This is a very comprehensive paper, encompassing model-model, model-data and data-data comparisons, and will be a fantastic resource for the WACCM community. The authors have followed many of the previous reviewers' suggestions, but I feel that some of these points still need to be addressed, particularly regarding clarity and length. I appreciate the authors have put a lot of work into this analysis, and do not suggest discarding large sections entirely, but I think some tightening up of the text and figures will improve uptake (see my specific suggestions, below).

As a general comment, I agree with a comment by one of the previous reviewers that discussion of differences between FR-WACCM and SD-WACCM is fairly limited. The authors argue (perhaps rightly so) that this would justify a separate paper in its own right, but the discussion of data-data differences is often fairly comprehensive, so at times the paper feels a little unbalanced.

The authors have done a good job at setting the paper within the existing body of literature. Overall, I think this paper is close to being ready for publication, and my specific comments below aim to improve the length, clarity and uptake of the paper.

1. Abstract. Page 1, lines 12-19 are clear, as are lines 10-12 on page 2. In between is a lot of detail that I think could be simplified. What are the simple, take home messages of this study? What is new and exciting?
2. Figures. To reduce the number of figures, and reduce the amount of cross-referencing between different subplots, I suggest as an example for Figure 1:
a) Changing the colormap to red-white-blue, where red shows positive values and blue shows negative values, or something similar. The current colormap is not intuitive to read, and readers with color blindness will not be able to distinguish the red/green shading.
b) Add contour lines showing the climatological mean state for MLS, MLS and FR-WACCM (for the three plots on the left-hand side of figure 1). Then you can get rid of the left-hand column of figure S1.
c) Apply hatching over the areas where the model is outside the error limits on the observations (or where it's inside the error limits, if you prefer). Then you can get rid of the right-hand column of figure 1.
d) Add labels (a) (b) etc to the subpanels – referring to Fig. 1c is more concise than Fig. 1 (left column, bottom panel) etc.

In total, this reduces nine sub-plots down to three. For a nice example of how this was done in a previous WACCM study, see e.g. Figure 3 of
https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2014GL061627

3. Appendices. There is quite a bit of overlap between the appendices and main text. I wondered if some of the discussion from the main text should be moved to the appropriate appendix, to help make the main text more concise, and the appendices stand alone. E.g. Page 8, lines 3-23 could go to Appendix A1; Page 10, lines 4-28 could go to Appendix A2, along with page 11 lines 3-28; page 14 lines 29-39 could go to Appendix A3. This is just a suggestion, however.
4. Discussion of figure S15, page 16 lines 5-20 – could this form a separate stand-alone appendix?
5. Section 6 is largely repetitive of prior sections. I suggest replacing this simply with a short 'Conclusions' section, and ensuring that the discussion here is incorporated earlier into the

text, as sections 4 and 5 already contain rather a lot of discussion. In one of the responses to the previous reviewers, the authors presented a bullet-point list showing what was new for the evaluation of each species. Perhaps that type of approach could be included here as well?

6. More accurate cross-referencing would help, e.g. p13 line 11 refers to the 'trends section' – please also state the section number.