

A historical-analog-based severe weather checklist for central New York and northeast Pennsylvania

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Outline

- The checklist
- Example – April 28, 2011
- Verification
- Summary / Conclusion

The main user interface



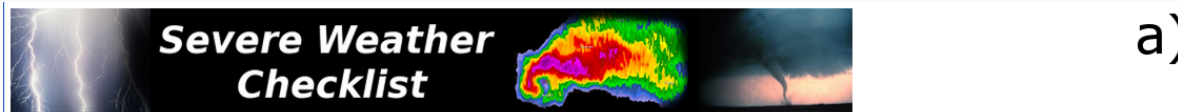
Move your mouse pointer over the question marks for popup information. The icon will change if there is more information available.

Parameters	Entry	References	Where to find?
Surface Weather Patterns =	Progressive Cold Front <input type="button" value="v"/>		
12 hour 500 mb height falls (m) = Values of falling heights should be positive.	<input type="text"/>		
Mixed Layer CAPE =	<input type="text"/>		
CIN =	<input type="text"/>		
Lapse Rate 950 to 700 mb (c/km) =	<input type="text"/>		
Lapse rate 700 to 500 mb (c/km) =	<input type="text"/>		
Maximum Dewpoint Depression from 700-500 mb (c) =	<input type="text"/>		
0-1 km Helicity =	<input type="text"/>		
0-1 km bulk shear (in knots) =	<input type="text"/>		
0-3 km bulk shear (in knots) =	<input type="text"/>		
0-6 km bulk shear (in knots) =	<input type="text"/>		
0-3 km directional shear vector (in degrees) =	<input type="text"/>		
EL storm relative flow (knots) =	<input type="text"/>		
Enter the Precipitable Water (inches)	<input type="text"/>		
Enter the Soil Moisture.	<input type="text"/>		

Related Information

- [To the long checklist.](#)
- [Past checklists.](#)

The analog finder



a)

Completed at 20:44:01 CEST Fri Jul 12 2013

Events Most Similar

Move your mouse over the links to see how your numbers compare to a similar event. Click on a link to see the past event.

Event	Type	Hazard	Flash Flood Reports	Damaging Wind Reports	All Hail Reports	Hail 1" or greater	Tornado Reports
1. 4/8/2010	Broken Line	wind	0	12	1	1	0
2. 5/9/2009	Short Lines	hail / wind	0	3	3	1	0
3. 5/4/2010	Broken Line	wind / hail	0	8	8	4	0
4. 5/30/2012	cluster of storms	wind	0	1	0	0	0
5. 5/1/2003	Broken Line	Wind / many null	0	2	0	0	0

Alert: Parameters are favorable for a significant cool-season convective squall line!

Your Values

Entered Values	Reference information
Surface Weather Patterns = Progressive Cold Front	
12 Hour 500 mb Height Falls = 80 m	Moderate upper forcing.
CAPE = 600	500-1000 J/kg - Weakly unstable.
CIN = 10	10-50 - Small amounts of inhibition.
Lapse Rate 950 to 700 mb (c/km) = 7 c/km	6.0 to 9.8 - conditionally unstable.
Lapse Rate 700 to 500 mb (c/km) = 6 c/km	6.0 to 9.8 - conditionally unstable.
Maximum Dewpoint Depression from 700-500 mb (c) = 10 ° C.	Greater than 10 degrees C - significant potential for enhanced downdraft speeds.
0-1 km Helicity = 50	Below the threshold for a favorable tornado day.
0-1 km Bulk Shear = 20 kts	less than 20 kts - No enhanced chance of significant tornadoes.
0-3 km Bulk Shear = 40 kts	20 - 40 kts - Bow echoes with greatest threats for damaging wind.
0-6km Bulk Shear = 50 kts	greater than 40 kts - Supercells likely.
DirectionShear = 250 degrees	Not a Northwest flow case.
EL Storm Relative Flow = 20 kts	Weak storm relative winds, less than 35 kts, at the equilibrium level favor wind over hail.
The Precipitable Water entered was 1 inches. For the month of July the entered precipitable water is 95% of normal. Less than 150% is less favorable for flooding.	Precipitable water greater than 150% of normal is associated with many flash flood events.
The Soil Moisture was not entered.	Nothing entered.

The analog comparison table



b)

Completed at 20:44:01 CEST Fri Jul 12 2013

Events Most Similar

Move your mouse over the links to see how your numbers compare to a similar event. Click on a link to see the past event.

Event	Type	Hazard	Flash Flood Reports	Damaging Wind Reports	All Hail Reports	Hail 1" or greater	Tornado Reports
1. 4/8/2010	Broken Line	wind	0	12	1	1	0
2. 5/9/2009	Similar day and your data.						
3. 5/4/2010	Element	Your values	4/8/2010 values	8	3	1	0
4. 5/30/2011	Surface Weather Patterns	1	1	1	0	0	0
5. 5/1/2003	12 Hour 500 mb Height Fall	80	60	2	0	0	0

Alert: Pa

Your Valu

Entered Va

CAPE	600	436	
CIN	10	21	
Lapse Rate 950 to 700 mb	7	9.2	
Lapse Rate 700 to 500 mb	6	7.1	
Surface W	0-1 km Helicity	50	46
12 Hour 50	0-1 km bulk shear	20	15
CAPE = 60	0-3 km bulk shear	40	35
CIN = 10	0-6 km bulk shear	50	50
Lapse Rat	0-3 km directional shear	250	210
Lapse Rat	Max Tdd	10	12
Maximum	EL Storm Relative Flow	20	36
0-1 km Hel	Precipitable Water	1	0.81
0-1 km Bulk Shear = 20 kts		less than 20 kts - No enhanced chance of significant tornadoes.	
0-3 km Bulk Shear = 40 kts		20 - 40 kts - Bow echoes with greatest threats for damaging wind.	
0-6km Bulk Shear = 50 kts		greater than 40 kts - Supercells likely.	
DirectionShear = 250 degrees		Not a Northwest flow case.	
EL Storm Relative Flow = 20 kts		Weak storm relative winds, less than 35 kts, at the equilibrium level favor wind over hail.	
The Precipitable Water entered was 1 inches. For the month of July the entered precipitable water is 95% of normal. Less than 150% is less favorable for flooding.		Precipitable water greater than 150% of normal is associated with many flash flood events.	
The Soil Moisture was not entered		Nothing entered.	

The analog data page

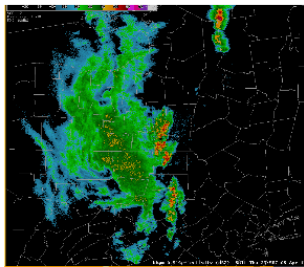
c)

April 8, 2010

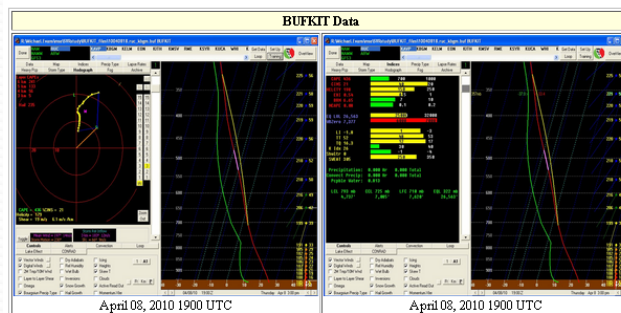
Synoptic Pattern: A cold front moved across the area from the west. A deep upper trough over the Great Lakes progressed slowly east.

