13.5 RADAR-RAINFALL ESTIMATION USING SPECIFIC ATTENUATION: IMPROVEMENTS AND CHALLENGES

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The Iowa Flood Center (IFC) has been generating a real-time radar-based rain rate product with time and space resolutions of five minutes and approximately 0.5 km. This QPE product is a composite of seven NEXRAD radars that cover Iowa and drives a distributed hydrologic model called the IFC Hillslope Link Model (HLM) for state-wide streamflow prediction. The main QPE challenges the IFC is currently facing are: (1) relative biases among different radars that occasionally result in a distinctive border at the overlapping areas (e.g., because radar calibration is not synchronized among radars in the network); and (2) significant rainfall underestimation in a region covered by one of the radars (e.g., KFSD in Sioux Falls, Iowa) due to the partial beam blockage. To resolve these issues, the IFC has recently tested a rainfall estimation algorithm using specific attenuation that is immune to partial beam blockage and radar miscalibration and is less sensitive to variations in drop size distribution. Therefore, this study presents the IFCs test results regarding how well the specific attenuation method addresses the current difficulties shown in the IFC QPE product. The evaluation of the new method is based on ground reference (e.g., rain gauges) data for selected rainfall events. Since the algorithm can be applied only to the region below the melting layer, the authors discuss rainfall estimation over the melting layer. They retrieve vertical profiles of radar reflectivity and polarimetric observables and characterize their features observed over the melting layer. The study also addresses how the vertical profiles are used to improve rainfall estimation over the melting layer, complementing the specific attenuation method for the regions below the melting layer.