

***Interactive comment on “Holocene evolution of the Southern Hemisphere westerly winds in transient simulations with global climate models” by V. Varma et al.***

**Anonymous Referee #2**

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General:

This paper looks at the response of the southern hemisphere westerlies (SWW) to orbitally-derived insolation forcing for the last 7,000 years across a small range of coupled climate models. The length of integration time required means that the models used are either AOGCMs of relatively low spatial resolution and use accelerated forcing, or feature atmospheric components of reduced complexity. Despite this wide range of representations of the climate system used across the different models, a reasonably consistent picture of the evolution of SWW emerges, which lends considerable confidence to the results shown. The paper is concise and well written and is suit-

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able for publication, although I think it would benefit from a little further discussion, as detailed below.

Specific comments:

As discussed in the paper's Introduction, there's considerable disagreement amongst models as to shifts in the SWW on glacial timescales - the last glacial maximum (LGM) is often used as a case study for this - and there are potentially important effects in the wider climate system with regard to the global ocean circulation and atmosphere-ocean CO<sub>2</sub> fluxes. I think the paper would be improved if it followed up on some of these issues and could expand the scope of the discussion section. For instance, whilst the agreement found across the various models in this paper for the mid-Holocene -> present is encouraging, it does apparently contradict the inter-model disagreement for the LGM that's in the literature - do these results (and their fairly simple dependency on surface temperature gradients) allow us to conclude anything about the LGM problem? Going further (and probably a lot more work!), the obvious extension would then be to see if the Southern Ocean also respond to these wind trends in a consistent manner across the different models here - if not, why not?

As mentioned in the other reviewer comment, I guess I'm also a little surprised that the only forcing factor considered is the surface temperature gradient and that other factors, for instance, the vertical structure of the atmosphere, don't come into it. That said, the variety of representations of the atmosphere that exist in this ensemble of models, from AOGCM->2.5 statistical, probably places pretty hard limits on what can be sensibly compared across the models here, and literature from more complex modelling studies is cited in support of the the approach taken.

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Interactive comment on Clim. Past Discuss., 7, 1797, 2011.

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