AN EXAMINATION OF TORNADO ENVIRONMENTS, EVENTS, AND IMPACTS FROM 2003-2012

Andrew R. Dean and Russell S. Schneider
NOAA/NWS/NCEP/Storm Prediction Center, Norman, OK

Environments

• Tornado reports are taken from Storm Data, with individual county segments being treated as separate reports.
• Environment data is taken from SPC’s archived hourly objective analysis system.
• Since weather reports are placed onto the analysis grid, then the environmental parameters at that grid point (for the hour prior to the report) are assigned as the representative environment.

Tornado Tracks and Population Density
Valid JAN 2003 – JUN 2012

Population Density per square km
- 10000+
- 100-1000
- 10-100
- 1-10
- 0-1

Tornado Watch Verification

Tornado Watch False Alarm Rate

Tornado Watch Precipitation on Tornado Days

Discussion

- As expected, conditional probability of tornadoes rises with increasing CAPE/shear (Fig. 3).
- Most tornadoes occur in low CAPE (< 1000 J kg\(^{-1}\)) and low 6 km shear (< 15 m s\(^{-1}\)) environments (Fig. 2). While the conditional probability (Fig. 3) is relatively low in these environments, thunderstorm frequency (Fig. 1) is much higher, resulting in more events.

Challenges

- Low CAPE/high shear events pose a difficult challenge in terms of both POD and FAR. These events tend to be more common in the eastern U.S., where population density and resulting aggregate risk to life and property is generally higher. How can forecast performance be improved for these types of events?

- Major tornado outbreaks still claim many lives. From a forecast perspective, what can be done in advance of these events to raise awareness and minimize the impact?

Impacts

- Population data is derived from the 2010 Census at the census block level.
- Population density calculated on 5km NEDD grid.
- Path length was used to rank outbreaks.
- Shaded outbreak areas below are defined by the 10% contour of the `practically perfect` F3 tornado coverage, which is designed to encompass an area where coverage of events was relatively high.