Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-211-RC2, 2018
© Author(s) 2018. This work is distributed under
the Creative Commons Attribution 4.0 License.

Atmospheric Measurement Techniques Discussions

AMTD

Interactive comment

Interactive comment on "Dual-Wavelength Radar Technique Development for Snow Rate Estimation: A Case Study from GCPEx" *by* Gwo-Jong Huang et al.

Anonymous Referee #2

Received and published: 10 October 2018

A method is proposed to estimate snowfall rates from the D3R dual-frequency radar measurements. The method is developed and assessed during a snowfall event in 2012. 2D-video disdrometer and gauge data are used to link observed radar reflectivity and particles physical properties. The dual-frequency estimator is shown to estimate snowfall rates with more accuracy than the conventional single frequency Z-S approach.

The paper is well written. The detailed discussion on the assumptions, methodology and techniques is appreciated. Dual-frequency estimation of snowfall rates addresses the critical need for improved snow estimation from ground- and space-based remote

Printer-friendly version

Discussion paper

CC BY

sensing. The work presented is worthy of publication after some minor aspects have been addressed.

1. This study relies on a set of observations that is unique. This is probably the reason why it is applied on a single event. It is recommended to discuss the representativeness of the results, i.e. to what extend the Z-S and DWR-S relations developed in this study can be applied to other precipitation events, regions or environmental conditions.

2. What are the perspectives in terms of implementing such approach to other instruments on the ground or in space (i.e. GPM dual-frequency radar)?

3. P.2 ll.10-11: "it is shown that a physically consistent representation of the geometric, microphysical, and scattering properties needed for radar-based QPE can be achieved" and following discussion on Ze-SR relations. For information this has been also been shown in a recent contribution involving dual-polarization ground-based radars: Bukovčić, P., A. Ryzhkov, D. Zrnić, and G. Zhang, 2018: Polarimetric Radar Relations for Quantification of Snow Based on Disdrometer Data. J. Appl. Meteor. Climatol., 57,103–120, https://doi.org/10.1175/JAMC-D-17-0090.1

4. P.3 ll.8&10: Dm is not measured; it is actually estimated from measurements.

5. p.3 ll.1-11: this paragraph seems too technical in the introduction section. You can consider including it in the methodology section.

6. Please correct Skolfronik-Jackson et al. (2015) to Skofronick-Jackson et al. (2015) throughout the paper.

7. p.13 ll.20 – p.14 l.10: âĂć "… Fig. 13 that there is considerable scatter at Ku-band for all three methods with the normalized standard deviation (NSTD) ranging from 55-70%". Are the errors in table 3 assumed to be normally distributed? Kirstetter et al. (2015) proposed a probabilistic Z-S QPE approach showing that uncertainty is characterized by non-symmetric distributions: Kirstetter, P.E., J.J. Gourley, Y. Hong, J. Zhang, S. Moazamigoodarzi, C. Langston, A. Arthur, 2015: Probabilistic Precipitation Rate

CC BY

Estimates with Ground-based Radar Networks. Water Resources Research, 51, 1422-1442. doi:10.1002/2014WR015672 âĂć "To reduce error, we may take the geometric mean of these two estimators": do you mean to reduce the bias? âĂć Does the non-linear least square fitting approaches assumes normally distributed uncertainty? Can this assumption be discussed?

8. p.14 l.4: "the SR (ZKu ,DWR) using LM method has the smallest NSTD (28.49%) but the other two methods have similar values of NSTD (≈30%)". Is this difference in NSTD significant?

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-211, 2018.

Printer-friendly version

Discussion paper