

Reviewer Response Document – Reviewer Round 2

Thank you very much. We have put a lot of effort in trying to make this manuscript as complete, informative, and useful as possible. Thank you for your time and effort in reviewing this manuscript.

1. Grouping: I appreciate that the authors have tried another grouping strategy. I am not sure I follow the logic for a 'middle' group, but I think it proves their point. This needs to be mentioned in the text.

The following text has been added to the manuscript to describe the robustness of our grouping strategy:

“As a test of the robustness of the grouping strategy, we created a third group containing the five models closest to the C3M observations (hereafter Group 3; bcc-csm1-1, CMCC-CM, CanESM2, MPI-ESM-MR, and MPI-ESM-LR). Composites of CA for from Group 3 show features present in both Group 1 and Group 2, as expected since Group 3 contains models from each (not shown). This indicates that even the models closest to observations display features from their respective group. If the 1:1 line was a poor metric to use for group selection, we would expect Group 3 to resemble one of the groups or neither of the groups. Thus, the results are robust to a small change in the grouping strategy.”

2. Daily data v. Monthly data: I'm concerned that the DJF joint distributions are qualitatively different since with daily data there is an increase with omega 500 at constant LTS, and a monotonic increase in frequency at higher LTS for all omega 500, neither clear in the monthly data. I don' think that comment in the text is sufficient: There are some differences besides the dynamic range. Do they matter for the conclusions?

Please describe that the differences do not affect the conclusions, because they look like they might from this figure. I think this needs a little more work in the text, and maybe even inclusion of this figure to explain it.

The following text has been added to the manuscript and have decided not to add the figure to the manuscript:

“The largest differences between the daily and monthly results occur in winter for high stability regimes ($LTS > 34$) in which daily data shows about 10% larger CA than monthly; however, these regimes occur with a frequency less than 0.1%. We also note that the covariances between clouds and cloud influencing factors evaluated at daily and monthly timescales represent different manifestations of processes; thus, different processes may be important for explaining cloud behavior and model differences at the daily and monthly timescales. As such, care must be taken in the interpretation of the results at monthly timescales. We do not expect that the use of monthly averaged data to affect the main conclusions, however an analysis performed at the daily timescale provides more detailed information due to the larger dynamic range with the potential to identify additional processes that cause model differences under the wider range of atmospheric conditions.”