Doppler velocity comparison of cloud radar and Microrain radar

Xia Wan[a], Baike Xi[b,*], Guirong Xu[a], Chunguang Cui[a], Linli Zhou[a], and Zhikang Fu[a]

[a]*Institute of Heavy Rain, China Meteorological Administration, Hubei Key Laboratory for Heavy Rain Monitoring and Warning Research, Wuhan 430074, China*
[b]*Department of Hydrology and Atmospheric Sciences, University of Arizona, Tucson, AZ, USA*

[*]*Presenting author (baikex@email.arizona.edu)*

This study is trying to address that the uncertainty may be caused by the cloud radar Doppler velocity aliasing issue with the aid of Microrain radar and distrometer measurements. The Mesoscale Heavy Rain Observing System located at Xianning, Hubei province of China, provides a comprehensive measurement during Integrative Monsoon Frontal Rainfall Experiment (IMFRE) in the summer of 2018. Seven precipitation events during the IMFRE are selected under either convective or stratiform clouds except one event that includes both convective and stratiform rain periods. The data collected during this field champion allow us to investigate (1) the effectively of the existing dealiasing algorithm for cloud radar Doppler velocity; (2) the relationship between the Doppler velocities measured by cloud radar and the precipitation rate measured by the disdrometer. The algorithm is simplified and then applied to seven events of convective clouds and/or stratiform clouds in the campaign. MRR measured velocities are used as a criterion to validate the dealiasing velocities of cloud radar measured Doppler velocities under four different rain rate ranges. The multi-instrument measurements provide a verification for the dealiasing processing. Comparisons reveal cloud radar velocities agree well with MRR velocities under rain rate between 0 and 1mm/h with correlation coefficient of 0.98 and bias less than –0.3 m/s. For other three rain rate ranges, the agreements are also acceptable, therefore four linear fitting relationships between the dealiasing Doppler velocities and the rain rate are proposed, respectively. Velocity vertical profiles of convective and stratiform clouds are also analyzed, and melting band is consistent with zero degree isotherm for stratiform clouds. At convective regions, the Doppler velocities are positively correlated with the precipitation rate, and the values increases while approaching the ground. At stratiform regions, very strong variation of Doppler velocities within the melting band, and the values are slightly deceasing with height except when the precipitation rate is greater than 10 mm/h.

References

[1] Battaglia, A., E. Rustemeier, A. Tokay, C. Simmer, and U. Blahak, 2010: PARSIVEL snow observations: a critical assessment. *J. Atmos. Oceanic Technol*. **27**, 333–344.

[2] Guang, C. C., *et al*., 2015: The Mesoscale Heavy Rainfall Observing System (MHROS) over the middle region of the Yangtze River in China. *J. Geophys. Res. Atmos.* **120**, 10399–10417.

[3] Clothiaux, E. E., T. P. Ackerman, G. G. Mace, K. P. Moran, R. T. Marchand, M. Miller, and B. E. Martner, 2000: Objective determination of cloud heights and radar reflectivities using a combination of active remote sensor at the ARM CART sites. *J. Appl. Meteorol*. **39**, 645–665.

[4] Fang, D., G. Liu, and X. Dong, 2007: The application of region growing in the analysis on velocity field of the weather. J. *Nanjing Univ. (Nat. Sci.)* **43**, 625–632.

[5] Feng, Z., X. Dong, and B. Xi, 2011: A method to merge WSR-88D data with ARM SGP millimeter cloud radar by studying deep convective systems. *J. Atmos. Ocean. Technol*. **26**, 958–971.

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