A broken line of showers moved southwest to northeast across the area. The line was associated with weak reflectivity cores aloft and 88-D velocity values were not very strong, but the radar appeared to overshoot stronger velocities at the surface accompanying downbursts associated with dry air and steep low-level lapse rates. Numerous wind damage reports were received across the southern half of the forecast area.

Click on a image for a larger view...

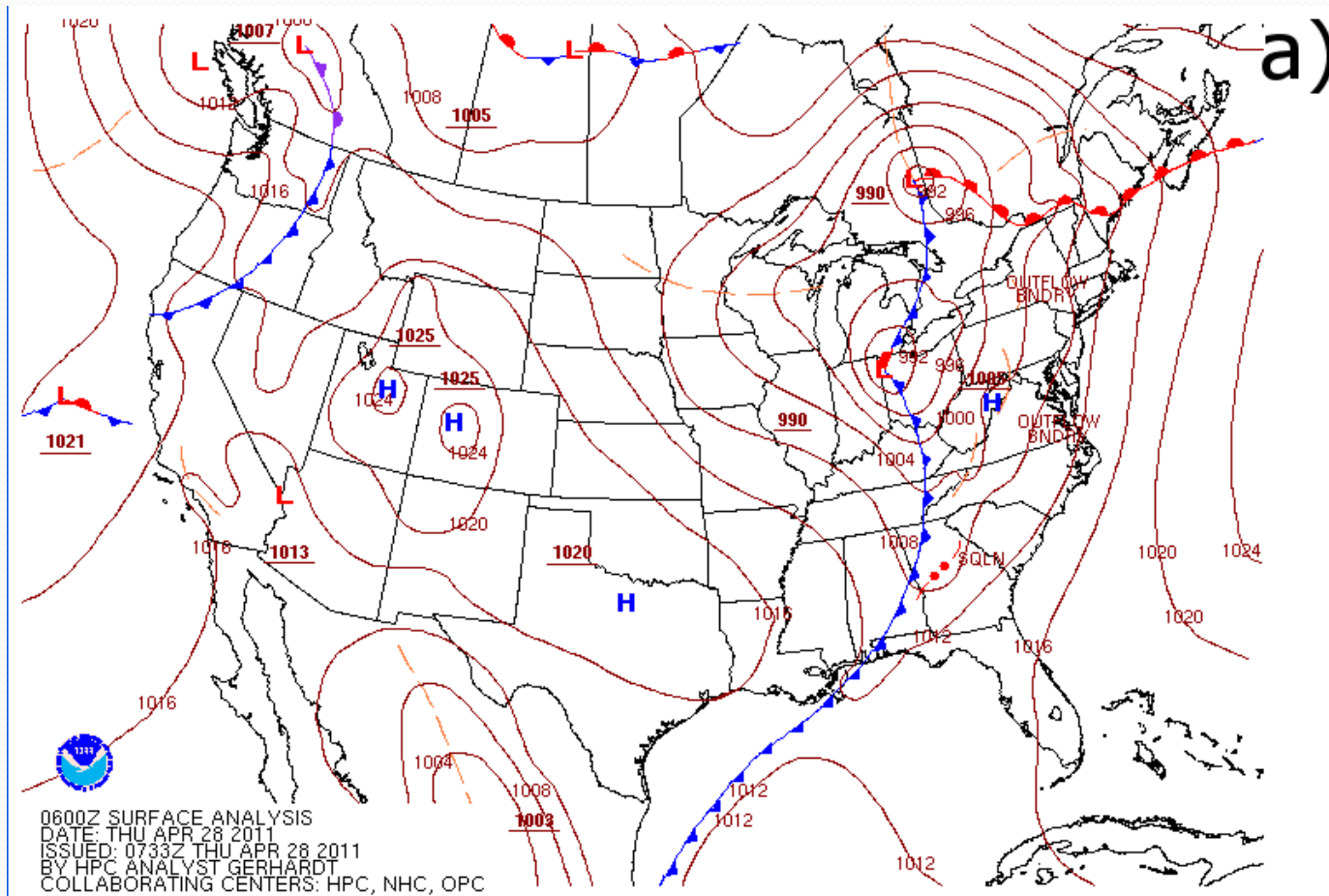


