

Interactive comment on “Technical Note: Volume Transport Equations in Combined Sverdrup-Stommel-Munk Dynamics without Level of no Motion” by Peter C. Chu

Anonymous Referee #1

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The author reexamines Sverdrup dynamics and concludes that classic Sverdrup theory be replaced by extended equations including the effects of bottom topography, friction and stratification, in addition to wind forcing. Evaluations of the various terms show wind and density are the most important.

I'm afraid I cannot recommend publication of this paper. First, much is made of the result that geostrophic transport vanishes if there is a level of no motion. This is not true. The simplest counter-example is the 1.5 layer ventilated thermocline where the lower layer is assumed at rest, and yet the interior flow maintains a net meridional flow via Sverdrup dynamics. Eq (14) is missing a term proportional to the integrated divergence of the geostrophic flow which, without a level of no motion, is a term involving

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the flow at depth $-H$. The only term retained in (14) is beta times meridional transport. Comparing then to (9) leads to the conclusion on page 5 about the vanishing of the geostrophic transport, which I disagree with.

The extended equation, including friction and bottom flow (20), is also missing this term. Wunsch and Roemmich show this quantity, i.e. the bottom flow in the presence of topography, is quite large. In spite of the statement that all other terms are shown to be small relative to wind and density, I could not find a plot of $\beta H V(-H)$. There seems to be a problem with (27) as it stands. Finally, the demonstration of (6) requires that the surface $(-H)$ be a material surface and I didn't see a statement to that effect.

There are several grammatical errors and typographical errors in the manuscript.

In view of these issues, I can not endorse publication.

Interactive posting of a review is also a somewhat uncomfortable way to deliver such an opinion.

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