

Interactive comment on “The dynamic connection of the Indonesian Throughflow, South Indian Ocean Countercurrent and the Leeuwin Current” by E. Lambert et al.

Anonymous Referee #1

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The authors analyze solutions to an OGCM and to layer model to explore the dynamical connection of the SICC, the LC and the ITF. I find the OGCM solutions interesting, there is certainly still something to learn about the dynamics of these features, and using a model of intermediate complexity like the layer model seems like a good approach. On the other hand, I am not sure what can be learned from the layer model solutions, since they appear not to show a LC, except right at the southern tip of “Australia”. I also have major concerns about the design of the experiments and their discussion, which are listed in more detail below. Because of these issues, I cannot recommend the manuscript for publication. If the authors were to revise the manuscript, I suggest that they redesign the layer model experiments.

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Specific Issues:

Position of the SICC: My understanding is that the position and behavior of the SICC is foremost determined globally by volume conservation (although the surface layer volume is not strictly conserved and the authors should state how it changes in time more precisely), and the position of the front (sometimes also called “Parsons jet” after Parsons 1969, JFM) can be (approximately) derived using a method of Rossby waves characteristics. Locally, it may also be affected by viscosity or inertial terms, but it is not clear to me that these effects are dominant in producing the differences between the layer model solutions shown.

Sensitivity to ITF: It seems to me that the connection of the LC and the SICC is again very sensible to the overall surface layer volume and its distribution. The former is kind of arbitrary given the experimental design. So I find it difficult to conclude that differences are primarily due to closing of the ITF.

General discussion of the layer model solutions: The discussion of the layer model solutions is relatively vague. Typically, the strength of such models is that key features of the circulation can be (qualitatively and quantitatively) derived from theory. The authors mention such theory, however, it is never really applied.

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