


“We Had No Warning”

An Overview of Available Forecast Products Before and During Severe Weather Events



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Two main sources for severe weather info

- ✦ NOAA/NWS Storm Prediction Center (SPC)
 - ✦ Convective Outlooks
 - ✦ Mesoscale Discussions
 - ✦ Severe Thunderstorm and Tornado Watches
 - ✦ On the Web: <http://www.spc.noaa.gov>
- ✦ NOAA/National Weather Service (NWS) Forecast Offices
 - ✦ Severe Thunderstorm and Tornado Warnings
 - ✦ Information via NOAA Weather Radio
 - ✦ On the Web: <http://www.weather.gov>

Note: There are many sources for severe weather information, but these entities are solely responsible for issuing their respective products.

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Tornado in Miami, FL




Photo: Miami Herald

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What is SPC’s Responsibility?


- ✦ Forecast severe storms across the 48 contiguous states
 - ✦ Tornadoes
 - ✦ Hail 1" diameter or larger
 - ✦ Thunderstorm winds > 58 m.p.h.
- ✦ Also monitor for:
 - ✦ Heavy rain
 - ✦ Winter Weather
 - ✦ Conditions favorable for wildfire initiation



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SPC Products


- ✦ Severe Weather Outlooks
 - ✦ Day 1 (today)
 - ✦ Day 2 (tomorrow)
 - ✦ Day 3 (day after tomorrow)
 - ✦ Day 4–8
- ✦ Severe Weather Watches
 - ✦ Tornado
 - ✦ Severe Thunderstorm



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More SPC Products

- ✦ Mesoscale Discussions
- ✦ Watch Status Messages
- ✦ Severe Weather Statistics
- ✦ Fire Weather Outlooks
 - ✦ Day 1 (today)
 - ✦ Day 2 (tomorrow)
 - ✦ Day 3–8



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Severe Weather Outlooks



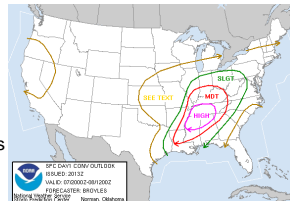
March 28, 2001 Fort Worth Tornado

- ☛ **Categorical**
 - ☛ Slight
 - ☛ Moderate
 - ☛ High
- ☛ **Probabilistic**
 - ☛ Tornadoes
 - ☛ Hail
 - ☛ Convective Winds

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Categorical Outlooks

- ☛ **Slight (SLGT)**
 - ☛ 5–20 Severe Hail Events
 - ☛ 5–20 Severe Wind Events
 - ☛ 2–5 Tornadoes
- ☛ **Moderate (MDT)**
 - ☛ 20–50 Severe Hail Events
 - ☛ 20–50 Severe Wind Events
 - ☛ 6–19 Tornadoes
- ☛ **High**
 - ☛ > 19 Tornadoes with 2+ potentially producing EF3–EF5 damage
 - ☛ Derecho – producing extreme wind damage (> 50 reports)



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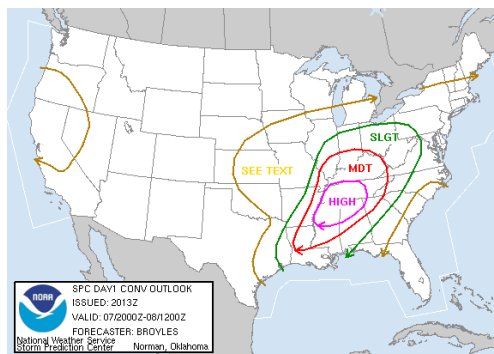
Probability Outlooks



- ☛ Provide the threat of severe weather occurring within 25 miles of any point within the area
 - ☛ Tornadoes
 - ☛ Large hail
 - ☛ Severe convective winds
- ☛ Also provide threat for extreme severe

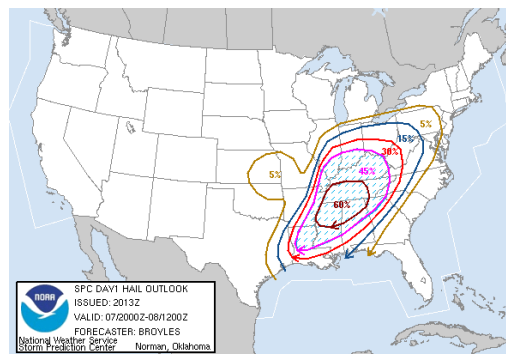
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April 7, 2006 Categorical Outlook



