Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
https://doi.org/10.5194/amt-2022-160-RC1, 2022

Comment on amt-2022-160

Anonymous Referee #1

Referee comment on "Image muting of mixed precipitation to improve identification of regions of heavy snow in radar data" by Laura M. Tomkins et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-160-RC1, 2022

This paper describes a visual technique to remove regions of melting hydrometeors in radar displays in winter storms. The technique allows forecasters and researchers to readily identify regions of heavy snowfall and associated hazards. This paper describes one implementation of such a product using NEXRAD data in the USA and corroborates the technique with some independent data. Overall the paper does a good job describing the technique and its general application. The contribution is worthy of publication, however I wish to suggest some improvements to the paper to help the reader through the reasoning behind it as well as comment on the particular application of the technique. Thus, I am returning the paper for major revisions.

L24: It might be worth noting that correlation coefficient is insensitve to radar power calibration issues, and intrinsic measurements of correlation coefficient should be consistent amongst radars with similar hardware and signal processing techniques (such as NEXRAD). Some intrinsic differences/biases could exist with radars with different transmission and signal processing techniques (number of pulses; antenna crosspolar performance; radome effects; determination of noise and receiver accuracy; spectral vs pulse pair processing).

L53:

(a) Polarimetric data quality is known to degrade with range, causing correlation coefficient values to decrease uniformly due to factors such as non-uniform beam filling. Does this impact the classification of pixels as "mixed" uniformly with range?

(b) In addition to mixed populations of hydrometeors, correlation coefficient also is lowered in regions of partial beam blockage and mainlobe and sidelobe clutter (terrain being one factor leading to this). Do you notice any stationary regions where mixed

precipitation is more likely to be classified due to these effects?

L71: What is the sensitivity of choosing a value of 0.97? In a fuzzy logic scheme, which is the current state of the art method for hydrometeor classification, uniform thresholds are not used, rather many variables are used and the "winning" hydrometeor classification is then selected. Can you comment on why a more sophisticated scheme was not used? Or even the operational hydrometeor classification in the NEXRAD? Perhaps it could be stated that the technique could be applied to any effort to censor data that might confound the user (clutter, biological scatter, partial beam blockage, non-uniform beam filling, etc.)

General comment: The video files in the supplement seem to suffer from video compression issues. If the authors could change their compression settings, that would be helpful to the reader.

L81: "reflectivity < 20 dBZ is too low to reliably indicate mixed precipitation". Can you expound/give a physical basis for this? Is this due to the long ranges used in the analysis - a quick perusal of NEXRAD data shows very high values of correlation coefficient in reflectivities as low as 5 dBZ in drizzle?

L104: Are there other parameters in the EXRAD data or other data collected aboard the aircraft to more reliably denote the melting layer? Was doppler velocity or linear depolarization ratio measured by any of the suite of radars on board?