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Ocean Science Discussions

Interactive comment on "Barotropic vorticity balance of the North Atlantic subpolar gyre in an eddy-resolving model" *by* Mathieu Le Corre et al.

Anonymous Referee #2

Received and published: 19 December 2019

This paper is a thorough and well-written breakdown of the barotropic vorticity balance of the subpolar gyre. I enjoyed reading the paper and found its arguments to be convincing. The model itself is impressive and Section 3 is a convincing validation of its circulation. I have a few comments that could be addressed by the authors, but otherwise find the paper impressive and worth publishing.

My most significant comments are numbered below. More minor comments follow.

1) Like the rest of the paper, the introduction is thorough and well-written. I think it it could do a better job of emphasising the novelty of the paper a little more strongly, particularly with regard to the vertical coordinate/nested domain and thorough analysis/breakdown of the barotropic vorticity equation.

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2) The model run is relatively short, although page 3 does discuss the spinup. Whilst this is probably sufficient to equilibrate the barotropic mode, there is a link to the baroclinic mode via the JEBAR term. Is the baroclinic mode properly spunup? If it isn't, the authors should discuss any impact this might have on their argument.

Minor comments, typos, etc

line 3 : "this dynamics has" -> "these dynamics have"

lines 9-10 : "the topographic Sverdrup balance cannot describe the dynamics in the interior". which it probably shouldn't. I'd expect the flat bottomed Sverdrup balance to dominate here.

line 18 : "this complex" -> "these complex"

line 31 : It would also be appropriate to mention bottom friction and Stommel (1948) here, as bottom friction is discussed later, e.g. Fig. 7e.

Section 2 : No mention of horizontal viscosity or diffusivity, although the rest of the section is very thorough.

line 132 : rogue "?" in brackets.

line 235 & 243 : There's really only a few locations where the BDC is large. It seems largely the case that betaV balances the residual of the NL and BPT terms.

line 292-297 : This goes past a little too quickly for me. Without further reading, or a more in depth description, I find it difficult to make the link between the gradient of the bottom pressure and the nature of the flow's driving force.

line 303 : "Figu. 10"

line 317 : "transferring" -> "transfer"

Figure 13 caption : "hacthes"?

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