

Comments and Responses on manuscript egusphere-2025-4468: Reviewer 1

This study examines changes in the isotopic composition of Indian summer monsoon precipitation during the Last Glacial Maximum (LGM) relative to the pre-industrial period, using an isotope-enabled general circulation model with vapor source tagging. The authors found that the LGM simulation shows 15% less monsoon rainfall, mainly due to thermodynamic drying from lower atmospheric moisture and enhanced subsidence over India. With the water vapor source tagging method, they further found that while primary moisture sources remain the same, their contributions weaken, producing $\delta^{18}\text{O}$ enrichment. This enrichment stems mainly from reduced input of isotopically depleted vapor rather than the local amount effect. The results suggest that $\delta^{18}\text{O}$ in Indian monsoon records reflects large-scale circulation changes rather than local precipitation intensity. The paper is very well organized and clearly described. I would like to recommend an acceptance for publication after some minor improvements.

We thank the referee for the thoughtful and constructive comments, as well as for the positive recommendation for publication of our manuscript. Below are our responses to their comments and suggestions. The reviewer's comments are shown in black, and our responses are in blue.

For Fig. 4, it would be better to also mark the research domain as in Fig. 3.

Thank you for the suggestion. We have now marked the Indian monsoon domain in Figure 4.

1. One of the main points of this study is to explain the reason of the reduced rainfall during the LGM compared to the pre-industrial period. While the manuscript has only 8 figures in the main text, I suggest to change one Figure (Fig. S8 or S9) from the supplements into the main text to show the corresponding changes in temperature and circulation.

Thank you for the suggestion. We agree that presenting circulation changes in the main text will help to increase clarity. Accordingly, we will move Fig. S9 (Monsoon Circulation Indices) from the Supplement to the main text.