April 08, 2010 2100 UTC

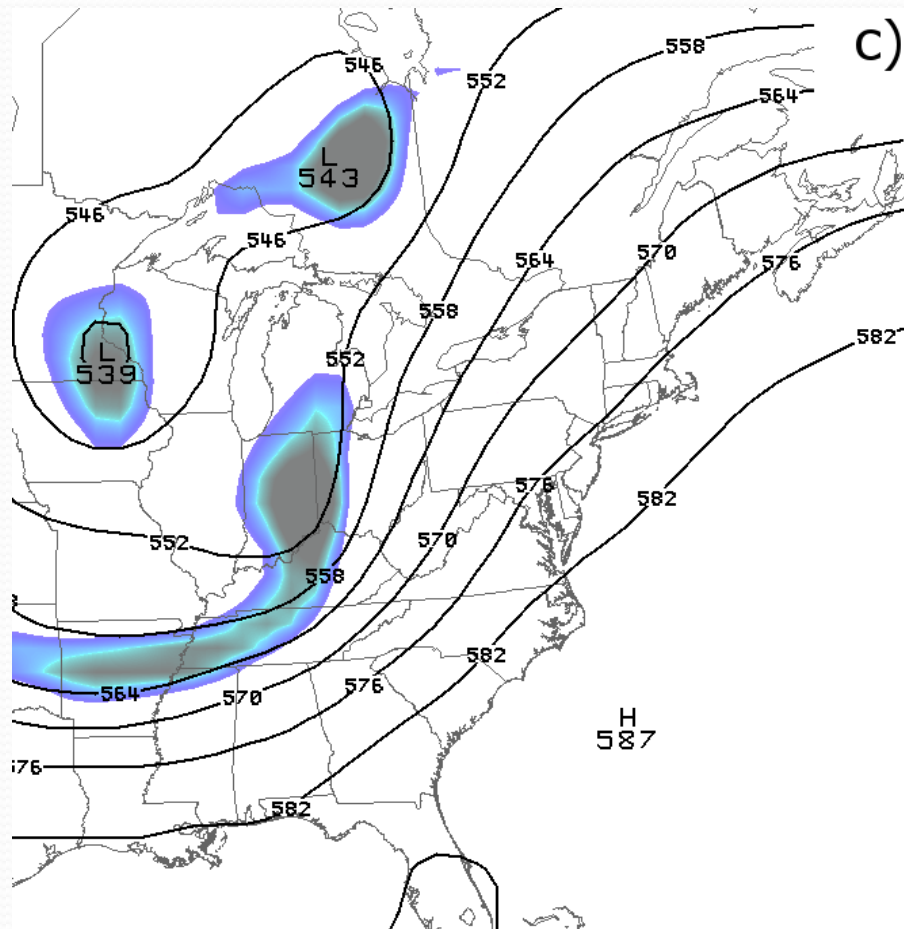


Last modified on: 04/17/2013 10:28:39

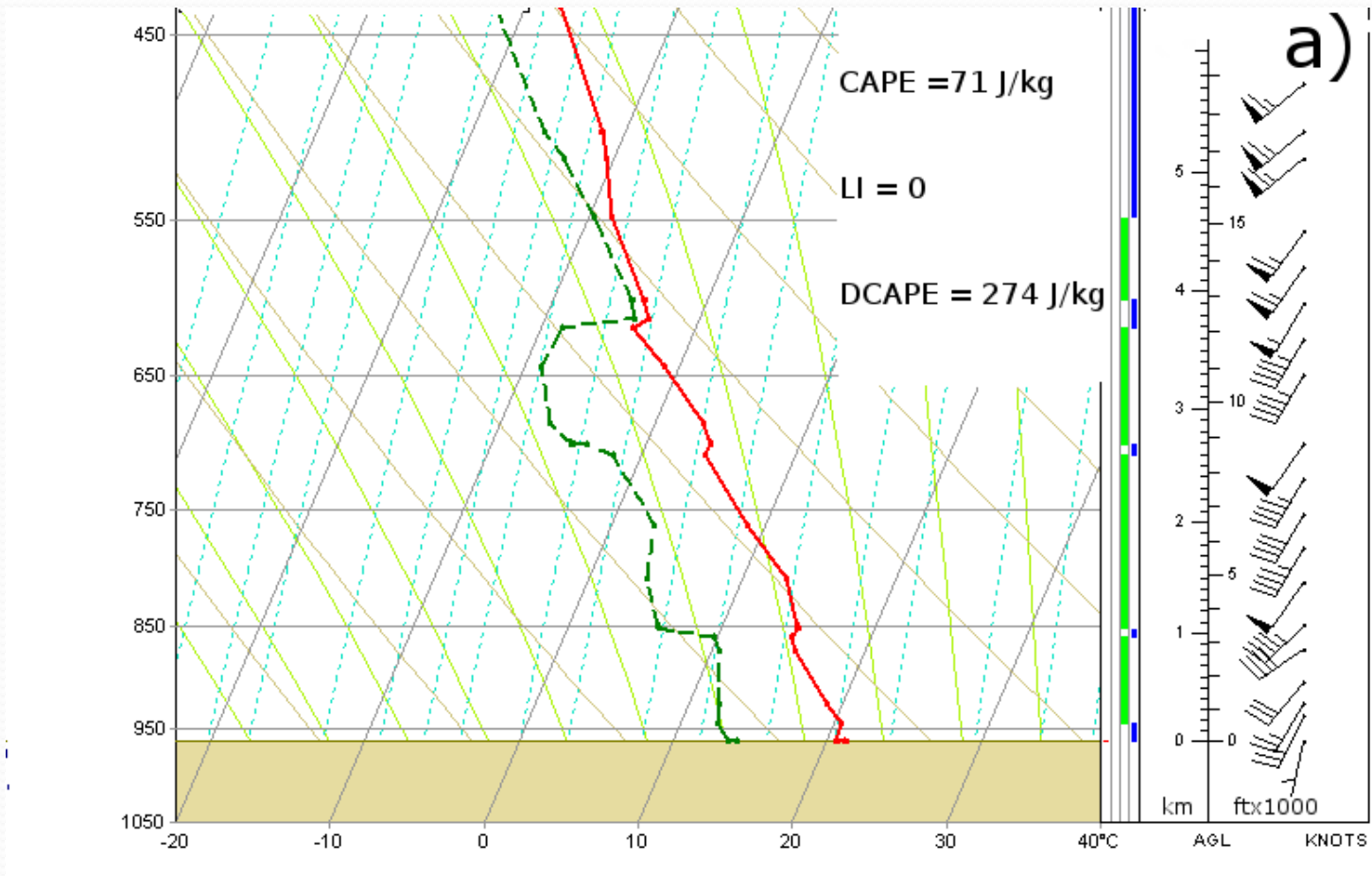
April 28, 2011



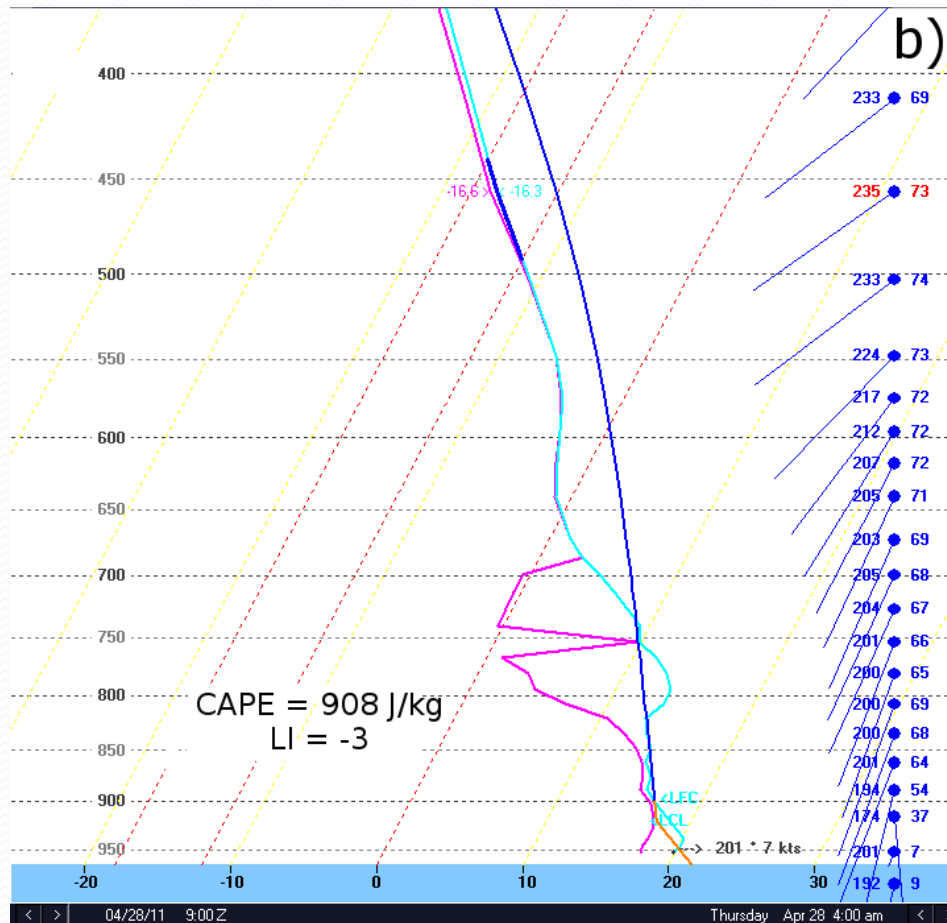
500 mb heights and vorticity



Pittsburgh sounding – 00z April 28



RAP forecast sounding – AVP – valid 08z April 28



Checklist for April 28



Move your mouse pointer over the question marks for popup information. The icon will change if there is more information available.

