Recent Modifications to a new Surface-based Polarimetric Hydrometeor Classification Algorithm for the WSR-88D Network

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In this paper, we describe recent modifications to a new, surface-based polarimetric HCA that uses thermodynamic output from the High Resolution Rapid Refresh model. The algorithm allows fuzzy-logic-based classifications from the lowest elevation sweep to be projected to the surface as snow or ice crystals for cold season events where the entire atmospheric column above a location has T < -5ºC and as rain, big drops, or hail for warm season events where the surface temperature at a location has a T > 5ºC. For intermediate conditions typical of transitional winter weather events, the algorithm uses vertical profiles of model wet bulb temperature profiles to provide a background precipitation classification type. Polarimetric radar observations are then used to either confirm or reject the background classification. Since the radar-based modification of the underlying background classification is strongly dependent on detection of the presence/absence of an elevated warm layer, a new hybrid technique to detect the melting layer (discussed in detail in a separate paper) is also introduced. With this new melting layer (ML) detection technique, Gaussian weighting functions that depend on range from the radar, horizontal gradients in model wet-bulb temperatures, and time from the most recent model analyses are used to create a "blended" map of ML detections by combining contributions from high elevation radar scans (accurate ML detection, but limited to short ranges from the radar), low elevation radar scans (ML detection available to more distant ranges, but often contaminated by effects of beam broadening), and model suggested ML locations. Attempts to automatically detect the presence of a low-level "refreezing signature", indicative of sleet formation, is also discussed.

The algorithm is tested on selected winter weather events and compared against a validation data set obtained from the Precipitation Identification Near the Ground (PING) project.