
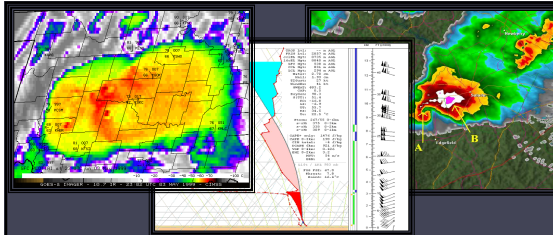


## TIPS TO SELF-FORECASTING SEVERE WEATHER & SEVERE WEATHER COMMUNICATION



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Gerald Satterwhite: Junior Undergrad, UNCA

## TIPS FOR FORECASTING SEVERE WEATHER



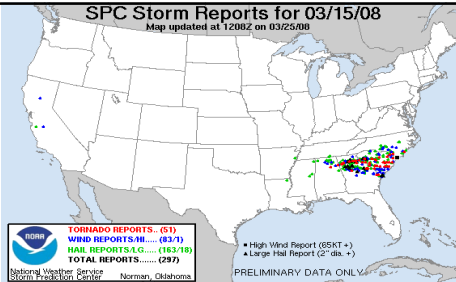
Philippe Papin

### Overview

- March 15<sup>th</sup> 2008 Major Tornado Outbreak over the southeast will be analyzed
- Upper Air Maps/Soundings
  - Used to depict favorable pattern for severe weather
    - Jet Streaks, Troughs, Wind Shear
- Satellite
  - Can identify features that indicate potential severe thunderstorms
- Radar
  - More detailed data can indicate imminent tornado formation

### SPC Storm Reports for 03/15/08

Map updated at 1200Z on 03/25/08



● TORNADO REPORTS: (51)  
● WIND REPORTS: (83/1)  
● HAIL REPORTS: (163/18)  
 TOTAL REPORTS: (297)

▲ High Wind Report (65KT +)  
▲ Large Hail Report (2" dia. +)

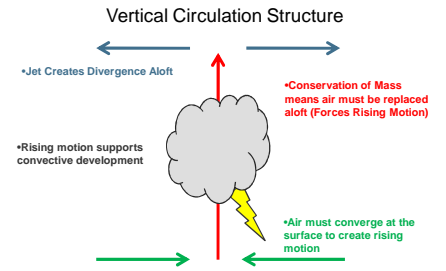
PRELIMINARY DATA ONLY

National Weather Service Storm Prediction Center Norman, Oklahoma

### Overview of March 15<sup>th</sup>, 2008 Event

- One of the biggest severe weather outbreaks in the Southeast in 2008
- 39 tornadoes confirmed (more reports due to duplicates)
- High Risk Area Issued by Storm Prediction Center (SPC) for 30% hatched tornadoes

### Vertical Circulation Structure

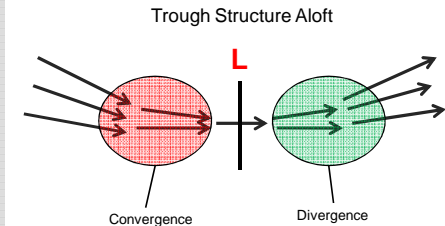


- Jet Creates Divergence Aloft
- Conservation of Mass means air must be replaced aloft (Forces Rising Motion)
- Rising motion supports convective development
- Air must converge at the surface to create rising motion

### Jet Streaks - Forecasting Severe Weather

- Jet Streaks (wind maxima within a jet) can help create proper ventilation of severe thunderstorms through divergence aloft, and convergence at the surface
- Best regions to be on the jet stream are in right entrance, and left exit

### Trough Structure Aloft



### Troughs - Forecasting Severe Weather

- Once again looking for divergence aloft for best ventilation for storm formation
- Wind converges near trough axis, and diverges as it leaves area of trough
- Most severe weather occurs out ahead of trough due to the divergence

**Speed Wind Shear – All in one direction but different magnitude with height**

**Directional Wind Shear – Change in wind direction with height**

**Wind Shear – Forecasting Severe Weather**

- Wind speeds tend to increase with height
- Both speed and directional wind shear can aid in severe thunderstorm production

**Wind Shear – Forecasting Severe Weather**

- Typically, veering winds promote warm air advection, while backing winds promote cold air advection
- Generally warm moist air advection in the low levels are needed for deep convective development, so veering winds are favorable for severe weather
- Also help promote mid level circulation in storms (mesocyclone).

**Upper Air Maps – 12z March 15<sup>th</sup>, 2008**

- Strong Divergence at 300mb over southeast, which evidence of dual jet structure.
- Weak trough at 500mb is more potent at 700mb and closed off at 850mb and 925mb
- Closed off features closer to the surface allow for veering winds with height, favorable directional shear for severe weather.

