

The Cryosphere Discuss., referee comment RC2
<https://doi.org/10.5194/tc-2021-298-RC2>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on tc-2021-298

Anonymous Referee #2

Referee comment on "Sensitivity of Antarctic surface climate to a new spectral snow albedo and radiative transfer scheme in RACMO2.3p3" by Christiaan T. van Dalum et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-298-RC2>, 2021

This is a well written and considered study, which would be of interest to readers of The Cryosphere. Many regional climate models have rather poorly defined sub-surface snow schemes, so the attempts by the RACMO group to improve this area are of significant interest to the modelling community. I only have minor corrections, which are listed below.

Line 24: Please update the Mottram et al. reference.

Line 56: An explanation of what the 'specific surface area' is would be useful here, as a non-expert may not be familiar with this term.

Line 67: Please explain what SNICAR stands for.

Line 72-78: I'm not clear what the parameter tau is. What are its dimensions? Based on the definition of SSA then it should be meters? The parameter tau is usually reserved for a timescale, so this is confusing. You also mention snow metamorphism is fastest for the first regime and slowest for the last, so this again suggests a timescale. Please clarify in the manuscript. (After reading further, is this symbol actually the radius r ? This is never defined.)

Line 91-92: This sentence does not make sense. As written, you are saying that the model time step is set equal to a depth. Also, can you explain what SLED actually means?

Line 105: Can rain contribute to mass gain? Do you mean via refreezing? Rain could melt ice/snow as well as runoff itself.

Line 126: Need a comma or semi-colon before the reference.

Line 148: What criteria did you use to assess that spin-up had been reached?

Line 158: What is the justification for looking at Neumayer? Are these results representative of the wider Antarctic region?

Figure 2: What are the numbers in this figure?

Line 186: Illustrate -> illustrates

Line 231: Has the fine tuning using this parameter been done? If you tune to surface temperature, then how will the other variables change?

Line 241: By too transparent, could this either be cloud with too small optical depth in both LW and SW spectrum or not enough cloud, or cloud at the wrong height?

Line 249: How can turbulent fluxes still be improved? Via the subsurface scheme? Or boundary layer scheme?

Line 263: Can some justification for why this station was chosen be included?

Line 305-309: Is this analysis that you did? Are you showing this here? What observations are used?

Page 20: Could some mention of future Antarctic conditions be made? The importance of runoff is likely to become more important then, so this model would be important to accurately simulate these conditions.