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Automatic Designation of the Melting Layer with a Polarimetric Prototype of the WSR-88D Radar

Abstract

A new polarimetric melting layer detection algorithm (MLDA) is utilized to estimate the top (melting level) and bottom boundaries of the melting layer. Melting layer designations used radar reflectivity factor Z, differential reflectivity Z_{DR} , and cross-correlation coefficient ρ_{HV} from a polarimetric prototype of the Weather Surveillance Radar-1988 Doppler (WSR-88D) in central Oklahoma at antenna elevations between 4° and 10°. They are validated using NWS Norman (OUN) radiosonde data and Rapid Update Cycle (RUC) model output temperature analysis. In 85% of cases, mainly widespread stratiform rain, the MLDA yields unbiased estimates of the height of the melting level with an RMS error of 0.22 km. The remaining 15% of the cases were primarily associated with mature warm-season mesoscale convective systems for which radar-derived melting layer heights were occasionally 1 km lower than the RUC model prediction. There is evidence that the polarimetric radar might yield better spatial and temporal designation of the melting layer within the storm than that obtained from existing numerical model output and soundings.

Keywords

Melting Level Rapid Update Cycle (RUC) model

Reference

Giangrande, S. E., J. M. Krause, and A. V. Ryzhkov, 2008: Automatic Designation of the Melting Layer with a Polarimetric Prototype of the WSR-88D Radar. J. Appl. Meteor. Climatol., 47, 1354–1364, <u>https://doi.org/10.1175/2007JAMC1634.1</u>.