

## ***Interactive comment on “Measuring snow water equivalent from common offset GPR records through migration velocity analysis” by James St. Clair and W. Steven Holbrook***

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The paper by St. Clair and Holbrook describes a novel approach for determining the snow-water-equivalent (SWE). I have read the well-written paper with great interest, and I judge it a useful contribution for the Cryosphere community. Before the paper can be accepted, I suggest that the authors address the following issues.

1. There are inconsistencies and errors with the units. I suggest that they should use mks units throughout the entire manuscript.
2. It is often referred to Line 7 and Line 19. Without a map showing these profiles

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and/or a table describing the characteristics of the profiles, these references are not helpful. Since there seem to be only lines 7 and 19 discussed, it would make sense to rename them to line 1 and line 2.

3. It is my understanding that the methodology works only for dry snow and that determining the liquid water content from the GPR data was not successful. These two facts should be stated more explicitly.

4. Figures 10 and 11 indicate that the GPR estimated depths are systematically smaller compared with the probe depths. This should be discussed.

5. Further discussion is required on the basic assumption of the approach that the scattering bodies can be considered as a point diffractor. I guess that the scattering occurs mostly at sizeable boulders. Therefore, I am not convinced that the point scatterer assumption is really justified. The diffraction hyperbola of a finite sized scattering body is expected to appear wider in a GPR profile, which would likely result in an over-estimation of the snow velocity. Consequently, one would thus rather overestimate the snow depth, but, as mentioned in point 4, the opposite seems to be the case.

6. Some of the figures are lacking proper axis labeling.

7. It seems that in Figures 7 and 9 only portions of the GPR profiles are shown. This should be clarified.

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