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Atmospheric Measurement Techniques Discussions

Interactive comment on "Microphysical properties and fall speed measurements of snow ice crystals using the Dual Ice Crystal Imager (D-ICI)" *by* Thomas Kuhn and Sandra Vázquez-Martín

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I have reviewed the manuscript, "Microphysical properties and fall speed measurements of snow ice crystals using the Dual Ice Crystal Imager (D-ICI)", submitted for publication to Atmospheric Measurement Techniques. In this manuscript, the authors present a detailed description, methodology, and application for a newly developed high-resolution ice particle imager that can be used to characterize ice crystal habits and fall speeds of these frozen hydrometeors without the influence of ground-level wind or turbulence. Overall, I found the manuscript to be very well-written and organized, with only minor typographic or grammatical errors, and I found all figures appropriately

and adequately represented. Additionally, the subject matter fits well within the scope of the selected publication.

Although there are currently several other similar instruments that have been developed in recent years for similar applications, as summarized in the manuscript, I found the D-ICI to be novel in that it appears to be the first of such instruments to incorporate a downward-looking viewing angle, such that two orthogonal planes of the ice crystal geometry are captured (i.e. parallel and perpendicular to the falling direction) when the ice crystal falls through the viewing area, allowing for a more accurate estimate of the maximum dimension of the particle. As an example of the effectiveness of their approach and instrumentation, the authors go on to show comparisons to well-known literature on the topic of classifying frozen hydrometeor type via power law relationships relating the particle area to its maximum dimension of (e.g. Mitchell 1996), with which their results compared quite well. Furthermore, the authors demonstrate from field data, the relevance in identifying ice crystal type as a means for correlating fall speed with the maximum dimension, such that maximum dimension alone cannot be used to predict the fall speed of such particles.

In conclusion, I congratulate the authors on their efforts and recommend the manuscript for publication upon completing only Minor Revisions.

Detailed Comments:

Line 23: delete the letter "s" in the word "remotes"

Lines 25-27: Citation for linking snowfall rate to snow depth on the ground?

Line 26: add word "role" after "significant"

Line 29: additional citations to Sun et al 2011 that are of relevance to the topic and may be of interest to readers:

Matrosov, S. Y., Mace, G. G., Marchand, R., Shupe, M. D., Hallar, A. G., & McCubbin, I. B. (2012). Observations of ice crystal habits with a scanning polarimetric W-band

radar at slant linear depolarization ratio mode. Journal of Atmospheric and Oceanic Technology, 29(8), 989-1008.

Marchand, R., Mace, G. G., Hallar, A. G., McCubbin, I. B., Matrosov, S. Y., & Shupe, M. D. (2013). Enhanced radar backscattering due to oriented ice particles at 95 GHz during StormVEx. Journal of Atmospheric and Oceanic Technology, 30(10), 2336-2351.

Line 182-183: Citation for assumed fall speed?

Line 188-189: Can you comment on any uncertainty associated with these estimates?

Line 201: add the letter “a” after “appear as”

Line 252: add letter “n” to “know,”

Line 256: add letter “a” after “As”

Line 304: add the word “the” after “when”

Line 387: Replace “form” with “from”

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