

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2021-1064

Anonymous Referee #1

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Referee comment on "Evaluating seasonal and regional distribution of snowfall in regional climate model simulations in the Arctic" by Annakaisa von Lerber et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-1064-RC1>, 2022

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Review of Manuscript # acp-2021-1064 in ACPD: "Evaluating seasonal and regional distribution of snowfall in regional climate model simulations in the Arctic" by Lerber et al.

### General comments:

The authors evaluated HIRHAM5 regional climate simulations of snowfall in the Arctic in terms of seasonal and regional distribution. They mainly evaluated surface snowfall rate and radar reflectivity profiles using CloudSat products. Overall, the manuscript is well organized and written, and the logic is clear. The reviewer would recommend minor revision for this manuscript. Specific comments are listed as follows.

### Specific comments:

- The major comment for this manuscript is that the authors could consider some objective metrics in the evaluation, e.g., spatial correlation, Taylor skill score.
- Lines 105-106: Why was 70N selected as the boundary of two rings? Please justify it.
- Lines 128-130: I might not agree with this statement. Simulation uncertainty comes from many aspects, and microphysics parameterization is only one of them. Boundary layer parameterization can also significantly influence the model dynamics and then influence the snowfall simulation. If the authors did not conduct the sensitivity test on model physics schemes, it is not suitable to give this statement.
- Section 2.3: Please provide the quantitative uncertainties of the two CloudSat products.
- Line 144: "Sect. A" -> "Appendix A"
- Line 280: "East regions" -> "East region"
- Line 294: "mmyr<sup>-1</sup>" -> "mm yr<sup>-1</sup>", please correct others throughout the manuscript.
- Section 4.1: It is better to show the locations of Greenland, Barents, Kara Seas, etc.
- Lines 400-401: It would be better to show the results in other seasons in appendix or

supplement.

- Section 5.1: Please discuss the differences more quantitatively.
- Figures 4 and 9: Please conduct significance test of difference for (b).
- Figure 7: "CFTD" -> "CFTDs", What's the meaning of "86500 - 6.6  $\times 10^6$ " in the caption?
- Lines 456-457: Please show the locations of the North Atlantic region, the East Siberian Sea and the Beaufort Sea in Figure 9.