



EGUsphere, referee comment RC2
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Comment on egusphere-2022-886

Anonymous Referee #2

Referee comment on "Simulation and sensitivity analysis for cloud and precipitation measurements via spaceborne millimeter-wave radar" by Leilei Kou et al., EGU Sphere, <https://doi.org/10.5194/egusphere-2022-886-RC2>, 2022

Please see the attached PDF for my detailed overall comments and line-specific comments.

Note that for some reason, the preview of my reviews is indicating I'm not willing to review the revised manuscript. This is incorrect, I *am* willing to review the revised manuscript.

This is a review of Kou et al., "Simulation and sensitivity analysis for cloud and precipitation measurements via spaceborne millimeter wave radar". The authors evaluate the sensitivity of a forward model for radar reflectivity to its microphysical input variables. The forward model includes cloud ice and water, melting mixed-phase precipitation, snow, graupel and rain. They then perform comparisons of reflectivities that are forward modeled for two WRF simulations (one stratiform and one convective event) against CloudSat observations of the same events. They find in particular that including radar attenuation in the forward model gives improved results over a forward model without attenuation.

Overall, this seems to be a concise and well-executed study. The conclusion that including attenuation in the forward model is necessary for reproducing W-band reflectivities in precipitation that includes melting and liquid phases is not surprising. Perhaps more surprising is that such good agreement was achieved in the comparisons of reflectivities between the WRF simulations and the CloudSat observations. It appears that the model fields were selected from the exact groundtrack and the exact time of the CloudSat overpass. It's unusual, I think, for model features, particularly precipitation, to be so well-located with the observations.

I think the study is a useful contribution to the precipitation retrieval

literature. My overall comments relate to how the sensitivity perturbations were defined and how the WRF simulations were configured. Most significant is whether the assessment of uncertainties due to particle shape and orientation is sufficient. I'd like to see this addressed in revision. My specific comments are more extensive and touch mainly on unclear language and missing details. Because they are extensive, I am calling the necessary revisions "major".

I think that with revision, the paper can be acceptable for publication. For this current revision, the scientific significance is good, the scientific quality is fair but this is difficult to judge due to the presentation. The presentation quality is fair.

Please also note the supplement to this comment:

<https://egusphere.copernicus.org/preprints/2022/egusphere-2022-886/egusphere-2022-886-RC2-supplement.pdf>