

Replies to Dr. John King

May 7, 2020

Performance of the higher-resolution subset of the CMIP6 ensemble

- Reviewer comment: *A somewhat surprising finding is that the higher-resolution subset of the CMIP6 ensemble appears to perform worse than the lower-resolution simulations over regions of complex orography such as the Antarctic Peninsula. This clearly warrants further investigation, but is outside the scope of the current paper.*
- Reply: We fully agree that this point is of particular interest. It will require a special analysis in a future dedicated work since this is not the focus of this article.

Representativity of the CloudSat measurements

- Reviewer comment: *The CloudSat dataset covers a relatively short time period (4 years), which raises questions about its representativity. However, the authors use a Monte Carlo approach to demonstrate that this is not a problem. With a little more work it might be possible to use this same approach to make a quantitative assessment of the statistical significance of the differences between models and observations.*
- Reply: A statistical analysis has been added in Appendix D to distinguish the regions where the comparison with the CloudSat dataset can be trusted with a good confidence level. It points out that the best reliability is on coastal regions, ice-shelves and peninsula, whereas there is a significant difference between the CloudSat snowfall means and re-analyses and model results on the interior of the continent. In addition, we carried out the same test with various time-series (whole temporal coverage and selected or random 4-years). The conclusion is that this choice has no significant influence on the result of the statistical test

for the CMIP (5 & 6) experiments whereas it plays a major role on ERA5 performances.

Other remarks

The number of stations per region has been added to the Table B1 in Appendix B. Missing acronyms have been detailed. The color palette has been modified for all figures to match the ones used by the IPCC for the CMIP (5 & 6) experiments.