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Interactive comment on "Theoretical framework for estimating snow distribution through point measurements" *by* E. Trujillo and M. Lehning

Anonymous Referee #1

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This paper presents estimators for errors of point snow measurements relative to the true mean along transects and within specified areas. Estimators of how representative point measurements are in space are an important topic that so far has received little attention in snow research. The authors assume that snow depth is a random field that exhibits spatial correlation according to an exponential model. From this assumption they estimate the errors by integrating the random variable along transects (1D) and over specified areas (2D).

As far as I can see the derivations are correct.

However, I have difficulties with the way the material is presented. The title suggests that the paper proposes a framework. I do not think this is the case. Instead the paper uses standard geostatistical methods and compares them with snow data. The equa-

tions are presented as if they were new, as no references are given. This is misleading as they have been developed by Matheron and colleagues more than half a century ago and can be found in geostatistical textbooks (see eg. Journel and Huijbregts pp. 84 and 117 for the 1D and 2D cases, respectively).

I also have difficulties with the notion that the estimators are specific to snow or hydrologically-relevant variables (p. 24). They apply to ANY random field that is correlated according to an exponential model.

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The following changes are suggested:

Change title to something like: "Geostatistical estimation of point measurement errors - comparisons with snow data"

Make it clear that the method is known (and has been known for a long time in fact) and is applied to snow data in this paper. The new contributions of the paper are the comparisons with the snow data but certainly not the equations. Give full credit to the geostatistical literature when presenting the equations and the plots where their numerical values are shown.

Also say that the kind of variable does not matter in this approach as the variable is fully specified by its variance and correlation scale.

Discuss in more detail what makes the snow application interesting. The cryospheric aspects in the current paper are limited to the shape of the covariance function. For example, it would be of interest how the correlation scale is related to the snow physical characteristics.

With these changes, the paper will be an interesting application of geostatistics to the snow sampling case.

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References

Journel, A. G. and Huijbregts, C.J. (1978) Mining Geostatistics, Academic Press

Interactive comment on The Cryosphere Discuss., 9, 1, 2015.