



EGUsphere, referee comment RC2
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Comment on egusphere-2022-197

Anonymous Referee #2

Referee comment on "Impact of an acceleration of ice sheet melting on monsoon systems" by Alizée Chemison et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-197-RC2>, 2022

Chemison et al. investigate the impact of ice sheet melting in Greenland and Antarctic on global monsoon using IPSL-CM5A-LR with freshwater hosing experiments. They find that freshwater input to sea from Greenland and Antarctic has different impacts. The former may slowdown the Atlantic meridional overturning circulation, and result in a southward shift of rain belt and thus monsoon in American and Africa. However, the impact of freshwater input from Antarctic is moderate due to circumpolar current dilution. They also study the changes in some monsoon index to depict the details of monsoon changes.

I find this study is interesting because the climatic and hydrological impacts of ice melting and freshwater input are unclear and have large uncertainty. This study may improve our understanding of future monsoon change and the underlying mechanisms. However, in some sections, such as the introduction and results, the authors present quite a large amount of details of all monsoon regions one by one which is hard to follow. The coherence should be improved. In addition, the methodology and novelty need to be clearly presented or highlighted before publication.

Major comments:

- Freshwater input is added continuously between 2020 and 2070. What is the rate of release each year? Is it constant during the 50-yr period? More details on the process of release will aid the reader to fully understand the setup of the water hosing experiments and your analysis. I think something like Figure 3 is a good example.
- Lines 112-115, and Lines 381-387: It seems that some previous studies have done similar work to yours. What's the difference and did you gain some new findings in this

work? Your novelty and key results should be highlighted.

Line 380: The choice of scenarios and climate models has a strong impact on the robustness of the results. What is the impact of the two factors on your results?

- The authors study the monsoon changes at both global and regional scales. However, global monsoon includes land and sea areas while regional monsoon is only limited to land area. This should be clearly noted in the methodology, subtitle or caption. Please add "land monsoon" or something similar to avoid misunderstanding.

Minor comments:

- Line 16: tropical regions with perennial rain regime are not belong to monsoon regions.
- Line 19: add some early seminal refs on land-sea temperature contrast in addition to Zhou and zon, 2010, such as Li et al., 1996.
- Lines 19-20: monsoon is also impacted by other possible drivers such as thermodynamic and dynamic (Kitoh et al. 2013; Endo et al., 2014), vegetation physiological effect of rising atmospheric CO₂ (Cui et al. 2020).
- Line 21: the order of first and last names of the authors is not correct. Please check.
- Line 31: important?
- Lines 33-34: total precipitation is projected to decreases in the North American monsoon regions by CMIP5/6, e.g. Wang et al., 2021.
- Lines 43-66: the authors only list previous studies by monsoon regions and some of them are common knowledge. Shortening these sections may improve the coherence and legibility.
- Figure 4f ,h: the precipitation shows contrasting change in north and south Equator at very short distance in tropical America and Atlantic. What's the reason for this strange phenomenon?
- Line 278: how did you infer double ITCZ from Figure 6?

1 Cui, J. et al. Vegetation forcing modulates global land monsoon and water resources in a CO₂-enriched climate. *Nat. Commun.* 11, 5184 (2020).

2 Endo, H. & Kitoh, A. Thermodynamic and dynamic effects on regional monsoon rainfall changes in a warmer climate. *Geophys. Res. Lett.* 41, 1704-1711 (2014).

3 Kitoh, A. et al. Monsoons in a changing world: A regional perspective in a global context. *J. Geophys. Res. Atmos.* 118, 3053-3065 (2013).

4 Li, C. & Yanai, M. The onset and interannual variability of the Asian summer monsoon in relation to land-sea thermal contrast. *J. Climate* 9, 358-375 (1996).

5 Wang, B. et al. Monsoons Climate Change Assessment. *Bull. Am. Meteorol. Soc.* 102, E1-E19 (2021).

