

## Nowcasting lightning using weather radar and a new ice mass estimator

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Lightning nowcasts are important for a number of applications and the range, resolution, and volumetric nature of weather radar observations are favorable for nowcasting lightning. Ice aloft, a key component in the atmospheric electrification process, can be estimated using weather radar data. This presentation describes a new model for estimating ice mass aloft and a method of nowcasting lightning activity using weather radar data. Previous research used a cell-based approach to lightning nowcasting and verification, where storm cells were first identified, lightning activity was associated with a particular cell, but lead times and lightning locations were not specified in the forecast. The new method described in this presentation takes a grid-based approach to lightning nowcasting and verification. This approach leverages spatial correlations and potentially complex interactions between storm cells and atmospheric scales. It also makes specific nowcasts in space and time. The new weather radar-based ice mass estimator uses a novel dynamic numerical optimization approach to reframe a simplified bulk microphysical model into a completely data-driven model. Preliminary results show that using this new model significantly improves nowcasts versus using the traditional weather radar-based ice mass estimator or lightning flash-rate density directly for nowcasting first-flash lightning occurrence. A novel verification approach is also described and used to assess this first-flash lightning nowcasting performance.