Analyzing the Ohio Valley Region’s Tornado Climatology, 1960-2018

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Why is This Subject Important?

- Ohio Valley (OV) tornadoes vastly understudied.
- This research creates a basic tornado climatology.
- Provides a basis for future research to expand our knowledge.

What Do We Already Know? What Questions Does This Spur?

- Most prior tornado research focuses on Great Plains and southeastern United States, not OV.
- Evidence suggests “Tornado Alley” – region of most tornado activity – is extending eastward.
- Historically, date of highest tornado activity in central OH is May 15th; is this changing over time?
- Previous research on tornado climatology excludes other OV states (IL, IN).
- Is seasonality of tornado activity changing throughout the OV states?
- What patterns emerge by examining monthly OV tornado activity (frequency and intensity)?

Data and Methods

- Storm Prediction Center’s comprehensive tornado base (1950-2018).
- Normal periods analyzed were 1960-1989 and 1990-2018.
- CSV file and analyzed using Python in Jupyter notebook.
- End goal was to create histograms of tornado frequencies by month and intensity.

Results

- Between 1960 and 1990 period, shift in the month of peak tornado occurrence for the Ohio Valley.
- For OV, more tornadoes recorded in May and November in 1990-2018.
- An increase of almost 25% in weaker tornadoes recorded in the more recent period.
- Drop-off in 2007-2018 in weak tornadoes vs strong tornadoes recorded.
- Weaker tornadoes appear to be more common today.

Discussion and Conclusions

- Overall increase of tornadoes seen between periods.
- Could be explained by technological advances:
  - 1950s: First tornado reports
  - 1965: Palm Sunday outbreak (SKYWARN created shortly after)
  - 1971: Creation of Fujita scale
  - 1974: Super Outbreak (more Doppler research)
  - 1990: New Doppler radar technology starts installation across country
  - 1997: All NWS offices have updated radar
  - 2000s: New Doppler products introduced to better detect weaker tornadoes (correlation coefficients)
  - 2007: Implementation of Enhanced Fujita scale
  - 2010s: Introduction of drone technology to better identify tornadoes vs downbursts vs straight line winds
- Could also indicate real changes in climate forcing.
- Tornado occurrences show discernible shifts in each season.
- Future research possibilities:
  - Examine diurnal vs nocturnal occurrence
  - Analyze changes in occurrence by intensity
  - Case studies of outbreaks in OV – explore weather and climate conditions, attribution of climate change

References

Figures 9 and 10: An example of new Doppler products and the SKYWARN logo, respectively.