

Interactive comment on “Microwave scattering coefficient of snow in MEMLS and DMRT-ML revisited: the relevance of sticky hard spheres and tomography-based estimates of stickiness” by H. Löwe and G. Picard

General comments

The manuscript is a valuable contribution to an improved and unified understanding of two different models for microwave scattering by snowpacks. The theoretical part is contained in Sections 1 to 3. The results of this analysis are described in these sections, and a summary is given in the Discussion Section 5.

Real data of snow were applied in Section 4 to derive the optimal parameters for one of the models (SHS). There, the symmetric treatment breaks down to a certain degree. Only the associated optical diameter (d_0 values), related to the correlation length, is shown in a scatterplot versus one (d) of the fit parameters (Figure 6). The conclusions from the presented material with respect to needs in future work should be improved.

Special comments, questions and requests for corrections

1) Introduction, p. 2497, l. 27 - p. 2498, l. 3: Although I agree that the exponential shape of the correlation function is an oversimplification, I would still state that observed correlation functions for snow approach the exponential one often surprisingly well.

2) p. 2504, l. 19 - p. 2505, l. 2: Comment on directional averaging in IBA. It seems to me that the authors refer to Eqs. (15) - (18) of Mätzler (1998). Please note that this transition correctly results for isotropic correlation functions because, in this case, the directional averaging in (15) is independent of $A(x)$.

3) p. 2509, l. 25 and p. 2513, l. 13: To avoid confusion change expression for $v(d)$ to $v(d) = \pi d^3/6$.

4) p. 2510, l. 13: Change '(Eq. 24)' to '(Eq. 23)'

5) p. 2511, l. 19-20: Change 'sticky hard spheres (SHS) model to represented the position ...' to 'sticky hard sphere (SHS) model to represent the position ...'

6) p. 2512, l. 6: Change 'the inverse the stickiness ...' to 'the inverse of the stickiness ...'

7) p. 2518, l. 8: add unit (mm) to a_0 . Same for a_0 and b_0 in Tables 1 and 2. Can you add uncertainties of the parameters ?

8) p. 2522, l. 19: Please refer to Eq. (41) when discussing b_1 . Or clarify.

9) p. 2525, l. 4: Change 're-interpretating' to 're-interpreting'.

10) Figure 5: The different grey shades are hardly visible. In the captions refer to (and explain) the solid and the dashed lines.

11) Figures 4 - 7: The different datasets of the snow samples show quite different behaviour. Especially the DIV dataset is very inhomogeneous. Please specify this one more clearly to make the information more useful.

12) Figure 7 showing RMSE data (of numerical fit - model): Since the numerical values of model and fit are unknown to the reader, it is unclear what the actual RMSE values mean, i.e. it is unclear how well the fits approach the snow data. Please mention at least the order of magnitude of the model/fit values or else show relative RMSE data (RMSE/model).

13) Plots showing all observed and fitted correlation functions (and pair-correlation functions) might help to elucidate the relations established in this work.

14) Language: Especially in Section 4, 'perfect times' were used instead of 'past' for completed actions. Example: 'For the following analysis we have used ...' , instead of: 'For the following analysis we used ...'. Please correct where applicable.