Review of WCD-2022-52 by Astrid Fremme et al. 2022

Bo Liu[a]

[a] Department of Atmospheric Science, China University of Geosciences, Wuhan

Email: boliu@cug.edu.cn

General Comments

This study investigates the hydroclimate variability of the Yangtze River Valley under different climate states, i.e., present, last glacial maximum, and future projection scenario, from the perspective of moisture sources and transport. The comparison of moisture sources and the associated contributions between modern climate and paleoclimate (LGM) could advance the understanding of the variability in the East Asian Summer Monsoon. Also, as the authors pointed out, it is the first time this moisture diagnostic driven by free-running model results. While I find these results presented very interesting, I have some suggestions for the authors to consider for further improvement.

Specific Comments

1. How about the simulation of LGM with CAM5.1? A comparison between this simulation and the LGM experiments, in CMIP5/6, in simulating precipitation and the EASM circulation is necessary.
2. The statements in the abstract [“differences in moisture source conditions are larger between the different climate models than between different climatic boundary conditions using the same model”] made the topic less important. Of course, the evaluation of results driven by climate model output is important. However, when I saw the title, I expected more enlightenment when comparing between past and future climate conditions. I would suggest the authors consider the linkage between the intensity of EASM and the moisture contributions from different areas.
3. Moisture recycling during the transport pathway may influence the contributions of moisture sources. In Fig. 4, moisture contributions from the Bay of Bengal increase in both CTL and PIN simulations, compared with ERAI. I guess such increases are connected to the lack of precipitation (moisture loss) over the Bay of Bengal. In

other words, anomaly moisture gains (lack of moisture losses) over this region in both CTL and PIN simulations increase the corresponding moisture contributions. Moreover, the weaker precipitation in CTL makes the moisture contribution from the Bay of Bengal larger than that in the PIN. The moisture contributions from the Pacific are likewise.

4. L141: The PIN simulations are substantially colder than ERA-Interim?
5. The CTL time slice used in this study is a 10-year period (L168) or a 5-year period (Table. 1). If the 1996-2005 period is selected, 1997/1998 strong El Niño is selected.
6. PIN is pre-industrial simulation and CTL is present simulation. Therefore, the comparison between ERAI and CTL is different from that between ERAI and PIN. Therefore, I would suggest the authors reorganize this manuscript solely with results from LGM and PIN simulations. The comparison between CTL and RCP could be formed into another manuscript.

Technical Comments

I would suggest the authors thoroughly check these technical details in this manuscript before submitting the revised manuscript.

1. It is “Yangtze River”, not “Yangtse River”. There are several “Yangtse River” in the text.
2. The usage of “screen-level temperature” and “near-surface temperature”. I would suggest using one of “near-surface temperature” or “surface air temperature”.
3. RCP is the abbreviation for “Representative Concentration Pathway”, not for “Reference Climate Projection” (caption of Fig. 1).
4. I would suggest the authors only use “Celsius (℃)” to describe the temperature and the associated difference.
5. Some expressions should be uniformly used in this study.

   5.1 “Western Pacific” instead of “West Pacific”.

   5.2 “South China Sea” instead of “south China Sea”.

   5.3 “Tibetan Plateau” instead of “Tibetan plateau”.
6. L288: While the authors say “However, some differences can be seen.” The following sentence gives a "similar to ERAI".

7. Some descriptions are with wrong figure numbers.
   7.1 L297: “Fig. 4d” should be “Fig. 4c”. Also, “both climate models” should be CTL simulation.
   7.2 L300: “Fig. 4d” should be “Fig. 4c”.
   7.3 L325: “Fig. 5b and c” should be “Figs. 5c and 5e”?
   7.4 L372: “Fig. 7b and c” should be “Figs. 7b and 7d”?
   7.5 L373: “Fig. 7e” should be “Fig. 7c”?
   7.6 L384: “Fig. 8b” should be “Fig. 8c”?
   7.7 L388: It seems that Fig. 8d does not indicate “and directly to the east towards Bangladesh”.
   7.8 L390: “…, coastal regions of the South China Sea and the Bay of Bengal towards India” seems with no significant increase.
8. Figure 7: “RCP” should be “LGM”.