Comment on tc-2021-152

Anonymous Referee #1

Referee comment on "Assessment of neutrons from secondary cosmic rays at mountain altitudes – Geant4 simulations of environmental parameters including soil moisture and snow cover" by Thomas Brall et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-152-RC1, 2021

Page 2, Line 45:

Please check the reference (Simpson ?Meyer and Simpson, 1955).

Page 4, Lines 88:

In the 1st step of the two-step calculation, it is necessary to introduce a region that absorbs all radiations (so-called "black-hole" region) below the scoring surface, otherwise some albedo particles are double counted as the source of 2nd step calculation because of multiple scattering between the ground and air. However, such gimmick is not mentioned neither in the text nor in Figs. 1 and 2. If the authors fully transport all radiation in the 1st step calculation, they must perform it again by introducing a black-hole region, or analyze the influence of the multiple scattering on their final results.

Table 1:

Please consider to provide the statistical uncertainties in the table.

Figure 5:

Please consider to provide the numerical values of a, b, c parameters in this figure. It is beneficial for some readers who want to reproduce the results.

Page 11, Line 214

It is written that "For the summer months when there is no snow at the UFS, the measured values are between 2.7 and 3.6 cm SWE." Assuming the influence of the buildings of the UFS research station was negligible, what is the corresponding moisture content in the limestone as expected from Fig. 12? Then, what is the typical moisture content in the limestone? The reason why I ask these questions is that there is no experimental verification of the simulation results, and this comparison could be a clue for the verification.

Reference:

Several authors have already investigated the influence of the soil moisture on the cosmic-ray neutron fluxes using Monte Carlo simulation. For examples, Sato et al. (2006)* and Hubert et al. (2016)** show graphs similar to the upper panel of Fig. 12 in this manuscript. I recommend to cite the earlier works and clarify the difference of this study in the Introduction.

*Sato et al. Radiat. Res. 166, 544 (2006)

**Hubert et al. JGR: Space Phys. 121, 12186 (2016)