We thank the anonymous reviewer for the comments on our manuscript "Influence of LGM boundary conditions on the global water isotope distribution in an atmospheric general circulation model". The comments will further help us to improve the manuscript to meet the expectations of the target audience. In the following, we will address the major comments of Referee #1.

"From the title and abstract, one expects that this is a sensitivity test that will show how isotopes over polar region will be affected by various boundary conditions."

In contrast to the comment by the reviewer, we think that the title and the abstract do not implicate any particular focus on the analysis of the distribution of isotopes over the polar regions alone. We intend to discuss the global distribution of the isotopes, which is indeed mentioned in the title as well as in the abstract.

"*They fixed sea surface temperatures and trying to argue that topography, albedo, CO2, and orbital forcing are affecting global temperatures in relatively magnitude. Two thirds of earth's surface is covered by ocean, and if they keep their sea surface temperature fixed, the other factors of course won't affect temperatures much. To be able to answer how these factors influence climate, they have to at least run the slab ocean model and let the ocean find its equilibrium temperatures"*

The methodology of using fixed SSTs to simulate the global isotopic distribution in atmospheric general circulation models was successfully used in the studies by Lee et al. (2007; 2008) using a different version of the Community Atmosphere Model (CAM, version 2.0) and by Sturm and Noone (2010) in the same model version of CAM (3.0) that was used in our experiment. In these studies, the climatological SST data derived from simulations with the coupled earth system model CCSM3.0, of which CAM is the atmosphere component, were used. We follow the same method of using prescribed SSTs in our analysis of the effect of the individual LGM boundary conditions on the climate and isotope distributions. Therefore, the SST used for the experiments was in equilibrium with the coupled climate model.

We realize that by excluding the feedbacks from SST and sea ice the quantitative aspect of the responses is likely to be different from that of a coupled ocean-atmosphere simulation, where the SST feedback to the CO_2 changes will be positive, and the glacial reduction in the GHG concentration would have cooled the ocean surface. In our factor analysis, we included the individual forcing factors one after the other to analyze mainly the spatial distribution pattern and, to a lesser degree, the magnitude of the climate response and corresponding isotopic response. We deliberately suppress the feedbacks from ocean SST and sea ice until the very last sensitivity experiment. Moreover, we think that the SST experiment is helpful in estimating the climate response to the LGM SST by treating it as a factor, which in turn has a significant contribution from the lowered GHG in the coupled run. This methodology has the advantage of largely isolating the effect of the individual forcing factors on the atmosphere without the response being modified by feedback mechanisms, for instance through the SST feedback, which leads to a cooling of the ocean surface in response to a reduction in the GHG concentration.

Section 5.7: tropical response - tropical response is unreasonable because they fixed their SST.

Following our arguments on fixed SSTs given above, we are still positive about showing the tropical response for our experiments. Our results could be a helpful reference for a factor analysis with coupled model experiments including the SST/sea-ice feedbacks. We are aware that the lack of an SST feedback in the GHG experiment affected the response to the reduced CO_2 in the tropics and has to be interpreted with caution. This was included in the discussion section (line 24, page 1338) of the current version of the manuscript.

References

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