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## ***Interactive comment on “Meridional transport of salt in the global ocean from an eddy-resolving model” by A. M. Treguier et al.***

### **Anonymous Referee #2**

Received and published: 16 January 2014

The manuscript presents an analysis of the salt and freshwater budgets of a high-resolution integration of the ORCA ocean model. The authors indicate that one of their goals is to clear up some confusion in the literature regarding definitions of freshwater transport. I tend to agree that there is a lack of consistency in the open ocean oceanography literature, which is disturbing given that the concepts are not complicated, are clearly spelled out in Wijffels et al (1992) (W92 hereafter), and have been used with both care and utility by our estuary physics colleagues since Knudsen in 1900! In general, I find the paper clear and useful, but given the premise of attempting to add clarity to the literature, I feel that some improvement can be made.

The first and most important point of clarification that I think should be made is that the current authors define  $\langle v \rangle$  and  $\langle S \rangle$  to represent GLOBAL depth-zonal averages, not

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basin section averages as done by Wijffels. This is important because the recirculating components of the volume transport arising from Bering Strait and the Indonesian Throughflow are pushed into the  $\langle v^*S^* \rangle$  term, whereas W92 and many others would limit that term to represent recirculation within a basin. Indeed many of the most interesting points and open questions posed by W92 relate to the requirement for the circulating parts of the flow (both time mean and eddy) to balance this net through flow in the salt budgets of the basins. There is additional opportunity for introducing confusion here, because the authors do decompose the transient eddy contributions by basin, and much of the introductory material is posed in terms of “sections bounding an ocean basin” (e.g., pg 2296, line 1). I would really prefer to see the analysis done in the W92 style decomposition, but if the authors insist on retaining their current form they should make it very clear how their definitions differ from W92.

A smaller detail is that it is asserted in the introductory material that EQ 9 is exact, though the authors need to give themselves some wiggle room in explaining FIG 4 that there are additional terms related to both mass (volume) transport in frozen water and from storage terms for non-equilibrium conditions. Perhaps it would be better to spell out these contributions to the balance equations in the derivations, rather than bury them in the discussion.

#### TECHNICAL COMMENTS

PG 2294 LINE 6: the method consist of a decomposition

PG 2294 LINE 8: (rainfall and rivers)

PG 2296 LINE 1: Denoting by  $b$ , a section . . .

PG 2303 LINE 8: literature

PG 2304 LINE 13: used as an abbreviation

PG 2307 LINE 8-9: Where does the change in volume come from? The model is Boussinesq, so there can be no thermal expansion. IS global  $E > P+R$ ? Lossif sea

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ice?

PG 2310 LINE 23: 15 deg N

PG 2313 LINE 1: around 15 deg N

PG 2313 LINE 2: In our model

PG 2314 LINE 13: Equatorward of the subtropical gyres

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Interactive comment on Ocean Sci. Discuss., 10, 2293, 2013.

**OSD**

10, C802–C804, 2014

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