

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-300

Anonymous Referee #2

Referee comment on "Impacts of a revised surface roughness parameterization in the Community Land Model 5.1" by Ronny Meier et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-300-RC2>, 2021

Review of manuscript entitled : "Impacts of a Revised Surface Roughness Parameterization in the Community Land Model 5.1" by Meier et al.

This paper examines the effect to updating the roughness height of several surface types including vegetation (parametrization of Raupach et al. (1992)) as well as bare soil, snow, and glaciers using observations of surface roughness from different sources. The discussion focuses on how the land surface temperatures, diurnal temperature range as well as the surface wind speeds change following large changes in these roughness heights that can reach one order of magnitude.

Major comment:s

I found this article very difficult to read as several sections were unpolished and need copy-editing. I wish that I could have spent more time concentrating on the science than trying to understand what the authors really meant. Several typos or wrong references to Figures made me think that the co-authors had not thoroughly proof-read the manuscript. This could be a requirement before an editor passes on papers to reviewers. More specifically, paragraph 2.2 which has been written hastily and needs a complete rewrite.

Line 328 the authors refer Fig 4b as illustrating forests when Fig. 4b is for grasslands, you probably meant Fig 4c which is for forests. Similarly on line 331 you refer to "Fig. 4c and d" for grassland and crops, I believe that you meant "Fig 4b and d".

I recommend that this paper undergoes copy-editing before it is published as in its present form few readers will read it to the end.

Minor comments

Line 59: dust does not necessarily cool surface temperatures, it can also warm them. Whether dust has a warming or a cooling effect on surface temperature depends on the surface albedo, the size of the particle and the mineralogy of dust (see Liao et al, 1999; Claquin et al 1998). Line 96: typo, change 'cylce' to 'cycle'

Lines 144-145: you say that Fig 1f opposes observations. I could not find the lines representing the observations in Fig 1f. Overall, Figure 1 should be improved, the colored lines are too faint and should be well referenced.

Line 196: change "For cw and V AIoff we use a precision of 0.1, for CR and c 0.01, and for CS 0.001. " to "The precision used for these key parameters is respectively: 0.1 for cw, 0.01 for CR and c and 0.001 for CS."

Lines 197-198: "Overall, the optimized Ra92 parameterizations improve the mean seasonal cycle of z0,v for all vegetation types (right column Fig. 1)." Indicate clearly that the line representing this seasonal cycle is the solid turquoise line so that the reader can readily grasp which lines to compare CLM with.

I did not find the definition of cw in the text and it should be added to Table 1. For your set of 5 parameters (cw Cs CR c and V AIoff), did you check that the set that constitutes your solution is unique? Could there be multiple sets of solutions? A Latin Hypercube method can find these multiple solutions. Imax seems to be missing from Table 1

Line 249. I would be careful when using the terminology 'an ideal solution'. How do you define what an ideal solution is? Line 500 mentions a comparison of diurnal temperature range (DTR) with MODIS observations, I could not find the MODIS observation of Figure 11b, did you mean Fig 11d?

ll 533-534: replace 'reacts comparably strong' with 'shows a response stronger by a factor 3' Line 542: replace 'And forth' with 'And fourth' Pp 26-27 needs re-writing.

References:

Liao, et al., (1999) Effects of aerosols on tropospheric photolysis rates in clear and cloudy

atmospheres, *J. Geophys. Res.* 104(19), 697-23,707.

Claquin et al. (1998) Uncertainties in modeling the radiative forcing of mineral dust, *Tellus*, 50B, 491-505.