

# ***Interactive comment on “Dynamical Connections between Large Marine Ecosystems of Austral South America based on numerical simulations” by Karen Guihou et al.***

## **Anonymous Referee #2**

Received and published: 25 October 2019

The manuscript analyses Eulerian transports and Lagrangian pathways between ecosystem regions on either side of southern South America. It is not my region of expertise, but from the past research described in the manuscript, it seems that previously there has been only limited observations and modelling work focused on this region. Therefore it appears that the results will fill a gap in the regional oceanographic knowledge and are worth publishing, after addressing the below comments.

Specific comments:

- Figure 1: It's not clear what the extent of the LMEs are from this map, can you add shading or an outline to show how large they are?

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- line 35-36, “The large-scale circulation of the HLME includes the broad eastward flowing West Wind Drift at  $\approx 43^\circ\text{S}$ ”. This is a very outdated view of the Pacific Ocean circulation. See Chaigneau and Pizarro 2005 for updated terminology. The term “West Wind Drift” is no longer used by physical oceanographers, and the flow in the south-east Pacific covers the breadth of the gyre rather than being concentrated at  $43^\circ\text{S}$  as suggested here.

- line 42: “In this region”. It’s not clear what region you mean by this. I assume you are talking about the CHS, since that was mentioned in the last sentence. But since this is the start of a new paragraph, I wonder if you could be talking about the whole of the HLME again? But in the last paragraph you said that extended north to  $4^\circ\text{S}$ , where the westerlies are definitely not strong. Please clarify.

- line 42-44, “the main flow patterns are from the Pacific towards the Atlantic”, this sentence needs a reference.

- lines 48-53: “Recent observational records with unprecedented spatial and temporal resolution in Drake Passage yielded an absolute ACC transport of  $173.3 \pm 8.9\text{Sv}$ ” etc. I am not sure how this level of detail is relevant, since your model transports are only measuring very close to the continent and in the upper ocean layers.

- model description at line 96: State how long the spinup is before the 27 years used here.

- line 120: What do you do with particles at the surface? Do you parameterize vertical motion within the surface mixed layer at all?

- there are so many acronyms used throughout the text for place names that are very difficult to follow and remember. E.g. line 135-137 (“Only a branch of this strong current, deflected between the PS and BB enters into the ME and flows along the Southern slope before joining the northwards flowing MC further north.”) is ridiculous! I suggest spelling out some of the less familiar or less used terms, such as SCHS, CHS,

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SPS, MIS, BB, PS throughout the manuscript.

Line 139: “vertically integrated up to 200-m deep”. I think you mean integrated DOWN to 200m deep? Section 3.1: It would be good to provide some discussion here of how these transports compare with observations where possible. You listed so many transport values in the introduction where it wasn’t obvious why the reader needed to know at that point. Move them here instead to validate you model circulation.

Line 175: I don’t see what the point of these climatological Lagrangian experiments is. Why use a 1/12deg model if you don’t include the mesoscale variability in your Lagrangian pathways? Past studies have shown that pathways are completely changed if you include the mesoscale variability. Later on you release at many different times and then average all of the subsequent trajectories to obtain an average picture of the pathways. Therefore I don’t see what this initial analysis adds, since it is incorrect to leave out the time-varying flow. Alternatively, you could clearly state that this section is just to see what impact the mean flow, with no mesoscale variability, has on the pathways, and then later do a quantitative comparison of advection by the mean flow and advection by the complete time-varying velocity field. You say here that you want to “qualitatively investigate” the pathways, but including the mesoscale variability will actually give a different (correct) qualitative picture.

Line 217: What is the impact of only using monthly resolution velocity fields on your results?

References A. Chaigneau, O. Pizarro, Surface circulation and fronts of the South Pacific Ocean, east of 120°W, *Geophysical Research Letters*, 32, L08605 (2005).

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