Anonymous Referee #2
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The authors used CMIP5 RCPs outputs for driving icesheet simulations to test how the precipitation boundary condition determines Antarctica's sea-level contribution. They found that the simulated ice-sheet thickness generally grows in a broad marginal strip where incoming storms deliver topographically governed precipitation. They further conducted scaling analysis showing that the scaling is higher across the East Antarctic Ice Sheet but lower across the West Antarctic Ice Sheet and lowest around the Siple Coast.

This study focuses on an interesting topic and potentially contributes to our understanding of further Antarctic icesheet change and sea level rise. Thereby, I would like to support this manuscript be published in Earth System Dynamics after minor revisions.

Thank you very much for reviewing our manuscript and your encouraging comments.

First, the authors may want to notice the effect of evaporation and atmospheric moisture budget on Antarctic icesheet. Evaporation (E) is large and comparable with precipitation (P) over most of Antarctic during SON and DJF. In the atmospheric moisture budget over Antarctic, P-E is generally balanced by horizontal convergence of vertically integrated moisture transport. Given the projected different responses of atmosphere circulation in various RCPs, it is would be nice to discuss the potential roles of atmospheric winds, moisture transports and in turn, P-E in Antarctic icesheet change.

Thanks for indicating these very intriguing points.

We would have liked to compute the surface mass balance with a more physical based surface mass balance scheme that takes into account the balance between radiative and turbulent fluxes as well as the conductivity of heat within the snowpack besides phase changes between liquid water and solid ice. Our model at hand would have been able to determine also the impact of sublimation, which balances, for example in the Dry Valley accumulation (Bliss et al., 2011). However, the data required are not available for all here used CMIP5 models. Hence, we have used a parameterization to compute the surface mass balance. Here, we decided to utilize the widely accepted and used positive degree day (PDD) approach (Hock, 2003), which is justified by the high correlation between the main drivers of ablation (radiation) and the near-surface air temperature (Ohmura, 2001).

Bliss, Andrew K., Kurt M. Cuffey, and Jeffrey L. Kavanaugh. 2011. “Sublimation and Surface Energy Budget of Taylor Glacier, Antarctica.” Journal of Glaciology 57 (204): 684–96. https://doi.org/10.3189/002214311797409767.

Hock, Regine. 2003. “Temperature Index Melt Modelling in Mountain Areas.” Journal of Hydrology 282 (1–4): 104–15. https://doi.org/10.1016/S0022-1694(03)00257-9.

Ohmura, Atsumu. 2001. “Physical Basis for the Temperature-Based Melt-Index Method.” Journal of Applied Meteorology 40 (4): 753–61. https://doi.org/10.1175/1520-0450(2001)040<0753:PBFTTB>2.0.CO;2.

Regionally, the surface mass balance is influenced by sublimation/evaporation in Antarctica. The strength of this process differs by a factor of two between model studies (Agosta et al., 2019; Wessem et al., 2018). The sublimation is strongly correlated with the surface temperature and only significant during summer (Lenaerts et al., 2012). This effect is already included in our background fields to which we add the anomalies of the 2m-air temperature and precipitation. We add the figure A16 to highlight the quality of the here used approach computing the surface mass balance.

In the RACMO model, the snow sublimation includes a wind-driven process, which dominates the sublimation (Wessem et al., 2018). Over the Antarctic continent, surface sublimation and blowing snow sublimation lose mass on the order of 29 mm yr^{-1} and dispose 17–20% of the total annual precipitation over this region (Déry and Yau, 2002). However, the large-scale effect of surface blowing snow redistribution is negligible (Déry and Yau, 2002). We are confident that the differences between the used CMIP5 models are larger than the described effects and dominate the results. Further analysis of the changes in moisture transport is beyond the scope of this study and would extend this already lengthy manuscript.

Agosta, Cécile, Charles Amory, Christoph Kittel, Anais Orsi, Vincent Favier, Hubert Gallée, Michiel R. van den Broeke, et al. 2019. “Estimation of the Antarctic Surface Mass Balance Using the Regional Climate Model MAR (1979–2015) and Identification of Dominant Processes.” The Cryosphere 13 (1): 281–96. https://doi.org/10.5194/tc-13-281-2019.

Déry, Stephen J., and M.K. Yau. 2002. “Large-Scale Mass Balance Effects of Blowing Snow and Surface Sublimation.” Journal of Geophysical Research 107 (D23, 4679): 17pp. https://doi.org/10.1029/2001JD001251.

Lenaerts, J.T.M., M.R. van den Broeke, W.J. van de Berg, E. van Meijgaard, and P. Kuipers Munneke. 2012. “A New, High-Resolution Surface Mass Balance Map of Antarctica (1979–2010) Based on Regional Atmospheric Climate Modeling.” Geophysical Research Letters 39 (L04501): 5pp. https://doi.org/10.1029/2011GL050713.

Wessem, Jan Melchior van, Willem Jan Van De Berg, Brice P.Y. Noël, Erik Van Meijgaard, Charles Amory, Gerit Birnbaum, Constantijn L. Jakobs, et al. 2018. “Modelling the Climate and Surface Mass Balance of Polar Ice Sheets Using RACMO2 - Part 2: Antarctica (1979-2016).” The Cryosphere 12 (4): 1479–98. https://doi.org/10.5194/tc-12-1479-2018.

Also, I am wondering how the results of authors’ ice sheeting simulations will affect Antarctic sea ice and deepwater formation. How will they modulate the Antarctic sea ice projection in various RCPs? How will they modulate deep convection in the marginal seas of the Antarctica, the formation of Antarctic Bottom Water and the strength of abyssal circulation?

Here we could only speculate since we do not simulate the actual processes in the ocean. Since our manuscript is already long, we prefer to keep this short and do not discuss these important points. In particular, the other referee suggested shortening instead of expanding our manuscript.