Title: Investigating the Lightning Jump Value in Operational Severe Weather Nowcasting

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The sudden temporal change in total lightning activity (lightning jump -LJ) has shown some promise in the nowcasting of severe weather. Nevertheless, issues such as automated vs. non-automated tracking algorithms, ground validation uncertainties and regional severe weather frequency have shown to have a substantial impact on probability of detection, lead time but especially the false alarm ratio. This study investigates the potential value of the LJ and how such information would be utilized along with radar in real-time for situational awareness, decision support, and warning operations during severe weather.

The total lightning data for the this analysis is based on the Lightning Mapping Array (LMA) networks located in central/SW Oklahoma, North Alabama, and Washington D.C. The numerical computation of the "lightning jump" is based on the 2-sigma rule (a "running" standard deviation of the total lightning time series) with additional constraints that pertain to flash rates. The storm identification and tracking is performed in real-time by the Hazardous Weather Testbed (HWT) in Norman, OK based on the Warning Decision Support System - Integrated Information (WDSS-II). Since the beginning of the study (April - August 2013) more than 7,000 storm cells of various intensities (e.g. total lightning activity) have been tracked. In turn, reflectivities from multiple WSR-88D radars within the LMA domains are merged with a local temperature profile from the RAP model, producing gridded reflectivity information at isothermal values producing additional radar proxy data (e.g. Vertical Integrated Liquid-VIL and Maximum Expected Size of Hail-MESH).

A statistical analysis of the identified storms reveals that the LJ has the ability to nowcast the tendency of high impact weather related proxies from radar. For example MESH shows direct relation to the presence of jumps rather than lightning flash rate alone. More importantly, the LJ can adequately provide low (<20%) false alarm values in nowcasting high (in relation to warning issuance) MESH/VIL values intensification and that are candidates for potential severe weather. The LJ should therefore be considered as value-added information to radar in the National Weather Service's Warn on Forecast paradigm.