

43 **Abstract**

44 Land surface heterogeneity affects mesoscale interactions including the evolution of
45 severe convection. However, its contribution to tornadogenesis is not well known. Indiana is
46 selected as an example to present an assessment of documented tornadoes and land surface
47 heterogeneity to better understand the spatial distribution of tornadoes. This assessment is
48 developed using a GIS framework taking data from 1950-2012 and investigates the following
49 topics: temporal analysis, effect of ENSO, antecedent rainfall linkages, population density, land
50 use/cover, and topography placing them in the context of land surface heterogeneity.

51 Spatial analysis of tornado touchdown locations reveals several spatial relationships with
52 regard to cities, population density, land use classification, and topography. Sixty-one percent of
53 F0-F5 tornadoes and 43% of F0-F5 tornadoes in Indiana have touched down within 1 km of
54 urban land use and land area classified as forest suggesting the possible role of land use surface
55 roughness on tornado formation. The correlation of tornado touchdown points to population
56 density suggests a moderate to strong relationship. A temporal analysis of tornado days shows
57 favored time of day, months, seasons, and active tornado years. Tornado days for 1950-2012 are
58 compared to antecedent rainfall and ENSO phases, both which show no discernible relationship
59 with the average number of annual tornado days. Analysis of tornado touchdowns and
60 topography does not indicate any strong relationship between tornado touchdowns and elevation.
61 Results suggest a possible signature of land surface heterogeneity- particularly that around urban
62 and forested landcover- in tornado climatology.

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64 Index Terms: tornado climatology, tornadoes and population, storm reports, tornado day,
65 Land-surface interactions, land-surface heterogeneity, urban storm interactions.

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