

Interactive comment on “An assessment of two automated snow water equivalent instruments during the WMO Solid Precipitation Intercomparison Experiment” by Craig D. Smith et al.

Anonymous Referee #2

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The paper compares SWE manual measurements with automated sensors of attenuation of passive gamma radiation attenuation device in two SPICE sites and another site with rather different climatic and snow conditions; and also one scale snow in one of the SPICE sites. The topic is of high interest for a broad community as the sensors that are compared are starting to be very popular in many sites of the world, and it is necessary to discuss about their accuracy, possible sources of uncertainty, etc. Due to the limited length of snow observations, few locations analysed and some problems related with the experimental design it is not possible to give strong evidences on their accuracy and the reason of biases found between manual and automated measure-

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ments. However, I think that the paper still has enough interest for many readers, and it launches some hypothesis of interest that may serve as basis for further research.

In my opinion, the structure of the manuscript is not the best to present the results. I recommend to reorganize the presentation of them showing the equivalent figures for each site together, instead of doing subsections of the results for each site (indeed the discussion is presented in the way I suggest). Meanwhile table 1 and 2 can be combined (and added results from Fortress). In this way it would be reduced the final number of figures (the 14 current figures is excessive in my opinion). More important, it would be possible to identify common processes amongst sites and their differences, and the paper would gain consistency (in the current version some figures are made for one site but not for the others..e.g.). Thus it could be presented the validation of CS725 and SSG1000 (where available) in the three sites with a couple of multi-panel plots (one panel per site), and afterwards to show figures that allow explaining the patterns of accuracy/error shown (the figures relating air temperature and difference SWE, the soil moisture...).

- One concern is how to ensure that snow depth in automated sensors is the same than that were SWE is measured manually in the three presented sites. This could be another source of error not mentioned in the manuscript. In page 11 is mentioned the spatial variability in snow melting that could affect to different snow depth. Are there snow depth sensors installed above the measured areas with automated sensors. If this is the case, we could see how well the depths are similar and if there are differences, some plot could focus on estimated snow density.

-Is there any evidence of a relationship between snow depth or amount of SWE with bias with the manual measurements. There are some references that CS725 may be inaccurate under very deep snowpack. - I think that Figure 11 should show the bias between manual and automated measurements to properly observe the coincidence between liquid water content and SWE differences.

TCD

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- It seems that the existence of water around SSG1000 may cause serious disruptions in the functioning of the device. Is it apparently due to problems in their installation or is a problem of design of the device?

Hoping my comments will result useful.

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-57, 2016.

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