

Dear Dr. Peter Haynes,

Thank you for handling our manuscript and for giving useful comments.

The manuscript was revised along your comments and the comments of two reviewers in the previous review process. We prepared two manuscripts; one is original, and another (as supplement file) with highlight is the corrected points along your (green) and the previous two reviewer's comments (yellow) for your reference.

Your response to Reviewer 1

Your proposed changes are an improvement. I suggest that you add to the revised text for p9l23-p10l2 an explicit reminder to the reader that in previous studies the convection was parametrized rather than being explicitly resolved. Re the revised text for p10l14-p11l4 -- 'convective activity was studied by Chae and Sherwood', 'in observational results'.

Reply:

The manuscript was modified along the above three points (p.10, l.18-22 and p.11, l.20, 26 in the current manuscript).

Your response to Reviewer 2.

identifying a causal relationship -- you are not entirely convincing on this point -- the fact is that to be certain you would have to run simulations in which the sudden warming was removed, or you would have to have longer simulations where the statistical relationship between changes in convective activity and sudden warmings could be more firmly established. My recommendation is that you acknowledge that there is uncertainty here, and perhaps also note that the connection between tropical tropospheric changes and sudden warmings has been established more carefully in other papers (give references) and therefore you have good reason to believe that in this single short-duration simulation you are seeing a real physical connection.

Reply:

We agree the comments. The sentences were corrected along the above logic (p.2, l.23 -p.3, l.2 in the current manuscript).

Finally I think that further acknowledgement that arguments are speculative and that further work is needed would be helpful -- that does not detract from the value of your paper.

Reply:

The below sentences were added, at the end of “Summary and discussion” section (p.12, 1.1-4).

“There is still uncertainty in the present results because of single simulation analysis. To clarify further the causal relationship between the tropical troposphere change and the stratospheric circulation change, in the near future work, the statistical analysis by using the longer simulation and the comparison study by the simulations with/without SSW will be helpful.”