Parameters	Entry	References	Where to find?
Surface Weather Patterns =	Progressive Cold Front <input type="button" value="v"/>		
12 hour 500 mb height falls (m) = Values of falling heights should be positive.	<input type="text" value="50"/>		
Mixed Layer CAPE =	<input type="text" value="908"/>		
CIN =	<input type="text" value="0"/>		
Lapse Rate 950 to 700 mb (c/km) =	<input type="text" value="6.2"/>		
Lapse rate 700 to 500 mb (c/km) =	<input type="text" value="6.2"/>		
Maximum Dewpoint Depression from 700-500 mb (c) =	<input type="text" value="4"/>		
0-1 km Helicity =	<input type="text" value="428"/>		
0-1 km bulk shear (in knots) =	<input type="text" value="55"/>		
0-3 km bulk shear (in knots) =	<input type="text" value="60"/>		
0-6 km bulk shear (in knots) =	<input type="text" value="65"/>		
0-3 km directional shear vector (in degrees) =	<input type="text" value="200"/>		
EL storm relative flow (knots) =	<input type="text" value="38"/>		
Enter the Precipitable Water (inches)	<input type="text" value="1.53"/>		
Enter the Soil Moisture.	<input type="text" value="25"/>		

Analogs for April 28



a)

Completed at 18:29:21 CEST Fri Jul 12 2013

Events Most Similar

Move your mouse over the links to see how your numbers compare to a similar event. Click on a link to see the past event.


Event	Type	Hazard	Flash Flood Reports	Damaging Wind Reports	All Hail Reports	Hail 1" or greater	Tornado Reports
1. 5/31/1998	Isolated Supercells	historical severe	0	55	13	11	17
2. 5/4/2011	Broken Line	isolated wind	0	1	0	0	0
3. 5/16/2009	Isolated Supercells	hail / wind / tornadoes	0	6	5	1	3
4. 5/31/2008	Broken Line	Wind / Hail	0	7	13	2	0
5. 5/9/2009	Short Lines	hail / wind	0	3	3	1	0

Alert: Parameters are favorable for tornadic supercells!

Your Values

Entered Values	Reference information
Surface Weather Patterns = Progressive Cold Front	
12 Hour 500 mb Height Falls = 50 m	Moderate upper forcing.
CAPE = 908	500-1000 J/kg - Weakly unstable.
CIN = 0	Less than 10 - No significant inhibition.
Lapse Rate 950 to 700 mb (c/km) = 6.2 c/km	6.0 to 9.8 - conditionally unstable.
Lapse Rate 700 to 500 mb (c/km) = 6.2 c/km	6.0 to 9.8 - conditionally unstable.
Maximum Dewpoint Depression from 700-500 mb (ζ) = 4° C.	Less than 10 degrees C - Less potential for enhanced downdraft speeds.
0-1 km Helicity = 428	Above the threshold for a favorable tornado day. IT'S CLOBBERIN TIME!
0-1 km Bulk Shear = 55 kts	greater than 20 kts - Enhanced chance of significant tornadoes.
0-3 km Bulk Shear = 60 kts	40 kts - Bow echoes likely with strongest winds above the ground.
0-6km Bulk Shear = 65 kts	greater than 40 kts - Supercells likely.
DirectionShear = 200 degrees	Not a Northwest flow case.
EL Storm Relative Flow = 38 kts	Equal chances for wind and/or hail.
The Precipitable Water entered was 1.53 inches . For the month of July the entered precipitable water is 146% of normal. Less than 150% is less favorable for flooding.	Precipitable water greater than 150% of normal is associated with many flash flood events.
The Soil Moisture entered was .25 .	Values greater than 0.35 mean flooding is possible.

Table for the first analog



Severe Weather Checklist

b)

Completed at 18:29:21 CEST Fri Jul 12 2013

Events Most Similar

Move your mouse over the links to see how your numbers compare to a similar event. Click on a link to see the past event.

Event	Type	Hazard	Flash Flood Reports	Damaging Wind Reports	All Hail Reports	Hail 1" or greater	Tornado Reports
1. 5/31/1998	Isolated Supercells	historical severe	0	55	13	11	17
2. 5/4/2011	Similar day and your date.		0	1	0	0	0
3. 5/16/2009	Element	Your values	5/31/1998 values				
4. 5/31/2008	Surface Weather Patterns	1	0	6	5	1	3
5. 5/9/2009	12 Hour 500 mb Height Fall	50	0	7	13	2	0
Alert: Para	CAPE	908	0	3	3	1	0
Your Value	CIN	0					
Entered Val	Lapse Rate 950 to 700 mb	6.2					
Surface We	Lapse Rate 700 to 500 mb	6.2					
12 Hour 500	0-1 km Helicity	428					
CAPE = 908	0-1 km bulk shear	55					
CIN = 0	0-3 km bulk shear	60					
Lapse Rate	0-6 km bulk shear	65					
Lapse Rate	0-3 km directional shear	200					
Maximum D	Max Tdd	4					
0-1 km Heig	EL Storm Relative Flow	38					
	Precipitable Water	1.53					
0-1 km Bulk Shear = 55 kts		greater than 20 kts - Enhanced chance of significant tornados.					
0-3 km Bulk Shear = 60 kts		40 kts - Bow echoes likely with strongest winds above the ground.					
0-6km Bulk Shear = 65 kts		greater than 40 kts - Supercells likely.					
DirectionShear = 200 degrees		Not a Northwest flow case.					
EL Storm Relative Flow = 38 kts		Equal chances for wind and/or hail.					
The Precipitable Water entered was 1.53 inches. For the month of July the entered precipitable water is 146% of normal. Less than 150% is less favorable for flooding.		Precipitable water greater than 150% of normal is associated with many flash flood events.					
The Soil Moisture entered was .25.		Values greater than 0.35 mean flooding is possible.					

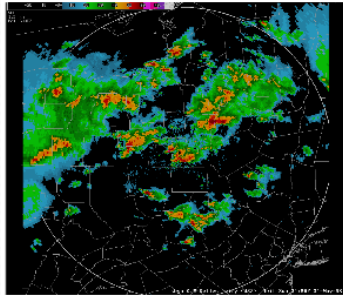
May 31, 1998

May 31, 1998

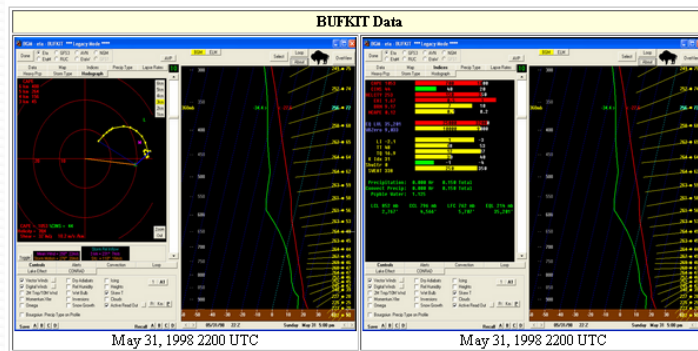
Synoptic Pattern: Strong cold front moved across the area with strong low-mid level winds and moderately strong height falls.

Massive, historical severe weather outbreak, with 17 tornadoes including 4 rated as F3. Over 50 damaging wind reports and several large hail reports of up to golf ball size.

Click on a image for a larger view...



