Review of Combination Analysis of Multi-Wavelength, Multi-Parameter Radar Measurements for Snowfall

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1 Short description

In this paper, the authors combine observations from vertically pointing radars (K- and W-Band) and polarimetric scanning Ka-band radar to group the ice particles into different classes and growth processes. Ground-based observations from an optical disdrometer (PARSIVEL) and a Multi-Angle Snowflake Camera are used to support the classification and the growth process identification. The authors show that analyses based only on dual-wavelength ratios (DWR) from K, Ka- and W-Band radars do not allow grouping the observation into different ice/snow classes. However, the paper indicates that combining DWR with mean Doppler velocity or differential Doppler velocity makes the classification possible. This last approach allows sites equipped with dual-frequency observations to distinguish between different hydrometeor classes. I, therefore, recommend this paper for publication at AMT, but I ask the author to address the minor issues listed below.

2 Minor comments

In the methods section, the authors indicate that the technique proposed by Tridon et al.(2020) to retrieve liquid-water content was applied after adaptations. It would be beneficial for future works if the authors describe the motivation for those adaptations.

3 Technical suggestion

The plots in the PDF file suggest that the authors are using the default jet colourmap. This colourmap is known for having a non-uniform transition between the different colours, and it is not friendly for colourblind people. An alternative to the jet colourmap is the newly available turbo colourmap. Below, you can find a link to a brief comparison between turbo and jet colourmaps. Please consider using turbo or some other colourmap that would improve the accessibility of the figures. For the density plots, it would be beneficial to use a perceptually uniform sequential colourmap (see links below).

Comparison between turbo and jet colourmaps:
https://ai.googleblog.com/2019/08/turbo-improved-rainbow-colormap-for.html.

Links for turbo colourmap:
python: https://matplotlib.org/stable/tutorials/colors/colormaps.html
matlab: https://www.mathworks.com/help/matlab/ref/turbo.html

Additional colourmap comparison:
The misuse of colour in science communication, https://www.nature.com/articles/s41467-020-19160-7

Perceptually uniform colourmaps
python: https://matplotlib.org/stable/tutorials/colors/colormaps.html
Matlab: https://www.mathworks.com/matlabcentral/fileexchange/51986-perceptually-uniform-colormaps

4 Figure issues

Figure 1:
The identification from panel d is missing. The hollow circles in cyan and yellow from panels a, c, and d are not easy to distinguish from the white background. What if the authors use filled circles.

Figure 5:
The comparison between the different panels would be easier if they had the same vertical range. Suggestion panels d, e, and f could have the same range from panels a, b, and c.

Figure 8:
The cyan and yellow curves in panel d are difficult to distinguish from the density plot in the background.

Figure 9:
The cyan curve in panels a, d and g is difficult to distinguish from the density plot in the background.

Figure 10:
Panels a and b have a similar issue from figure 9.

5 Typos

Pg 7, ln 253: Should it be FMCW instead CFMCW?
Pg 9, ln 333: ... total attenuation **cshould** (typo) then ...

Pg 20, ln 695: ... effects and the **PSDs.** **.**(there is an extra period) Figure 10 shows dependencies ...
Pg 22, ln 759: These time **seriesare** (missing space) consistent with the ...