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Geoscientific Model Development Discussions

Interactive comment on "MEMLS3&a: Microwave Emission Model of Layered Snowpacks adapted to include backscattering" *by* M. Proksch et al.

Anonymous Referee #2

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The author provides a clear detailed review of MEMLS3&a model. The extension of including the backscattering is documented with formulation, parameters setup and validation. In general, the paper is well written and the code provided is very useful to reproduce the results in the paper. However, there are still a few elements need to be elaborated and explained.

1. Figure 13 needs more explanation. On page 2622, line21, the statement " The effect of m is limited to small incidence angles. . ." only explains the curves of m = 0.05 and m = 0.1. When m increase to 0.25, there is a dramatically change over 30-50 degree. However, compared to the SnowScat measurement, it seems when the MEMLS model match well with small m setting. Is that mean a smooth surface is sufficient for the match-up?

2. The soil backscattering contribution can be significant in the lower frequency. It will be very helpful to include a sensitivity analysis of the soil permittivity in a reasonable range for frozen ground instead of a fix number of 3.6 + 0.9i. 3. In the model results, the vv is always slightly higher than hh. However, the SnowScat data shows more variability of the vv/hh ratio. Please provide some insights for both model results and data analysis.

4. In the figure 1, it will be more clear to mark the rs, rd in the plot as well as the sigma0, sigma_d from both snow-air and snow-ground interface.

5. In the backscattering plot, figure(7-13), it's more common to use dB as the unit for backscattering. I suggest to convert the y-axis into dB scale for better illustration and cross-comparison with other papers.

6. In equation (9), what is sigma_n refer to?

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