



EGUsphere, referee comment RC2
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Comment on egusphere-2022-675

Jacob Carlin (Referee)

Referee comment on "Automating the analysis of hailstone layers" by Joshua S. Soderholm and Matthew R. Kumjian, EGU sphere,
<https://doi.org/10.5194/egusphere-2022-675-RC2>, 2022

Title: Automating the analysis of hailstone layers

Authors: J. S. Soderholm & M. R. Kumjian

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General comments:

This article details a novel methodology for quantitatively and objectively analyzing hailstone growth layers to make inferences about their growth histories and trajectories and which can serve as a way to generate databases which hailstone growth model output can be compared and validated against. The paper is succinct and well-written and will be a valuable contribution to the field, helping to very-much address the large existing gap in hailstone observations and hailstone model validation. I have no concerns with the manuscript beyond the minor comments below and am glad to see such advancements being made.

Specific comments:

L59: I am doubtful it would have affected the measurements appreciably, but can the authors include how long the time gap was between when the hailstones were collected and when they were ultimately sliced and photographed? I'm wondering mostly about the potential for (likely minor) sublimational losses while in the freezer, or how that may have affected at least the very outer layer of each hailstone.

L101: Regarding "80" and "25", is this on the 0-255 scale or normalized to a 0-100 scale?

L102: Was the efficacy of the algorithm strongly affected by these `find_peaks` parameter choices (and, e.g., the 30%-of-peak threshold for consolidating layers) or is it relatively immune to the specific values chosen? The same question goes for the parameters applied to the consolidated smoothed radial on lines 115-117.

L135: Is my understanding correct that the "total wet growth fraction" is the % of cross-sectional area that is due to wet growth, and the "final wet growth layer fraction" the % of the cross-sectional area that is present in the outer-most wet growth layer? (Even if the outer layer is due to dry growth? Or in that case should it be 0%?) This was for some reason a bit confusing to me at first but was made clearer by the caption of Figure 6. Perhaps a brief explainer in-text of what is meant by each term may be helpful to readers.

L139: Is it known how well the oblate spheroid model fits (vs. an ellipsoidal model) for the 26 hailstones that were measured in 3D?

L149: I certainly understand and appreciate the uncertainty in so many of the parameters governing hailstone melting. Nevertheless, is it possible to add a brief sentence about how much melting might be expected under typical conditions for hailstones of different sizes? I'm thinking just an order-of-magnitude-style estimate. E.g., simulations in Ryzhkov et al. (2013a) show that for a 35-mm hailstone over 4-km only about 5 mm of ice core diameter is lost. This might help orient readers to how severe these impacts from melting might be expected to be regarding the true nature of the outermost layer of these stones.

Technical corrections:

L75: Missing closing parenthesis

L87: Move parenthesis to around year

L119: "if" should be "of"

L130: "a" should be "the"

Please also note the supplement to this comment:

<https://egusphere.copernicus.org/preprints/2022/egusphere-2022-675/egusphere-2022-675-RC2-supplement.pdf>