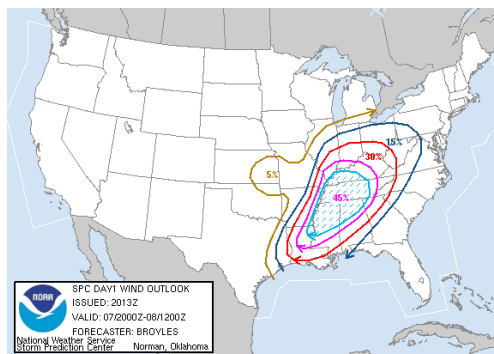
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April 7, 2006 Hail Probabilities



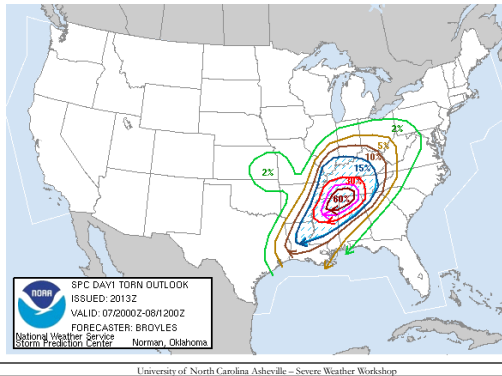
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April 7, 2006 Wind Probabilities

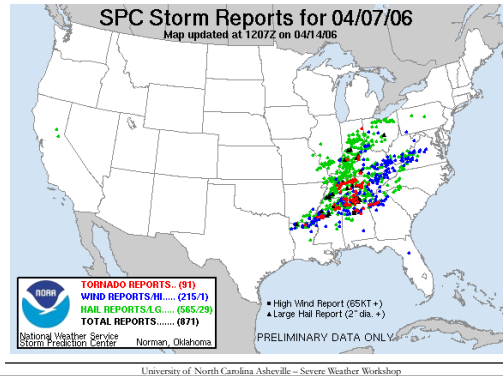


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April 7, 2006 Tornado Probabilities



April 7, 2006 Storm Reports



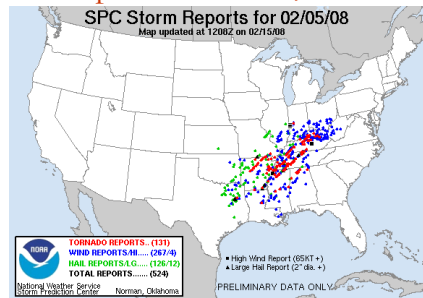
Day 4-8 Severe Outlook



A severe weather area depicted in the Day 4-8 period indicates a 30% or higher probability for severe thunderstorms within 25 miles of any point.

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Storm Reports on Feb 5, 2008



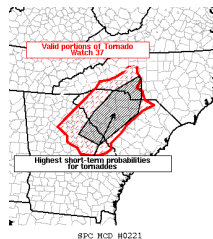
SPC made a great forecast six days in advance!

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Mesoscale Discussions:

Technical discussions of developing mesoscale features and their impact on hazardous weather

- What, when, where, why
- Emphasis on the short term outlook
 - Written in plain language
 - Geared for professional meteorologists
- Winter weather
 - Freezing rain, rapidly accumulating snow, blizzards
- Heavy rainfall
- Severe thunderstorm potential/Outlook upgrade
 - 1-2 hours prior to a watch
 - 2-3 hour cycle during watch
 - Change in convective outlook category
- Thunderstorms not expected to become severe



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Weather Watches

- Issued when the risk of a hazardous weather or hydrologic event has increased significantly but its **occurrence, location, and/or timing is still uncertain.**
- A watch is intended to provide enough lead time so that those who need to set their plans in motion can do so (e.g., emergency managers, television meteorologists, spotters, schools, anyone planning outdoor activities, etc.).

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Tornado Watches

- ↻ Issued when strong/violent tornado (EF2–EF5) damage is possible
- ↻ Multiple weak tornadoes are possible
- ↻ Not all tornadoes will occur within a watch!



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“Particularly Dangerous Situation” Watches

- ↻ **PDS Tornado watches**
 - ↻ Multiple strong or violent (EF2–EF5 damage) events
- ↻ **PDS Severe Thunderstorm Watches**
 - ↻ Long-lived wind systems with possible widespread damage (derechoes)



May 3, 1999 Moore, Oklahoma Tornado

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ZCZC MKCSEL9 ALL 250500;365,0980 321,0985 321,1013 365,1004;
 WWJUS9 KMKC 242144
 MKC WW 242144
 OKZ000-TXZ000-250500-

URGENT - IMMEDIATE BROADCAST REQUESTED
 TORNADO WATCH NUMBER 49
 STORM PREDICTION CENTER NORMAN OK
 344 PM CST THU FEB 24 2000

THE STORM PREDICTION CENTER HAS ISSUED A
 TORNADO WATCH FOR PORTIONS OF

WESTERN OKLAHOMA
 NORTHWESTERN TEXAS

EFFECTIVE THIS THURSDAY AFTERNOON AND EVENING FROM 430 PM UNTIL
 1100 PM CST.

