

Interactive comment on “The evolution of sub-monsoon systems in the Afro-Asian monsoon region during the Holocene – comparison of different transient climate model simulations” by A. Dallmeyer et al.

Anonymous Referee #2

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This paper deals with an interesting topic on the response of different sub-monsoons to changes in the Holocene insolation. The authors have made a lot of interesting analyses using several transient model simulations. Their results would be of broad interest for paleo-monsoon community. I would recommend its publication after the following comments are taken into account.

1. Monsoon precipitation has strong seasonality and usually it is the summer precipitation that is used to discuss the monsoon variations and to indicate the monsoon intensity. In this paper, the annual mean precipitation over different monsoon regions is used

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to make several conclusions (for example sections 3.2.1 and 3.4). Using annual mean would smooth out the seasonal signal and might lead to totally different conclusion especially for the region where the seasonal contrast is large like East Asia. Moreover, Fig6 shows that contrary to the pollen data reconstructions, most of the models simulate less annual mean precipitation at 6k over East Asia. The model-data comparison would be better if summer precipitation is used. The same remains for the correlation between different monsoon regions. I would recommend the authors to revisit at least their conclusions which were drawn from sections 3.2.1, 3.4, 4.2 and 4.3.1 by doing the same analysis but with summer precipitation to see if the same conclusions are still obtained.

2. Page2315, Lines 13-16: Averaging over a large area is probably not the only reason for the lack of abrupt changes in the model results. Other reasons might include: only change in insolation has been considered in the model, other factors like ice sheet and vegetation related processes being not active; the proxy-based reconstructions might not reflect only the precipitation change; or the model resolution is not high enough.

3. The seasonal precipitation change over North Africa has been found to follow the insolation gradient between 30N and 30S. Any explanation of why it is so is welcome. Moreover, this relationship has been found by using the results of three time slices (9k, 6k, 0k). As the authors have the results of several transient simulations, a confirmation of this relationship by using these transient results would also be welcome.

4. Page 2320, Lines 28-29: I would be careful to say “The simulated East Asian monsoon rainfall signal reveals no clear relationship to the change in insolation...”. First, fig.13 shows clearly that the intensity of the summer precipitation of the northern EASM region is strongly depending on the intensity of summer insolation (9 k is the strongest followed by 6 k and 3k). This result has also been found in other model studies. For example, Yin et al (2014, <http://www.clim-past-discuss.net/10/1025/2014/cpd-10-1025-2014.pdf>) found that the change in insolation has strong impact on summer precipitation in northern China but little in

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southern China. Second, proxy records in both northern (eg. Sun et al 2006 <http://www.sciencedirect.com/science/article/pii/S0277379105002039>) and southern (Wang et al 2005 cited in this paper) China have shown strong astronomical periodicities, which indicates the impact of insolation on the East Asian monsoon.

5. 6 ka simulation has been done by many modelling studies especially by PMIP. The response of different sub-monsoon systems to insolation has also been discussed in some papers. It would be important to compare the results and even conclusions of this paper to these PMIP papers to see if different analytical methods lead to different conclusions. For example, the analysis of Wang et al (2010, <http://www.sciencedirect.com/science/article/pii/S0031018210000465>) shows a warmer and wetter summer in East Asian at 6k.

6. Conclusion section should be more concise.

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