**Upper Air Maps – 00z March 16<sup>th</sup>, 2008**

- Obvious strong divergence at 300mb (notice how the winds diverge near SC)
- Once again trough gets more defined and cutoff as you progress downward in the atmosphere

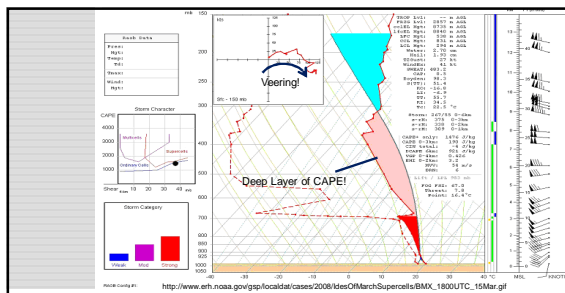
CAPE = 4278  
CIN = -1.52  
K Index = 34.100  
LI = -6.89  
Showalter = -5.3  
LCL = 639 mb  
LFC = 806 mb  
EL = 1844 mb  
TPW = 2.83 cm

**Upper Air Sounding - Forecasting Severe Weather**

- Skew T log P Diagram used for most upper air soundings
- Large CAPE (Convective Available Potential Energy) is favorable for storm formation.
- Some modest CIN (Convective Inhibition) is needed to "cap" the atmosphere in the morning and early afternoon

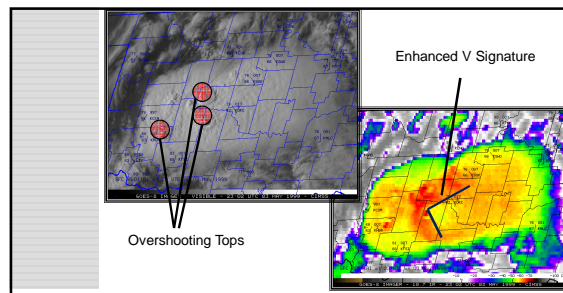
**Hodograph - Forecasting Severe Weather**

- Often associated with upper air sounding, can help show wind shear pattern of the atmosphere
- Graph goes by U and V components of wind, meaning a negative U wind is easterly while a negative V wind is northerly
- This particular graph shows veering winds (notice how the wind goes clockwise, with



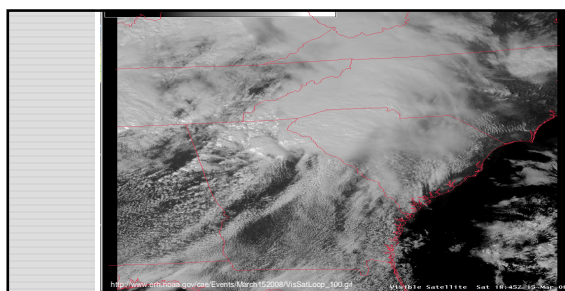
**Upper Air Sounding – 18z March 15<sup>th</sup>, 2008**

-Notice the deep layer of CAPE  
 -Hodograph shows speed and directional shear in a veering direction, once again favorable for severe thunderstorms



**Satellite - Forecasting Severe Weather**

-Overshooting Tops – Indication of very powerful updraft (often seen in severe thunderstorms)  
 -Inferred Satellite presentation might show a V of colder cloud tops in the wake of where the overshooting top has occurred  
 - Called Enhanced V signature, may indicate the onset of a severe thunderstorm



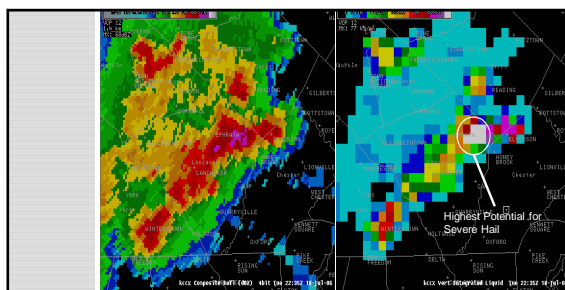
**Visible Satellite – March 15<sup>th</sup>, 2008**

-Each letter corresponds to a particular storm that produced a tornado  
 - Notice that most of these storms were associated with an overshooting top  
 -Wind direction differences indicated by cloud motions



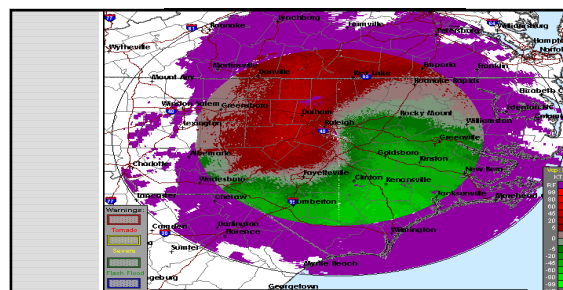
**Radar - Forecasting Severe Weather**

-Radar can be used for more immediate detection of severe weather  
 -Three phenomena that can be picked up on radar  
 - Hail, Damaging Winds, Tornadoes



