Evaluating the Accuracy and Skill of the SPC's Significant Severe Convective Outlooks

Nathan M. Hitchens[1] and Harold E. Brooks[2]

[1]Department of Geography, Ball State University, Muncie, Indiana

[2]NOAA/OAR/National Severe Storms Laboratory, Norman, Oklahoma

Introduction

Among the convective outlook products issued by the Storm Prediction Center are forecasts of significant severe weather: EF2+ tornadoes, wind gusts ≥ 75 mph, and hail with ≥ 2 in. diameter. These forecasts, indentified by hatched areas on probabilistic convective outlooks for individual hazards (Day 1) and all severe weather (Days 2 and 3), represent a 10% or greater probability of the occurrence of significant severe weather.

An inherent difficulty in evaluating these forecasts is the lack of a well-defined threshold for determining whether the significant severe events that were reported on days without an outlook were numerous and/or clustered tightly enough to have warranted an outlook (a missed event).

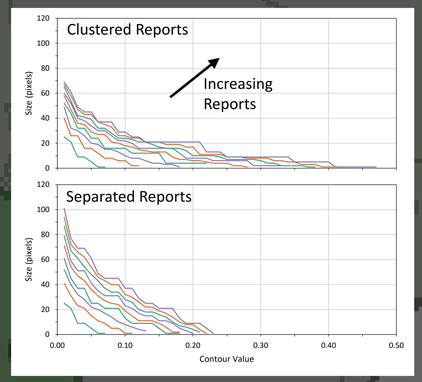
Missed Event Criteria

To establish criteria for missed events, tests were performed on synthetic reports placed one at a time on a 20x20 grid, smoothing them with 2-D Gaussian smoother described in Hitchens et al. (2013). Reports were placed in the center of the grid in two configurations:

	1	2	5	
	3	4	6	
	8	7	9	

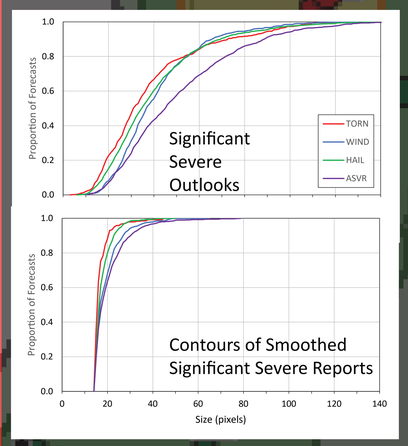
1		2		5
3		4		6
8		7		9

- Tight clustering results in higher contour values and smaller areas with increasing reports
- Separation of reports by one grid box results in lower contour values and larger areas



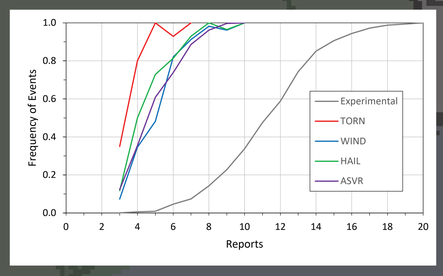
A reasonable minimum threshold for a significant severe event that warrants an outlook is defined by:

- Existence of 0.1 smoothing contour, and
- The 0.1 contour must be ≥10 pixels
- Contour used is highest value with report coverage of ≥10% and size ≥15 pixels

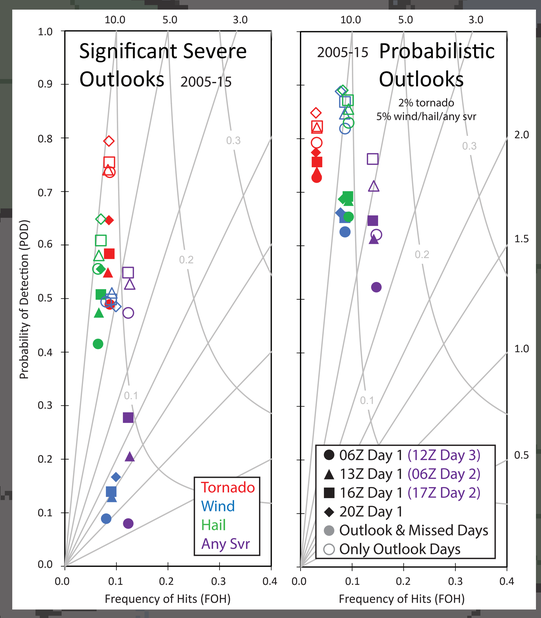


- Forecast areas for tornadoes are generally smaller than areas for wind and hail
- Forecast areas for any severe (Days 2 & 3) tend to be larger
- Smoothed areas which met the criteria established above are mostly 15-30 pixels

- Frequency of observed events from 2005-15 that meet the above criteria
- "Experimental" curve shows 1000 random placements on 20x20 grid



Results



	Observed Yes	Observed No	Sum
Forecast Yes	**a**	**b**	a+b
Forecast No	**c**	**d**	c+d
Sum	a+c	b+d	n

Probability of Detection (POD)

a / (a+c)

Frequency of Hits (FOH)

a / (a+b)

FOH = 1 - False Alarm Ratio (FAR)

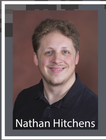
Critical Success Index (CSI)

a / (a+b+c)

Bias

(a+b) / (a+c)

- Tornado outlooks have highest POD values when only considering days with outlooks
- Large differences in POD values for wind outlooks when including or omitting missed events indicates that wind events are under-forecast
- Day 2&3 forecasts for any significant severe have highest FOH/CSI, likely since forecasters don't have to discriminate between hazards
- Criteria for missed events, while sensitive to choices in thresholds, work well, and will be useful in evaluating probabilistics outlooks



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