

## ***Interactive comment on “Weak Southern Hemispheric monsoons during the Last Interglacial period” by Nicholas K. H. Yeung et al.***

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Review of “Weak Southern Hemispheric monsoons during the Last Interglacial Period” by Nicholas K. H. Yeung et al.

This is a very interesting paper which clearly and concisely describes the results of a new Last Interglacial simulation with the ACCESS-ESM1.5 CMIP6/PMIP4 model. The model results are compared with both other CMIP6/PMIP4 simulations and proxy records. The main focus of the paper is on changes in the Southern Hemisphere precipitation in monsoons and convergence zones, although global changes are also summarised. The paper is well structured and clearly written, providing a comprehensive discussion of previous model and proxy studies. The figures are also clear and

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well described. I found the discussion of the results convincing and thorough. I have only a few minor corrections to suggest, listed below.

Specific comments:

1. Title – the paper covers a wider scope than suggested by the title, perhaps the title could be modified to reflect this.
2. Line 205-206 (also Figure 6 caption): The definition of monsoon domain is a bit confusing. The meaning is that the difference between wet and dry season precipitation is greater than 2.5 mm/day but the wording implies that wet season precipitation itself is greater than 2.5 mm/day. Rewrite to clarify.
3. Line 226-228: Interesting that there is also an increase in precipitation at the south-eastern edge of the SPCZ, associated with the weakening of the south-eastern Pacific climatological high pressure region and anti-cyclonic circulation (whereas this region is projected to become drier in future climate simulations).
4. Line 249: There is also reduced north-westerly flow to north-west of Australia.
5. Line 266: How was southern boundary of the Hadley cell defined?
6. Line 301-302: Apologies for suggesting citation of my own work, but Brown et al. (2020) is relevant here in discussing proxy records of last interglacial ENSO and latest PMIP4 model simulations – that study found that a large majority of models simulate weakened ENSO in the last 127k simulations. You could also cite other proxy & model studies of last interglacial ENSO mentioned therein.
7. Line 320-321: Another study which considered the response of SH monsoons to past and future forcing is D’Agostino et al. (2020) (again, apologies as I am a co-author), who found reduced SH monsoon strength in the mid-Holocene but increases in future under RCP8.5.
8. Figure 6: See comment re line 205, make monsoon definition clearer.

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9. Figure 8: Why not identify the edge of the Hadley cell instead, as this is discussed in the text but the eddy-driven jet is not.

Technical corrections:

1. Abstract, line 4: “southern hemispheric” – replace with “Southern Hemisphere” here and elsewhere.
2. Line 194: “globally averaged” should be “zonally averaged” (referring to Figure 5).
3. Line 206: replace “general monsoon season” with “wet season” or “monsoon wet season”.
4. Line 209: replace “general extension” with “expansion”.
5. Line 230: eastern Australia (not Eastern).
6. Line 281: replace “multi-model mean” with “model range”
7. Line 341 onwards: References: Check formatting as several have duplicate doi/URL information.
8. Figure 1: Specify that months are calendar-adjusted.
9. Figure 4: Label panels a, b, c, d etc.

References: Brown, J. R., Brierley, C. M., An, S.-I., Guarino, M.-V., Stevenson, S., Williams, C. J. R., Zhang, Q., Zhao, A., Abe-Ouchi, A., Braconnot, P., Brady, E. C., Chandan, D., D'Agostino, R., Guo, C., LeGrande, A. N., Lohmann, G., Morozova, P. A., Ohgaito, R., O'ishi, R., Otto-Bliesner, B. L., Peltier, W. R., Shi, X., Sime, L., Volodin, E. M., Zhang, Z., and Zheng, W.: Comparison of past and future simulations of ENSO in CMIP5/PMIP3 and CMIP6/PMIP4 models, *Clim. Past*, 16, 1777–1805, <https://doi.org/10.5194/cp-16-1777-2020>, 2020.

D'Agostino, R., Brown, J. R., Moise, A., Nguyen, H., Dias, P. L. S., & Jungclauss, J. (2020). Contrasting Southern Hemisphere Monsoon Response: MidHolocene Orbital

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