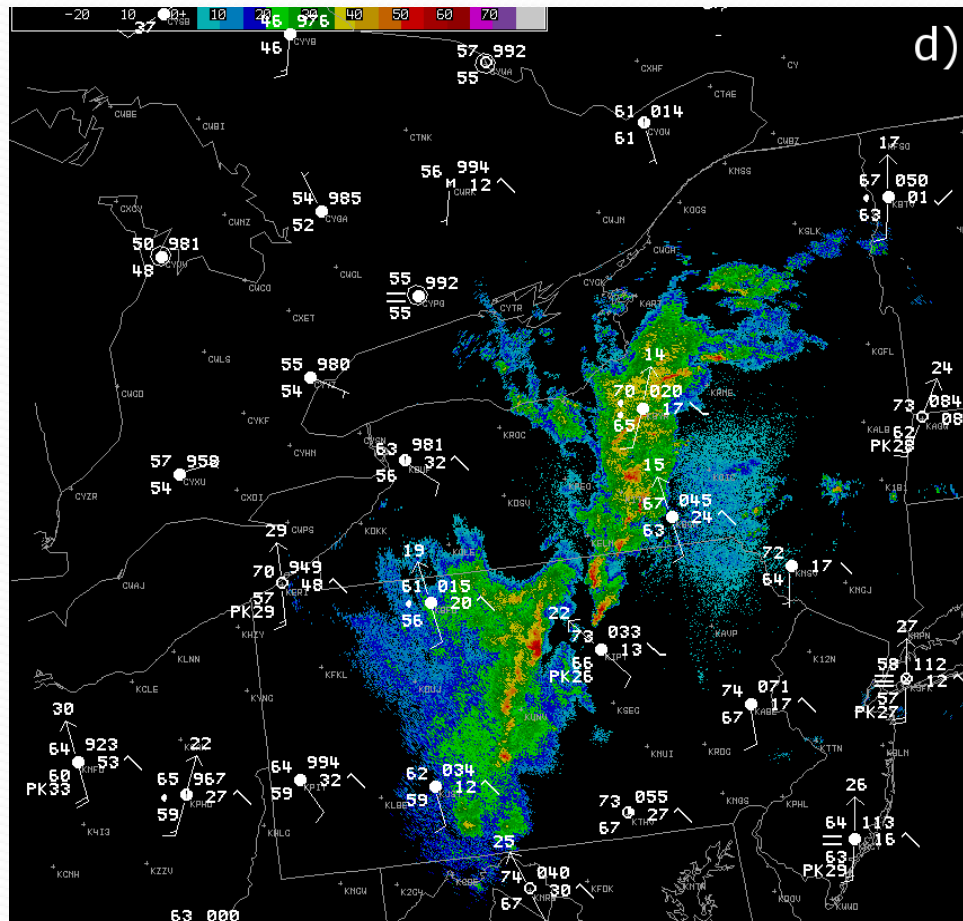
May 31, 1998 2100 UTC



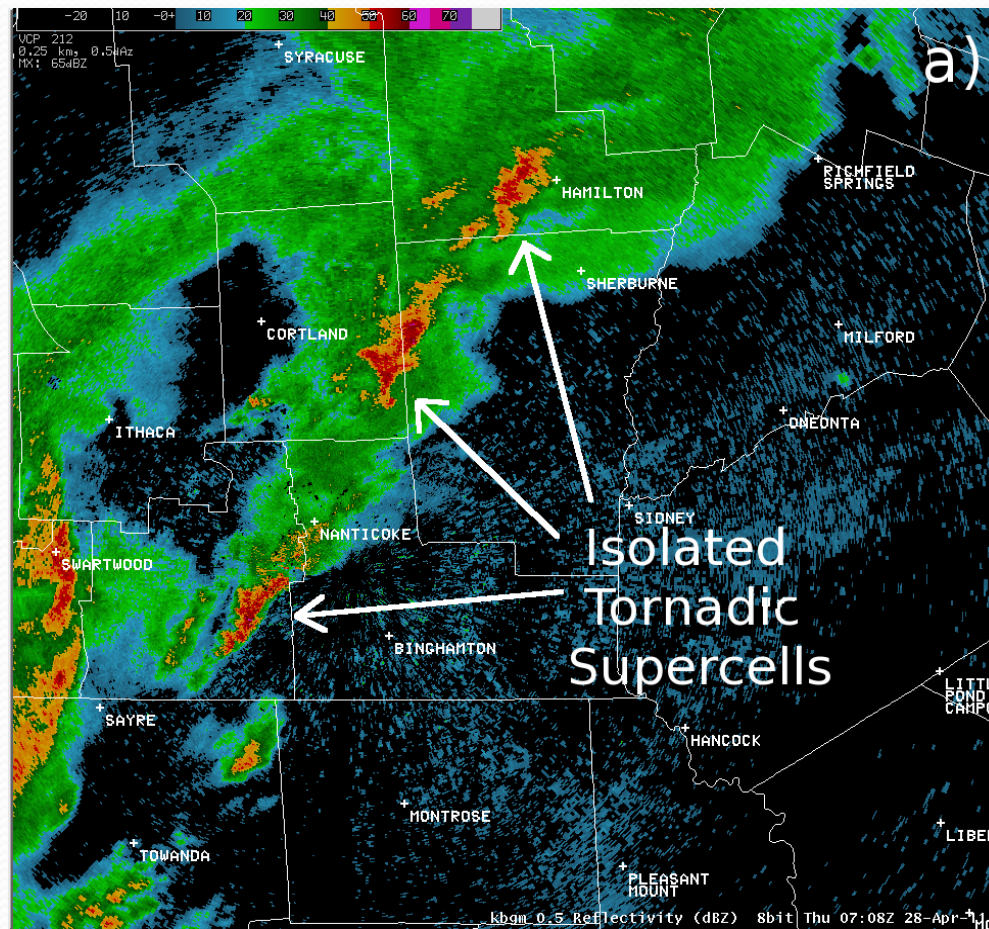
Last modified on: 06/04/2013 09:38:28

c)

