**Convective Storms Producing Winds Greater Than 70 mph - Longevity, Radar Structures and Near Storm Environments**

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From a National Weather Service perspective in Iowa, the recognition and warning of thunderstorms producing damaging winds in excess of 70 mph has taken on increased importance. Several of Iowa's larger municipalities are now activating sirens when a severe thunderstorm warning makes specific mention of winds of 70 mph or greater. The decision was based on the increased threat of falling large trees and branches, a danger mostly to people outdoors. This study and presentation were undertaken with the goal of providing the best possible service when warning of severe thunderstorm winds in excess of 70 mph, by giving warning meteorologists a detailed view of the widely varied storm structures and insights into the environments in which they occur. It should be noted that less than 20 percent of the cases in the study dataset were determined to be classic mature bow echo systems as often referenced in the literature, so there is potential for much to be learned.

The presentation will provide an overview of severe thunderstorm events that produced "widespread damaging winds" in excess of 70 mph within the NWS Des Moines County Warning Area (CWA) from 2007-2010. Initially, all reports of 70+ mph winds within the Des Moines CWA were obtained which amounted to 452 reports. These were then organized into "storm events" based on examination of radar data and the distribution of the reports in time and space. The goal was to identify "events" based on identifiable storm structures that could be tracked in time. Any such events that did not produce at least two reports of winds greater than 70 mph were then cut, in order to eliminate single anomalously high reports or events that produced only an isolated 70 mph or greater gust. Similarly, three more events were cut in which the 70+ mph reports all occurred within a small area and 1-2 minute window, as these were deemed to represent extremely localized events. After applying these conditions we arrived at a working dataset of 302 reports comprising 26 "storm events". Duration of damaging winds, time of day, and elapsed time between the first severe wind report and the first 70 mph report were noted for each of these.

Based on radar analysis, numerous parameters were also noted and compared. These included the dimensions of the damaging radar feature as well as that of its associated parent convective elements, and the speed and direction of movement of each. The 26 events were also classified by storm structure including 5 as Supercells (classic/isolated), 17 as Hybrid Supercell/Bowing Structures, and only 4 as somewhat larger Bow Echoes. The Hybrid Supercell/Bowing Structures category is necessary because a large percentage of the cases were in transition from HP Supercells or other intense convective segments/storms to more of a comma or bow echo shape (typically) during the period of 70+ mph extreme wind reports. Characteristics of each structure were also compared. Of interest is the fact that the horizontal dimensions of extreme damaging elements were not particularly large no matter what type of event - typically ranging from 19-32 nm (35-59 km).

Finally, the thermodynamic and shear environments were examined for each structure type. The near storm environment of each of the 26 events was analyzed using archived SPC mesoanalysis data on the hour before the first report. For example if the first report of an event occurred at 1405, then the 1400 data was used. If the first report occurred at 1455, then the 1400 data was used as well. First and foremost, metar data was used to determine if a surface boundary was in place. The thermodynamic and shear parameters chosen for this study were both Surface Based and Mixed Layer CAPE and CIN, Effective, 0-1, and 0-6km Shear, Mid Level Lapse Rates (700-500mb), and Precipitable Water. Finally, RUC soundings were compared and analyzed. These parameters were used in an attempt to diagnose any distinction between classic bow echo environments, characterized by damaging straight line winds in excess of 70 mph, and supercell environments capable of producing both damaging winds and tornadoes.

In summary, this should be an enlightening presentation due to the wide variety of storm structures, storm evolutions, environments and time of day that were associated with winds in excess of 70 mph. Although many of these events were not bow echoes, the presentation should provide balance and highlight the challenges of warning for extreme winds in all environments, many of which precede or eventually evolve into more classic bow echo structures. The most common storm structure associated with extreme winds (70 mph+) in this study was one of transition; from HP supercell or other small intense convective segment, growing upscale horizontally, at times reaching classification as a bowing segment or bow echo toward the latter part of the damaging time period.