The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC2
https://doi.org/10.5194/tc-2021-277-RC2, 2021
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Comment on tc-2021-277

Anonymous Referee #2

Referee comment on "Brief communication: Application of a muonic cosmic ray snow gauge to monitor the snow water equivalent on alpine glaciers" by Rebecca Gugerli et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-277-RC2, 2021

This brief communication on the ‚Application of a muonic cosmic ray snow gauge to monitor the snow water equivalent on alpine glaciers‘ by Guggerli et al. gives a comprehensive introduction to a new cosmic ray sensor to monitor SWE at a point scale. The manuscript is well structured and gives comprehensive information on the applied methods and results. Moreover, the authors try to discuss their results carefully and point out potential uncertainties and further steps. Of course, it would be nice to get more detailed information on the method itself, however, for the chosen type of manuscript (brief communication) the length and amount of given information is well suited. In general, I see a great need in investigation of new sensor systems as presented here, as we still lack continuous in situ SWE measurements in alpine areas for various applications. I only have some minor points:

- Was the glacier surface already covered by snow at the date of installation (6 December 2020)? If yes, the natural snow cover was most likely destroyed by shovelling, which could have an impact on the results, especially at the beginning of the winter period. Please state on this.
- What is the distance [m] between the buried neutron comic ray sensor and the buried muonic cosmic ray sensor? At what distances where the manual measurements carried out? I agree with Reviewer 1 on his point 2 – referring the measurements to a common snow depth should be applied if available (if not, please discuss this issue carefully).
- Please add the RMSE (besides R^2) to describe the accuracy between manual SWE measurements and n-CRSG-derived SWE (Section 3.1.2).
- The two-part or eventually also three-part conversation function needs more explanation and background information (Section 3.2.2).
- (How) does the footprint of this in situ measurements change with an increasing snowpack? In addition, could you give an assumption how the accuracy of the novel method changes with an increase of SWE?