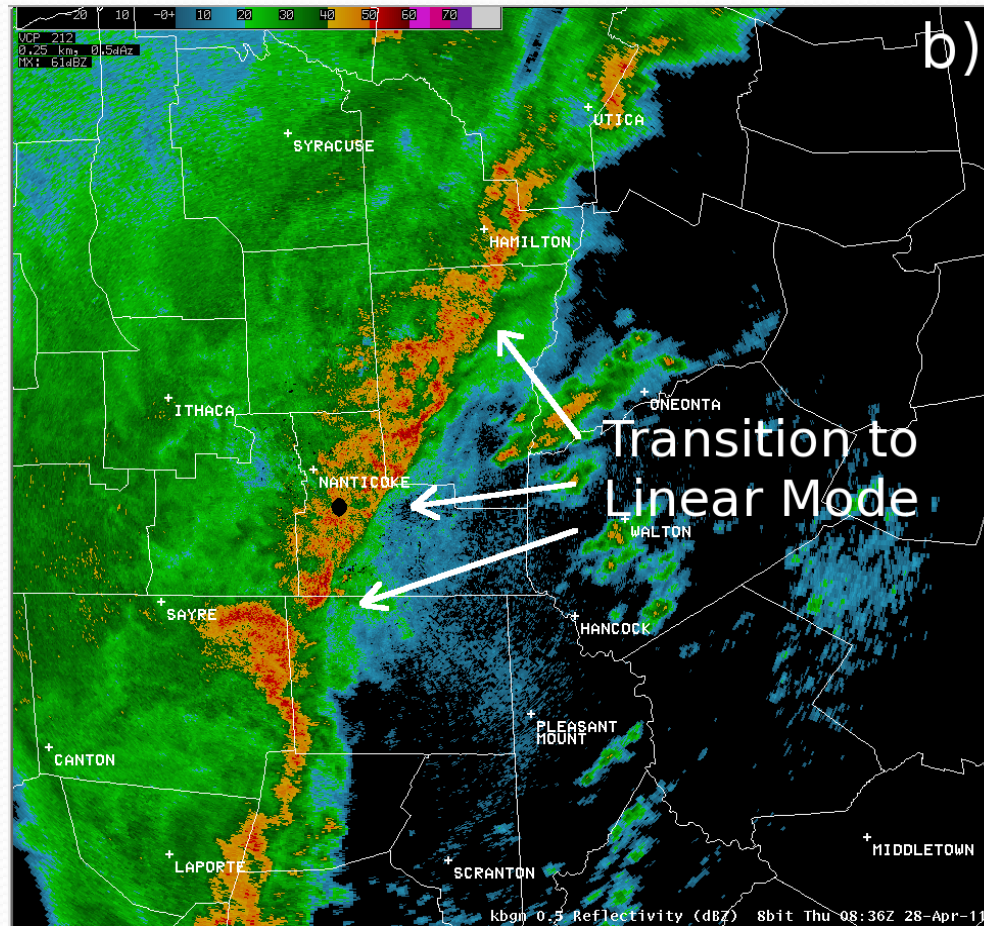
Radar



Radar – 0708z April 28, 2011



Radar – 0836z April 28





Verification Study

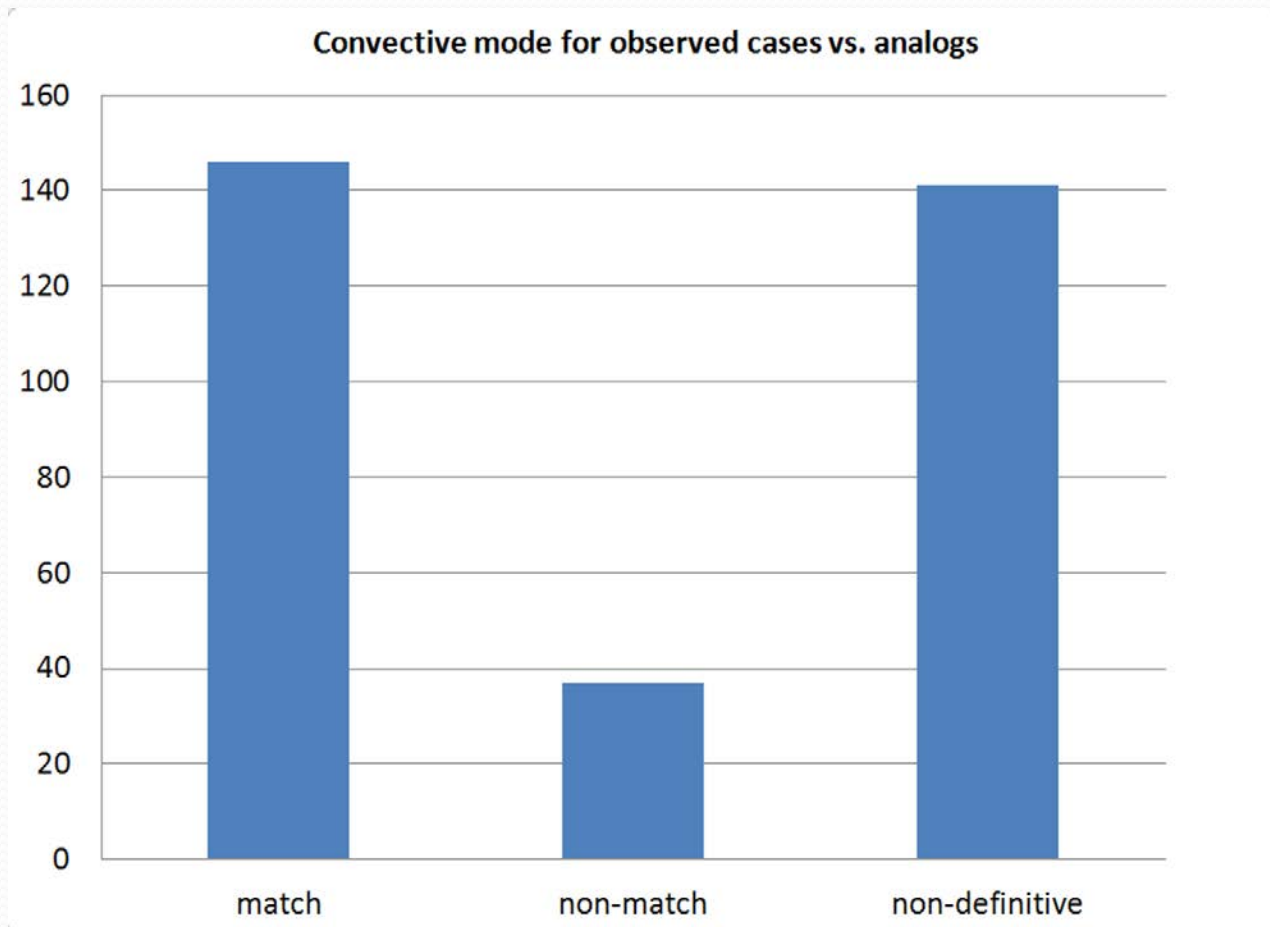
- Run the checklist for 81 cases from 2011-2013
- Examine characteristics of the top 4 analogs for each test case
- Convective mode
- Identification of major vs. null events



