



Environmental controls on the climatological scaling of tornado frequency with intensity

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The frequency of natural hazards typically decreases with increasing intensity. Tornado intensity is measured using the damage-based EF-scale, and tornado frequency has been observed to decrease approximately exponentially with increasing EF-scale in many locations. Although tornado frequency varies considerably by geographic location, the rate of exponential decrease with increasing EF-scale varies little, except for sharper decreases in places such as Florida and the United Kingdom where supercell tornadoes are a relatively small fraction of the tornado population. Here we examine seasonal and regional variations in US tornado frequency/intensity scaling. A tornado environment index that varies with EF-rating is developed and used to interpret the results. Similar environmental indices have previously been useful in capturing aspects of the climatological and interannual variability of US tornadoes, but have not been constructed for different EF-ratings. We show that the new index represents some features of the tornado climatology, including the scaling with intensity. The new tornado environment index provides supporting evidence that factors associated with supercell occurrence play an important role in setting the intensity scaling. In addition to known geographic variations, we find seasonal changes in the intensity scaling that can be related to environmental factors. We will discuss the relevance of these findings for modeling tornado risk in current and future climates.