Earth Syst. Sci. Data Discuss., referee comment RC2
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Comment on essd-2021-12

Anonymous Referee #2

Referee comment on "Large ensemble of downscaled historical daily snowfall from an earth system model to 5.5□km resolution over Dronning Maud Land, Antarctica" by Nicolas Ghilain et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-12-RC2, 2021

Review of Reconstruction of daily snowfall accumulation at 5.5km resolution over Dronning Maud Land, Antarctica, from 1850 to 2014 using an analog-based downscaling technique

The paper estimates annual precipitation rates over the coastal area of Dronning Maud Land. Using a downscaling from general circulation models of the atmosphere, a regional model and reanalysis data, the paper attempts to identify key atmospheric processes predicted back in time and which can be used to infer surface precipitation rates. The idea is intriguing and worthy of study. It is consistent with the theme of this journal.

The paper requires editorial revision and further analysis. Specifically, the paper repeatedly states that the results are an estimate of surface mass balance. In fact and as is also stated, the estimate is surface precipitation rates. Further reference to Lenaeerts et all 2019 and the magnitude of other contributions to SMB would be useful.

Section 3.1 on the dataset should go at the end of the paper once a convincing argument about the utility of the data set has been made. To that point, the variation between model and ice core data seems to be about 25 % (Figure 8) and it needs to be made clear this is a meaningful result. Moreover and perhaps more importantly, there does not seem to be a strong correlation between the variations in the model data and the ice core data. If there is a correlation it should be quantified. I expected to read a conclusion about long term trends in precip rates as hinted at in the introduction. I did not find that nor do I think such a conclusion is possible based on inspection of Figure 13. More discussion on that point would be useful and would strengthen the paper whether a trend is discernible or not.

I made editorial comments in the text. My recommendation is to return the paper to the authors and to strongly encourage them to make major revisions before resubmitting. I believe they are on the right track to an interesting result but it needs a bit more work.

Please also note the supplement to this comment:
https://essd.copernicus.org/preprints/essd-2021-12/essd-2021-12-RC2-supplement.pdf