



## **Urban lightning climatology and GIS: an analytical framework from the case study of Atlanta, Georgia, USA**

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There are three underdeveloped components of urban cloud-to-ground lightning studies: 1) the integration of multiple flash descriptors into more informative summary metrics of flash production, 2) the comparison of flash patterns by thunderstorm type, and 3) the correspondence of urban flashes with underlying land-use. A GIS was developed to integrate these components as part of an analysis of warm season (May-September) lightning for Atlanta, Georgia, a sprawling region in the thunderstorm-prone southeastern U.S. GIS was used to map Atlanta's flash patterns utilizing these three analytical methods and results illustrate a large (420 km<sup>2</sup>) contiguous region of high flash production in suburban northeast Atlanta. Each of the three methods employed has the potential to improve how we visualize CG flash patterns and how we understand the mechanisms of urban lightning. The rationale is to document urban lightning flash patterns for Atlanta, but with more emphasis on methods and the development of a generalizable analytical framework. By making a more nuanced, GIS-based characterization of how flash production coincides with land-use, how it changes according to meteorological setting, and how integrated flash metrics can be employed, our investigation stresses a context dependency that has been only moderately developed in other urban lightning hazard studies.