A general treatment of snow microstructure exemplified by an improved relation for the thermal conductivity

Reviewer's Comments

This is a very good paper about snow microstructure and its relationship to thermal conductivity conducted by leveraging decades of research in microstructure-property relationship for random heterogeneous materials. The particular adaptation of the methodology, by taking advantage of the anisotropic nature of snow cover, is quite good in that one tackles the physically more important vertical conductivity first with appropriate approximations resulting in excellent linear correlation. The work represents an important advancement in the field and holds promise for more complicated situation of the lateral conductivity, perhaps in conjunction with sophisticated sensitivity analysis involving some of the approximations made.

Minor comments follow.

1. It would be useful to include the range of correlation lengths (l_z, l_{xy}) and ϵ, as well as the range of the size of specimens of the snows studied. Will the results change with respect to the size of the specimens?

2. Since the theoretical solution is a lower bound, and its results compare well with those from numerical simulations, could this mean that the lower bound solution is good enough for intended purpose?

3. Define x in Eq. 1.

Editorial comments:

1. For better readability, the authors may want to insert commas and 'the' at appropriate places.

2. Page 4677, line 16: 'on the order' is better than 'in the order'.

3. Page 4675, line 22: 'are' should be 'is'.

4. Page 4680, line 14; page 4681, line 7: 0.024 should be for k_{air}.

5. Page 4682, line 20: 'independently' is perhaps a better word than 'orthogonally'.