

Interactive comment on “Microphysical Characteristics of Frozen Droplet Aggregates from Deep Convective Clouds” by Junshik Um et al.

Anonymous Referee #1

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This is an innovative paper that obtains quantitative measures of the geometric properties of frozen droplet aggregates, demonstrated to dominate some cloud cases. The work will be useful in future studies of radiative properties and fall speeds of such particles. The paper is well presented and I only have some relatively minor comments, with the exception of the suggestion to publish it in AMT instead of ACP.

The circle Hough transform is an interesting new approach in this context, and it is worth publicising. However, the authors noted that the two sub-methods used (two-stage and phase-coding) performed differently for different aggregates, yet do not give any statistics, or suggest why they perform differently. Since the methods may lead to different bias, this should be elaborated on.

The authors say repeatedly that the relative frequency of occurrence of single frozen

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droplets and FDAs depended on temperature and position within the anvil cloud. The same may be the case for the retrieved properties, like the AI or fractal dimension. Yet no quantitative data, even a simple as scatter plots or correlations are given. Why is this valuable information withheld? Without it, the paper is essentially a method paper, and appears to be more suitable for Atmospheric Measurement Techniques, not ACP.

It is not correct to assume idealised spheres as basic elements of the aggregates. This is because frozen droplets are not smooth spheres, and the scattering properties of chain aggregates tend towards the scattering properties of individual elements as the the chain straightens (due to diminishing interactions - this effect is seen e.g. in Um et al, 2009). Thus the scattering may become dominated by the low asymmetry parameter of rough spheres for some aggregate types. So for the future study that the authors propose in the Summary and Conclusions microscopic detail of the particle surface must be taken into account, determining the selection of the single-scattering modelling method, e.g. superposition T-matrix would not be appropriate.

Minor correction: p.1, line 28: this sentence needs rewriting.

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