Public Abstract

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Title:Thermodynamic, Kinematic, and Radar Parameters of Isolated Tornadoes With and Without NWS Warning

Tornadoes are a rapidly forming weather phenomenon that forecasters may have difficulty anticipating. A tornado warning is issued when atmospheric conditions are imminent for formation or a tornado has already formed and been confirmed. The purpose of this research was to find what, if any, atmospheric parameters and radar variables that may differ between isolated tornadoes that were anticipated by an official NWS Tornado Warning (WARN) versus isolated tornadoes that occur without NWS warning (NOWARN). The hypothesis was that there is a distinct difference in wind shear and azimuthal shear between WARN and NOWARN events. A dataset of tornado events from 2004 – 2015 was obtained from previous work completed by Thompson et al. (2012) and Smith et al. (2012). The dataset was condensed to only isolated events by analyzing dates and times with NOAA's Interactive Radar Map Tool. Specifically, outbreaks and tornadoes embedded in a synoptic system were removed from the dataset. The data were further reduced to include years 2013 – 2015, months April – September, and geographic region between the Rocky and Appalachian mountain regions. Each event was then analyzed using the Iowa Environmental Mesonet Search for NWS Watch/Warning/Advisories Products by County/Zone or by Point (latitude and longitude). This left 57 isolated tornadoes that were not warned for and 39 that were. These events were analyzed using a paired Student's t-test among the thermodynamic and kinematic parameters given in the dataset. Radar analysis was done using MatLab and a code that picked out individual cells using a dBZ threshold of 35. The tornadic cell was analyzed among multiple radar parameters using paired Student t-tests to find any significant difference between WARN and NOWARN at time of tornado formation and 30 minutes before formation, as well as between nearby nontornadic cells. The results revealed shear, divergence and convergence as significantly different between the events. Although azimuthal shear resulted as statistically significant, it does not perform well when deciphering between tornadic and nontornadic cells. However, convergence and divergence appear to be an indicator of tornadic cells.