...THIS IS A PARTICULARLY DANGEROUS SITUATION...

DESTRUCTIVE TORNADOES...LARGE HAIL TO 2 INCHES IN DIAMETER...
 THUNDERSTORM WIND GUSTS TO 70 MPH...AND DANGEROUS LIGHTNING ARE
 POSSIBLE IN THESE AREAS.

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Severe Thunderstorm Watch

- ↻ Organized severe storms
 - ↻ Supercells
 - ↻ Squall lines
 - ↻ Multicell complexes
- ↻ Extreme severe storms
 - ↻ Wind gusts \geq 65 kt (75 m.p.h.)
 - ↻ Damage to permanent structures
 - ↻ Hail $>$ 2" diameter

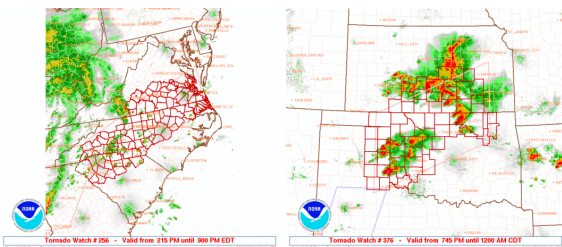


(c) 1999 Keith B. Brown

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Watch By County

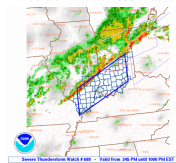
- ↻ Watch area is based on individual counties



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Watch Probabilities

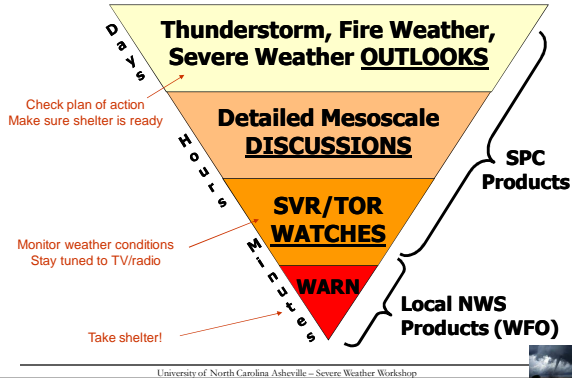
Severe Thunderstorm Watch 688 Probability Table



Tornadoes	
Probability of 2 or more tornadoes	Low (10%)
Probability of 1 or more strong (F2-F4) tornadoes	Low (<5%)
Wind	
Probability of 10 or more severe wind events	Mod (60%)
Probability of 1 or more wind event $>$ 65 knots	Low (10%)
Hail	
Probability of 10 or more severe hail events	Low (10%)
Probability of 1 or more hailstones $>$ 2 inches	Low (<5%)
Combined Severe Hail/Wind	
Probability of 6 or more combined severe wind/hail events	Mod (60%)

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The Watch/Warning Funnel Concept



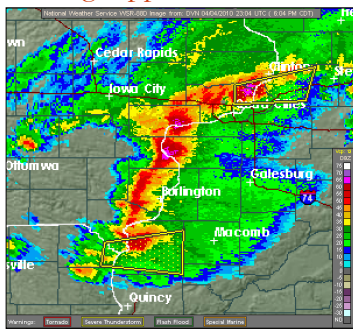
Weather Warnings

- ✦ Issued when a hazardous weather or hydrologic event **is occurring, is imminent, or has a very high probability of occurring.**
- ✦ A warning is used for conditions posing a threat to life or property.
- ✦ Warnings are issued by a local NOAA/ National Weather Service Forecast Office*

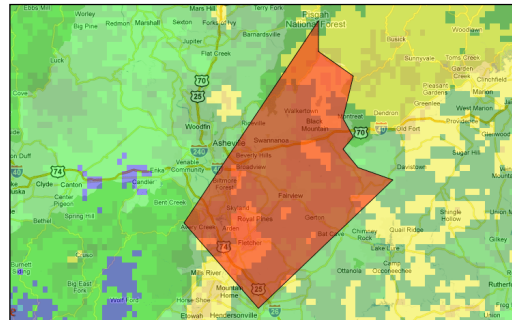
*Exception: Hurricane warnings are issued by the NOAA/National Hurricane Center

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Severe thunderstorm, tornado, and flash flood warnings appear on NWS radar images



Tornadoes can happen in the mountains...



Tornado warning for Buncombe and Henderson Counties, 24 January 2010

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What is the best way to receive warnings?

- ✦ NOAA Weather Radio is the best means to receive warnings from the National Weather Service



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How do people receive, interpret, and respond to severe weather warnings?

- ✦ UNCA and National Weather Service study on convective warning utilization
 - ✦ 1 May – 15 September 2010
 - ✦ <http://www.warningstudy.org>



Photo: Jim LaDus

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