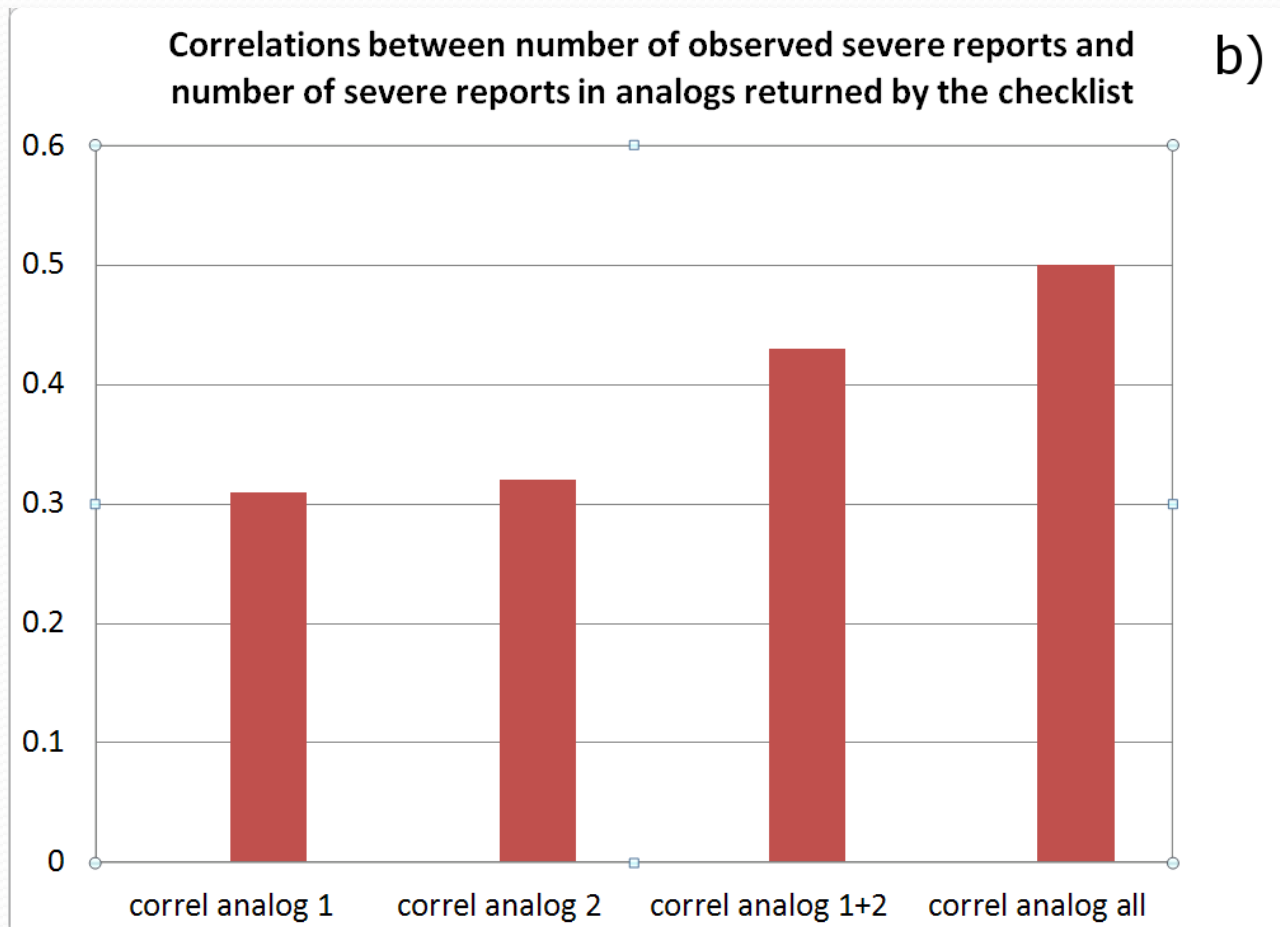
Convective mode test – compare test event to corresponding analog

- Assign categories to all test events and analogs – linear (solid, broken, short), isolated, multi-cell cluster
- Match – linear with linear, isolated with isolated
- Non-match – isolated with solid or broken line
- Non-definitive – all others

