**Ocean Science
Discussions**

Interactive comment on "Impact of the Indonesian throughflow on Agulhas leakage" *by* D. Le Bars et al.

Anonymous Referee #2

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This article concerns the impact of the Indonesian Throughflow on the transfer of mass between the South Indian and the South Atlantic oceans. I found the analysis of the POP results interesting. The candid discussion of the weakest points of the POP model builds confidence on the strength of the analysis. Unfortunately this discussion is a bit shallow and disorganized. For example, we learn in section 5 (the discussion of HIM), that the magnitude of the percentage of water retroflected in POP is insensitive to the opening of the ITF. Shouldn't this have been mentioned in section 4 (the POP section)? The fact that the retroflection index remains more or less constant does not mean that the ITF has no impact on the interocean exchange. More water is transferred when the ITF is open because the AC transport is larger. It just means that the Agulhas retroflection is insensitive to variations of its transport, which seems to be a bit surprising in light of previous theoretical work (e.g., de Ruijter et al.). It would be interesting to include in

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the discussion the results of an extreme case e.g., one in which the ITF is increased to a substantially larger value (50 Sv?). This example is obviously unrealistic but process studies do not have to be realistic... as the discussion of HIM and the linear model demonstrates.

There are some points of the POP discussion that I don't understand. In page 363 it is stated that the ITF is increased by 13 Sv, yet the MC flow increases in 15 Sv and the SEMC flow in 13 Sv. How an inflow of 13 Sv produces a change of 18 Sv?

This article suggests that the cold path of the meridional overturning circulation is more important than the warm path. That is, that the entrainment of Agulhas eddies into the South Atlantic is largely irrelevant to the MOC. The authors note that of the 13 Sv injected by the ITF only 4 are outflowed to the South Atlantic. I therefore surmise that the remainder is advected eastward by the ACC and retrained through the Drake Passage (the cold path). This conclusion should be highlighted.

I'm not particularly impressed by the analysis of HIM and the linear model. These models do not represent a logical progression of the POP analysis. It is impossible, for example, to compare the results of a flat-bottomed model, two-layer, highly ideal-ized model (HIM) with the results of the highly realistic POP simulation. Like the first reviewer, I am not impressed by the discussion of the linear model either.

Summary: I enjoyed reading this article. I think, however, that it needs of a sharper focus. The discussion about the results of HIM should be deleted or, at the very least, should be expanded to conciliate the differences between the highly idealized and re-alistic simulations. A new simulation with POP and a larger ITF discharge is suggeste. The results of the analytica model should be eliminated.

Small points: - Perhaps it should be noted that two POP simulations are not started from dynamically equivalent. Both POP simulations are initialized with a simulation in which the Indonesian Passages are open. The model with the closed Indonesian Passage therefore is not in dynamical equilibrium at the beginning of its simulation

while the one with the open IP it is in dynamical equilibrium. - I would suggest to reduce the number of acronyms. It seems that each current or geographical accident in the Indian Ocean is given an acronym to purposely distress those, that like me, have a bad memory. - I don't see why the authors cannot change the winds in POP.

Interactive comment on Ocean Sci. Discuss., 10, 353, 2013.

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