

Lightning Jump Algorithm and Relation to Thunderstorm Cell Tracking, GLM Proxy and other Meteorological Measurements

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The lightning jump algorithm has a robust history in correlating upward trends in lightning to severe and hazardous weather occurrence. The algorithm uses the correlation between the physical principles that govern an updraft's ability to produce microphysical and kinematic conditions conducive for electrification and its role in the development of severe weather conditions. Recent work has demonstrated that the lightning jump algorithm concept holds significant promise in the operational realm, aiding in the identification of thunderstorms that have potential to produce severe or hazardous weather. However, a large amount of work still needs to be completed in spite of these positive results.

The total lightning jump algorithm is not a standalone concept that can be used independent of other meteorological measurements, parameters, and techniques. For example, the algorithm is highly dependent upon thunderstorm tracking to build lightning histories on convective cells. Current tracking methods show that thunderstorm cell tracking is most reliable and cell histories are most accurate when radar information is incorporated with lightning data. In the absence of radar data, the cell tracking is a bit less reliable but the value added by the lightning information is much greater. For optimal application, the algorithm should be integrated with other measurements that assess storm scale properties (e.g., satellite, radar). Therefore, the recent focus of this research effort has been assessing the lightning jump's relation to thunderstorm tracking, meteorological parameters, and its potential uses in operational meteorology. Furthermore, the algorithm must be tailored for the optically-based GOES-R Geostationary Lightning Mapper (GLM), as what has been observed using Very High Frequency Lightning Mapping Array (VHF LMA) measurements will not exactly translate to what will be observed by GLM due to resolution and other instrument differences. Herein, we present some of the promising aspects and challenges encountered in utilizing objective tracking and GLM proxy data, as well as recent results that demonstrate the value added information gained by combining the lightning jump concept with traditional meteorological measurements.