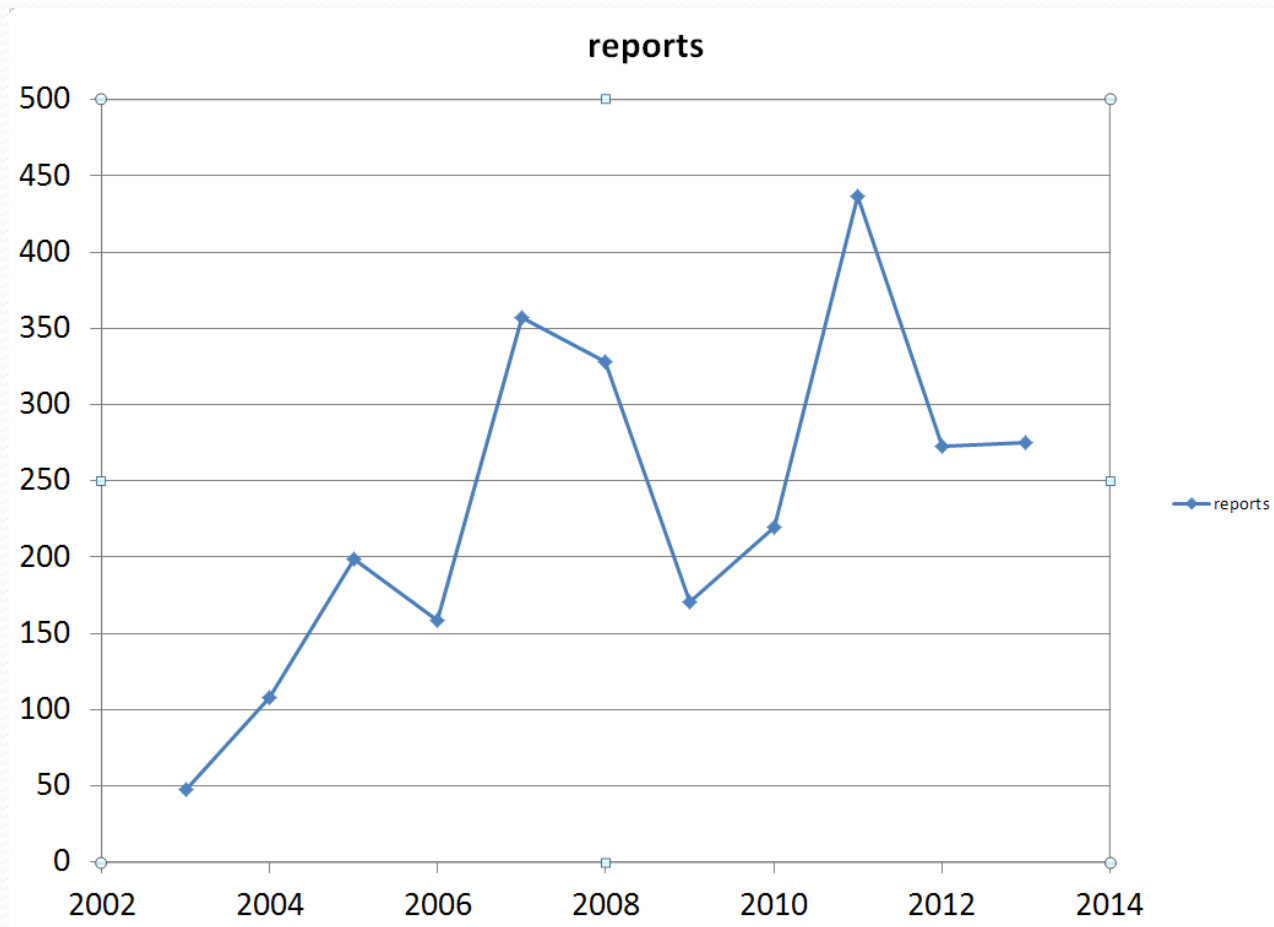
Convective mode



Correlations



Report trends

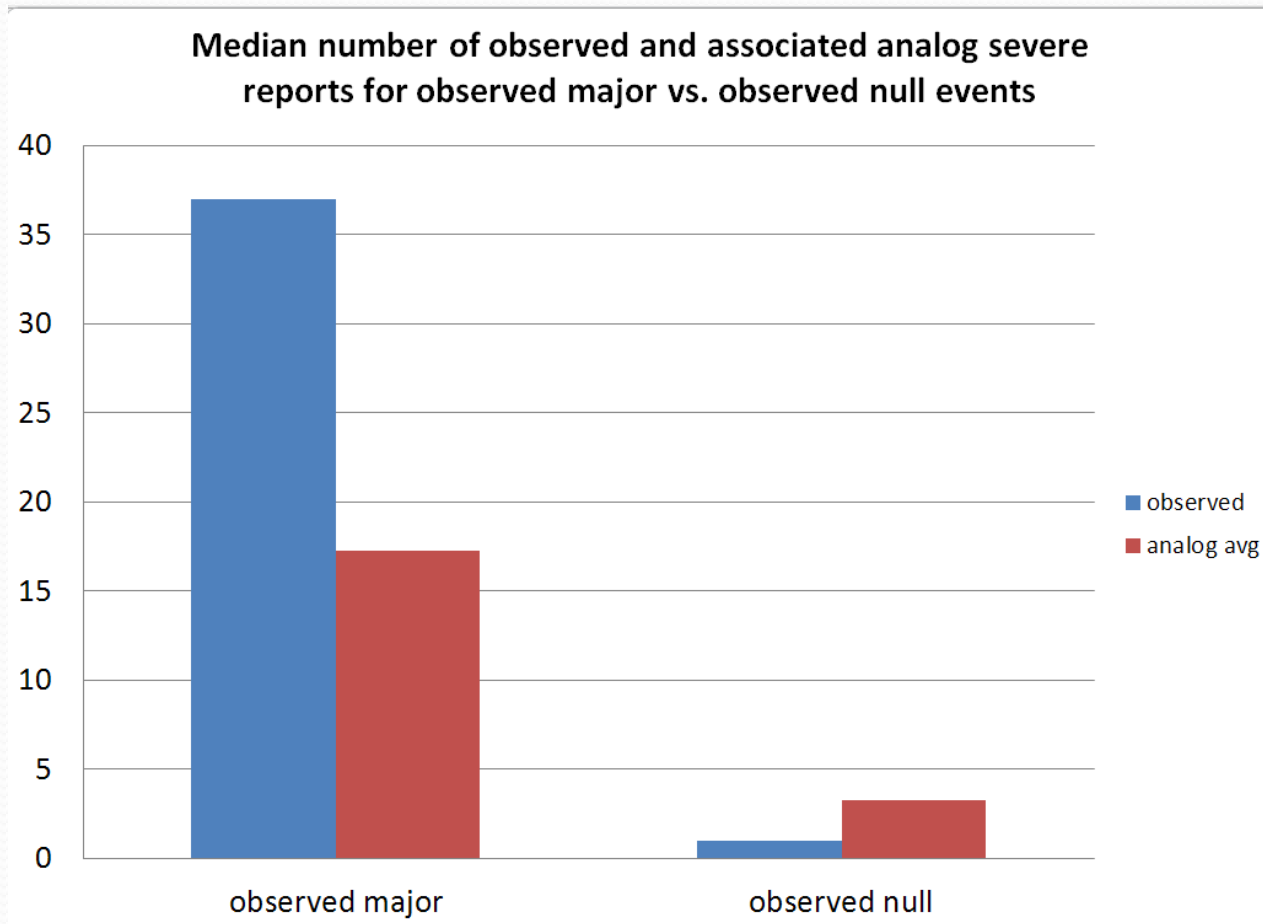




Definitions...

- Observed major event – any test case with at least 30 severe weather reports (11 events).
- Observed null event – any test case with one or fewer severe reports (23 events).

Observed major vs. observed null events

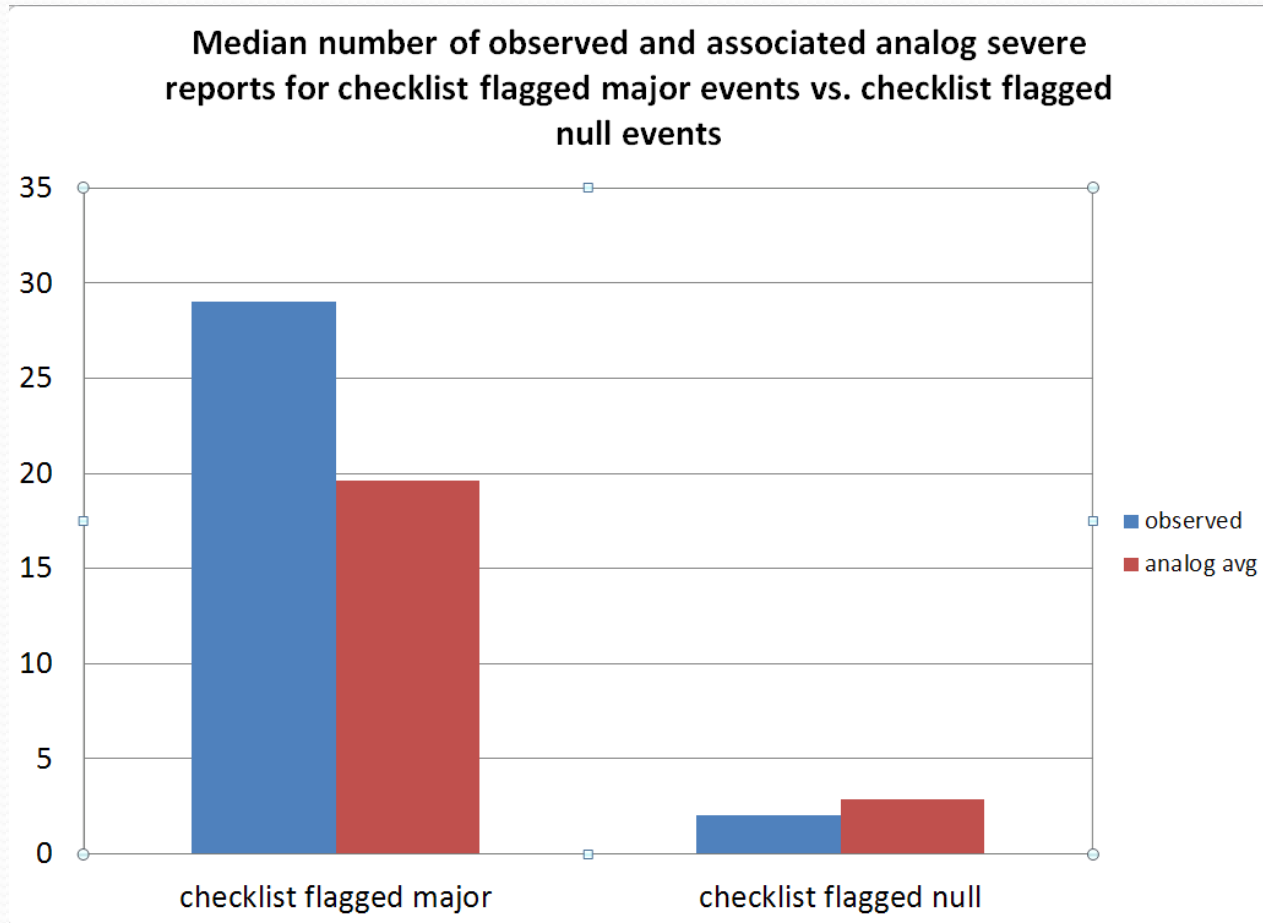




Definitions...

- Checklist flagged major event – any event when the analog-average number of reports was greater than or equal to 15.
- Checklist flagged null event – any event when the analog-average number of reports was less than 5.

Checklist major vs. checklist null events



Summary

- The BGM severe weather checklist helps forecasters assess the convective environment.
- The analog finder helps forecasters compare current events with similar historical events.
- Verification of the analog finder indicates that it can help to distinguish between major and minor events.
- Additional results (not shown) indicate some skill with identification of tornadoes, flash floods, and hail vs. wind dominance.