

Interactive comment on “Influence of Sea Ice Anomalies on Antarctic Precipitation Using Source Attribution” by Hailong Wang et al.

Anonymous Referee #3

Received and published: 12 August 2019

General Comments:

As far as it goes, this exploration of the impact of sea ice extent anomalies on Antarctic precipitation within the climate model context is competently done and the findings are interesting and valuable. Unfortunately, there are many things left dangling that require some effort to rectify before publication.

1. This is a model study and the title should reflect this. 2. There is very little effort made to relate the results to the real world, rather the manuscript seems to assume that the results must be realistic. What constraints can you apply throughout the manuscript to the results to verify their credibility? In the background, stable water isotope studies are relevant, so it would be nice to see explicit discussion of relevant results. 3. Explain why you used a pre-industrial control as the basis for your atmospheric sensitivity

C1

studies. What difference does this make to today? Do you think that fixed SST and sea ice distort your results in contrast to having an interactive ocean? 4. There are some unexplained results for low versus high sea ice. What is the reason large PW increase north of 55S between 90E and 120E (Fig. 3c)? Why does the surface sensible heat flux decrease north of 55s (Fig. 3d)? Why does the latent heat flux decrease north of 55S between 90E and 170E (Fig. 3e)? This impacts the precipitation (Fig. 3f). You could discuss/explain these results after presenting Fig. 10. 5. You use unusual units for P, g/m²/h, in contrast to the frequent mm/d or mm/yr. The latter units allow the reader to evaluate the magnitude of the simulated changes.

Smaller Comments.

6. Page 3, line 17: Palerme et al. (2016) as per reference list? 7. Page 4, line: Difference between natural and internal climate variability? 8. Page 5, line 2: Need Hurrell et al. (2013) reference. 9. Page 6, line 8: “further” than what? 10. Page 6, line 10: What is “CESM LENS”? 11. Page 7, line 11: Must be “anomalous meridional moisture transport divergence” to fit with the atmospheric water balance equation. 12. Page 7, line 18: Fall and spring are when the low-pressure trough around Antarctica is closest to the continent, known as the semi-annual oscillation. 13. Page 8, line 1: “Evaporation/sublimation over land”. This is a quite surprising result. Do you mean primarily over Antarctica in summer? 14. Page 8, line 24: Why do you think that the remote sources mostly lead to precipitation decreases? 15. Figs. 3, 8-10, S2, S3: Statistical significance should be tested for these figures. 16. Fig. 10f: Please use the more physically meaningful hPa rather than Pa for SLP differences.

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2019-69, 2019.

C2