

Development and validation of ARMS-gb v2.0: Extending fast radiative transfer modeling capability to all-sky conditions for ground-based microwave radiometer retrievals

General Comments

The manuscript aims at developing more accurate microwave transfer models for ground-based microwave sounder, which are important and critical in applying its data from monitoring atmosphere condition continuously. The manuscript gives a complete answer to it with a clear description and logical writing.

Special comments

1. Some expressions in the abstract need to be polished further, such as missing 'of' before 'these instrument observe' in the second sentence, 'correlation coefficient' instead of 'correlation', and lacking some summaries on RMSE of ice, snow, and graupel.
2. The second sentence at Page 2 is not complete, which does not mention the contribution of cloud water, rain, ice, snow, and graupel to absorption.
3. The colors in figures 2, 5 and 7 are too low contrast to display the differences.
4. What is the version of U.S. standard atmospheric conditions used in Page 9, and what is the rule on adding cloud liquid water, rainwater, ice, and snow into the profile?
5. Why are the differences of ice water content and snow water content in Figure 3 c) and 4d) so great, if they are relevant to the height assumed of ice and snow appearances in the atmosphere?
6. At section 4, line 243 to 245, it is not clearly stated if the vertical distributions of cloud liquid water, rainwater, ice water, and snow water contents are also taken from ERA5 reanalysis.
7. At line 277, it mentions the calibration quality of the data at YKW-1 and YKW-2 is not consistently stable, how do you give the conclusion? Since the data quality are not consistent, why do you use the data for comparing?
8. About the large error of exceeding 30 K in rain simulations at line 364, if the conditions on simulations are the same for MR measurements and the simulated BT? If the contributions from the rain cover are removed from the measured BT or included in the simulated BT, since most ground-based MR are not suggested working at rain condition? The conclusion seems arbitrary and lack of proof for it, which should be further investigated in the coming version of the manuscript.