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Atmospheric Measurement Techniques Discussions

Interactive comment on "Uncertainties of ground-based microwave radiometer retrievals in zenith and off-zenith methods under snow conditions" *by* Wengang Zhang et al.

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This paper investigates the accuracy of microwave retrievals under snow conditions. With this goal the authors assess the accuracy of temperature, relative humidity and vapor density from microwave retrievals comparing with the profiles obtained from an in-situ technique as it is the radiosonde measurements. Microwave profiles are obtained from what authors call "two methods", that what it really means if the use of a neural network method for two different observations, zenith and off-zenith observations (with an elevation angle of 15°). The authors compare the retrievals from both methods with the RS measurements for three snow cases. In addition, they compare the results obtaining from both microwave retrievals for two different events (heavy and light snow conditions).

The topic by itself is interesting, since microwave measurements have shown good results under clear and even cloudy conditions but the results are more problematic under rain and snow. However, I do not see any relevant result in this study that can be considered as an improvement of microwave technique under snow conditions or can help for a better understanding of the influence of snow on microwave measurements.

Next, I indicate the main reasons for my decision:

What the authors present as an improved method it is just the use of the neural network method for one observational angle (off-zenith, 15° elevation angle). At any moment there was something new in the method, as for example it could has been the consideration of snow properties (scattering, snow size distribution, etc) in the microwave retrievals. So it cannot be considered as a new method or an improved method. It is well known that elevation scanning measurements increase the accuracy of retrieved microwave profiles (Crewell and Löhnert, IEEE 2007). So the fact that they use for the second retrieval a different observational angle to the zenith is not new at all.

The only explanation that the authors give about why one retrieval (off-zenith retrieval) give better agreement with RSs than the other one (zenith retrieval) it that there is more ice or snow in the part of the window where the mirror point for the zenith observation, and that due to the shape of the window (inverted "U") there is less snow for low elevation angles because the snow fall down more easily due to the gravity effect. From this explanation, I do not learn anything about how snow should be treated in microwave retrievals to improve the results. The only that I can learn is that I should clean the window. I miss in this study an evaluation of the effect of the snow on microwave measurements due to atmospheric emission.

The authors assess the uncertainties of the microwave retrievals only for three snow events. If I understand correctly, they compare microwave profiles with three radiosondes. This is totally insufficient to obtain any significant result of the uncertainties of microwave retrievals under these conditions.

The discussion about the two case studies is very speculative. The authors compare the temperature, relative humidity and vapor density profiles for both microwave retrievals given as the best results the ones from the off-zenith methods because it looks more reasonable. However, they should compare with independent measurements in order to confirm that what they consider reasonable is the real state of the atmosphere.

I do not give more specific comments about the study because I consider that in the current status this study should not be accepted in Atmospheric Measurement Technique.

Reference

Crewell, S. and Lohnert, U.: Accuracy of boundary layer temperature profiles retrieved with multifrequency multiangle microwave radiometry, Geoscience and Remote Sensing, IEEE Transactions on, 45, 2195–2201, 2007.

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