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Atmospheric Measurement Techniques Discussions
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Interactive comment on "Unraveling hydrometeor mixtures in polarimetric radar measurements" *by* Nikola Besic et al.

Anonymous Referee #3

Received and published: 20 April 2018

Summary:

The manuscript describes efforts to utilize a statistically based approach to hydrometeor classification and how it can be used to identify not only the primary hydrometeor type, but also a secondary classification of particle within the radar volume. Scientifically, this is significant in that understanding where mixtures of particle types occur in the real atmosphere is extremely important to a variety of research efforts. The ability of a hydrometeor classification to identify mixtures of particles would be a large improvement over the current method of singular particle types.

Major Comments: While it is obvious that the authors spent considerable time in this effort and in the formation of this manuscript, the paper is presented in a way that makes it difficult to read. The article is very dense, and contains a significant amount

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Discussion paper

of "jargon" and unnecessarily complicated explanations. This makes it difficult to follow through some explanations and generally distracts the reader from the point of the paper. This is primarily the case in the first two sections of the manuscript.

Part of the verification that is used in the manuscript is comparing observations between the statistical HCA retrieval and a ground based snowflake camera (MASC). While this is a good comparison, this is only valid at the surface and primarily only for solid precipitation particles. The radar volumes being examined extend well above the surface where no verification data exists. A discussion about the limitations of comparison with the MASC due comparing a point measurement at the surface with a volumetric measurement aloft needs to be made. Furthermore, there is no discussion about the potential change in the hydrometeor distribution from when it leaves the lowest radar volume and before it reaches the ground.

The figures need a substantial amount of work. Entropy is displayed on several figures (6, 7, 8, 10, 11, and 13) and is given a range of "low" to "high". This range is meaningless and uninformative. There needs to be a definable range for these values. Figure 8 is particularly busy and while the plots are of good quality, their size makes it impossible to examine. Break this figure up into at least two figures.

Minor Comments: Pg 2, line 6: This line is difficult to read, suggest rewrite as: "Hydrometeor classifications are a very popular topic in the weather radar community, particularly since dual polarization radar became a widely used technology (Bringi et al., 2007).

Pg 2, lines 9-12: This sentence is long and difficult to read, suggest breaking it up

Pg 3, line 29: Phv typically has a value range of 0-1, yet you list -50 - -5.23. Is this value range correct?

Pg 5, line 17 - "...prevents us from applying the..."

Pg 6, line 7 - "...one can notice the intuitive similarity of the problem." Don't make the

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assumption that this is as easily viewable by the average reader. Explain why its similar

Pg 6, line 13 - PolSAR, previously it was POLSAR, be consistent with your acronym, also need to define what POLSAR is when it is first used.

Figure 5: Why is there text in an alternate color? The figure caption should all be a single color of text.

Figure 8: In addition to the point listed in the major comments, there need to be more tick marks on the altitude axes. There are a number of altitude axes in this figure that don't have any labels at all. This is also true regarding the proportion color bar which shows a scale of 0-100%. A intermediate value or two is needed here to determine the spacing of the scale. Suggest either 0,50,100% or 0,25,50,75,100%.

Figure 10: I understand the use of color here, but this should be stated in plain text rather than attempting to use color in the figure caption.

Figure 11: The labels of the axes are small and difficult to read. Please make these labels larger. This might be a complication of attempting to use 5 plots in a single figure, in which case I suggest breaking the figure up. Additionally, don't use text color in the figure caption, just state the color in words.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-58, 2018.

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