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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Linkage among Ice Crystal Microphysics, Mesoscale Dynamics and Cloud and Precipitation Structures Revealed by Collocated Microwave Radiometer and Multi-frequency Radar Observations" *by* Jie Gong et al.

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General Comments)

This manuscript extends the analysis of polarization difference in high-frequency passive microwave brightness temperature along with triple-frequency radar backscattering. Overall, fairly well-written, and analysis and plots are generally reasonable (need a bit corrections). This paper definitely progressed the understanding of ice microphysics



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Discussion paper

in deep convection and stratiform precipitation. I really like the analysis of co-located sensors. I enjoyed reading it.

There are two specific comments and a number of technical corrections for improving the manuscript. Also, I'm not familiar with writing style of EGU, but you may improve the writing by omitting mathematical symbols and suppressing spoken language/expressions.

Specific Comments)

Life cycle vs. cloud structure: Line 218: can you weaken the word "conclude"? Actually, without tracking actual life cycle of deep convection, you cannot conclude your hypothesis. This could be explained by the location of cell (how close to the convective cores or geographic locations) in addition to the life cycle as seen in Fig 9. If you can, plot classification of categories 1-4 on Fig 8 case (like several case in horizontal map)? You may see all categories in one case of MCSs regardless of the life cycle of MCSs.

GPM DPR-CloudSat CPR mismatch: Line 353: You stated that you cannot trust Figure 7d due to imperfect match for microphysics analysis. In that case, you cannot also trust neither Ka/W nor Ku/W analysis in Figure 6? Can you justify why one analysis is trustable (Figure 6) and other (Figure 7d) is not.

Technical Corrections)

Line 38: "how much of that precipitation reaches the ground and where" -> "how much and whre precipitation reaches the ground"

Line 50: Add citations of triple-frequency radar retrievals.

Line 70: Remove "healthy"

Line 78: Computational cost is not the answer of using spherical assumption. It is just uncertain to derive size and orientation simultaneously.

Line 90: Please add citations of Olson et al. 2001 with several sentences in the intro-

duction. This is probably most related original paper of using PD to discuss oriented non-spherical ice in the stratiform precipitation.

Line 114: “Microwave Imager” -> “GPM Microwave Imager”

Line 118: “250m” -> “500m” range resolution of interlaced DPR Ka band is 500m.

Line 121: “correction” -> “attenuation correction”

Line 148: Remove “(rain or ice)”.

Line 157: Please write the resolution of ECMWF analysis.

Line 180: “convective scenes” -> “convective core”.

Figure 2: Shade bar and values in contour lines are missing.

Line 207: “less and less” -> “lesser”

Line 208: “more and more thick” -> “thicker”

Line 215: “the melting layer” -> “the melting layer due to increased temperature”

Line 270: “presented evidences” is too strong. Suggest “Our analysis in Section 3 supports that. . ..”. Everything from remote sensing of microphysics is retrieval and guess. Without direct measurement of in-situ observation, you cannot conclude it.

Figure 6: Again, color shade bars and values in contours are missing.

Line 305: I’m not sure about these isolated sample. How significant it is. Can you still say the sample close to theoretical curve? It does not looks like.

Line 359: How do you roughly define “large” or “small” ice particle here?. What is the size ranges of ice particle

Line 439: “enjoy”?

Line 447-449: If you like to conclude this, you must show the plot using 89GHz (e.g.,

in Appendix). Otherwise, you cannot state it.

Line 451: “highest frequency dual-polarized radiance measurements” -> “highest frequency of dual-polarized microwave radiance measurements”

Line 475: You must also mention to use ground-based polarimetric radar for alternative approach, too.

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