SMRT: An active / passive microwave radiative transfer model for snow with multiple microstructure and scattering formulations (v1.0)

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Very useful tool for simulation of snow microwave emission, allowing interesting comparison between models. SMRT will certainly contribute to improve brightness temperature simulations, using measured and/or simulated snowpack characterization (stratification, micro-structure…).

I suggest to modify the Table 1, because, as said in the text (see p.11), all choices of microstructure parameters are not compatible with all choices of electromagnetic models!
I also suggest to add in this Table 1 the input parameters needed for running SMRT corresponding to each of the microstructure parametrization. The Fig.1 only gives the fundamental parameters used by the model.

For the IBA_exp mode, the definition of l_{ex} is not clear (Eq. 17). In practice, as said in the text, in the field, the correlation length can only be estimated from easy measurable parameters, e.g. SSA and density!
The commonly used relationship is the Deby equation : $l_{ex} = 4\ A$
where $A = (1 - f) / (\rho_{ice}\ SSA)$
In practice, previous studies and this SMRT paper show that, in general, a factor Φ must be used, such as:

$$l_{ex} = 4\ \Phi\ A \quad \text{(Eq.1)}$$

Matzler et al used $\Phi = \frac{3}{4}$, given : $l_{ex} = 4\ \frac{3}{4}\ A = 3\ A$

$$\text{or in general : } l_{ex} = 3\ \Phi_{ex}\ A \quad \text{(Eq.2)}$$

I think that there could be a confusion here depending of the definition of the Autocorrelation function used (Eq.17) . Is it the same definition in MEMLS?
Montpetit et al. (2013) used Eq.1 for running MEMLS. The factor considered by Montpetit as input of MEMLS is not for Eq. 2 but for Eq. 1 (Line 32, p16).
When applied to Eq2, this gives $\Phi_{ex} = 1.3 \times 4/3 = 1.73$ instead of 0.975 as stated in the paper. I suspect a mistake here?
Why Fig. 8 uses Eq.2 , instead of the original formula Eq. 1 ? For clarity and to ovoid ambiguity, I suggest to plot the Fig. 8 using Eq.1 and not Eq.2. Text p17 should then be modified. (there is presently a typo error: 0.13 at 300 kg/m3, line 6)

I also suggest to better discuss or explain how to include an ice lens in the snowpack. This is a major issue because of the observed significant increase of winter heat wave events and of rain-on-snow events. Both events generate ice crust in the snowpack that have a strong impact on microwave emission.

Other comments:

- Defined the ν parameter (frequency) p5, line 31
- P9 Line 4 should need parenthesis? : $k_a = k_o\ f_2\ F(\varepsilon_2 Y^2)$
- P10 Eq. 17, 18, 19, 20 and 24 should be aligned?
- P27, Eq 65 : e_1 ?

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