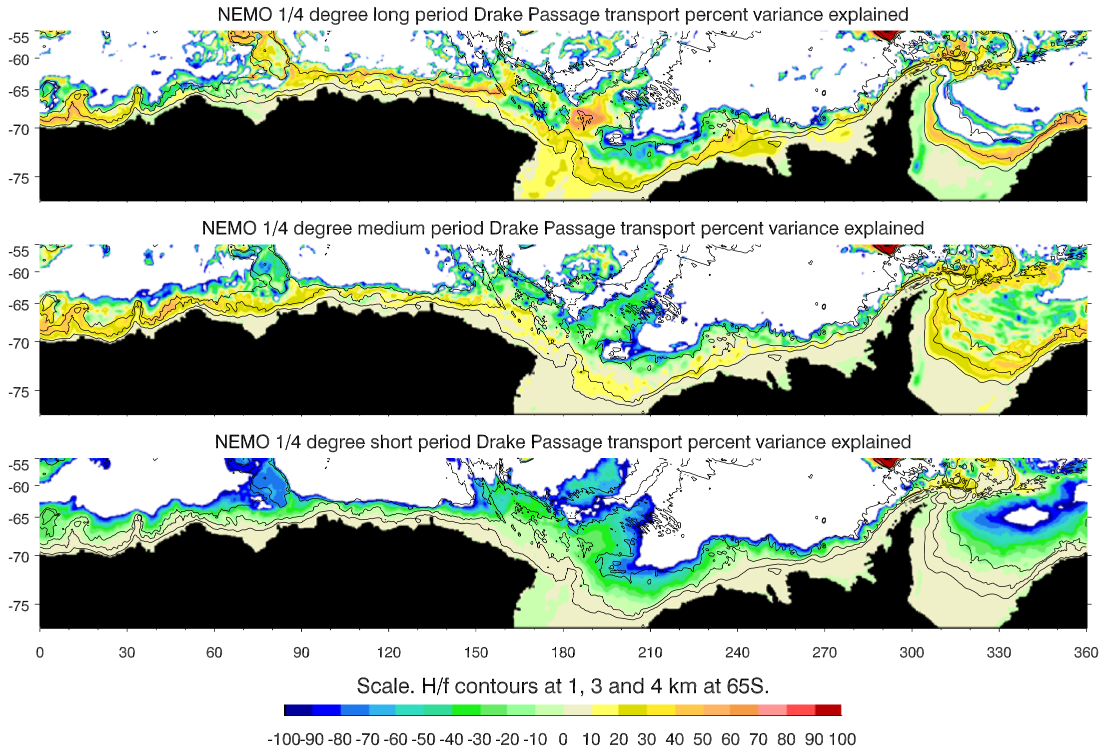

Fig. 1. The percentage of variance in Drake Passage transport which is explained by the total zonal transport integrated across a section reaching northwards from Antarctica to each grid point.

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