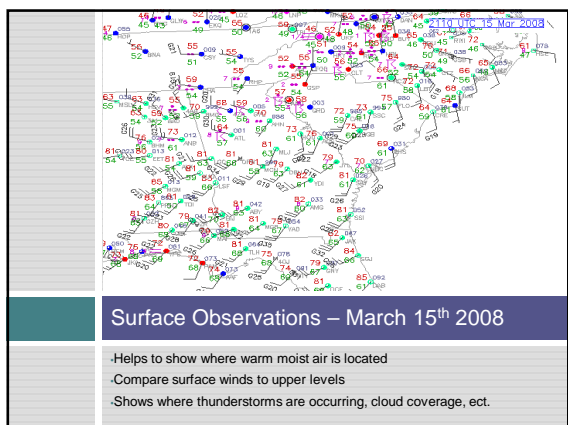
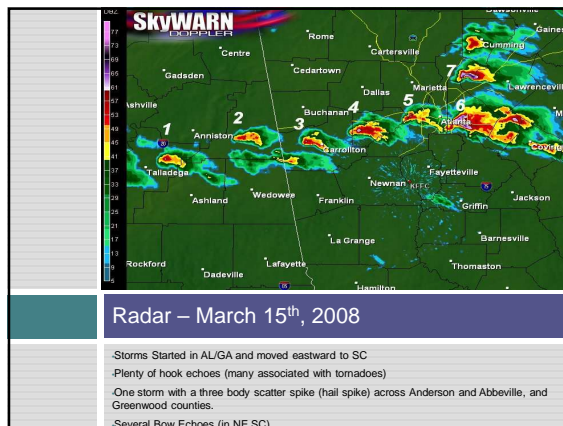
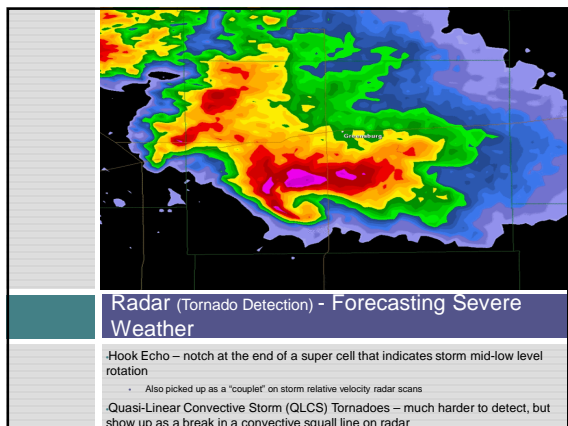
**Radar (Hail Detection) - Forecasting Severe Weather**

-Vertically Integrated Liquid (VIL) – Used primarily to indicate hail production  
 -Three Body Scatter Spike (or Hail Spike) – Light reflectivity shoots off out of a strong thunderstorm – indicates large hail



**Radar (Wind Detection) - Forecasting Severe Weather**

-Doppler Radars allow wind speed and direction detection  
 -Bow Echo Signatures – Bow in a line of severe storms – Straight line wind damage production  
 - Can occasionally produce tornadoes



### Event and Forecasting Conclusions

- The March 15<sup>th</sup>, 2008 severe weather outbreak was unusually large for the southeast
  - Supercells dominant storm type, a bit atypical for this region
- Severe weather forecasting tools were useful in this event
  - Upper Air Charts/Soundings, Satellite, Radar, Surface Obs.

**But What Online Resources Are Available To Track Severe Weather??**


## Severe Weather Communication

Wx software for at-home storm tracking

**GR Level 3 – Image Captures**  
 Examples of GR applications



**GR Level 3**  
<http://www.grlevelx.com/>



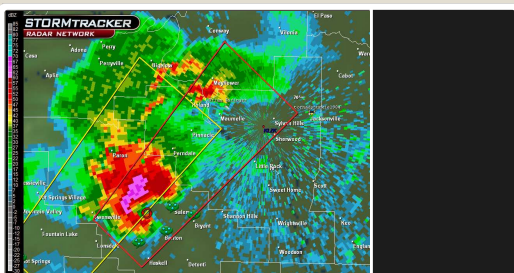
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<http://www.grlevelx.com/>



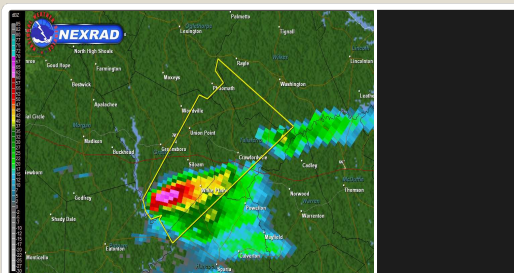
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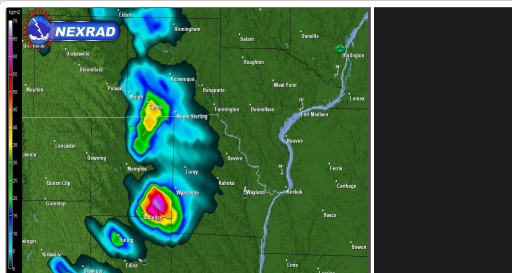
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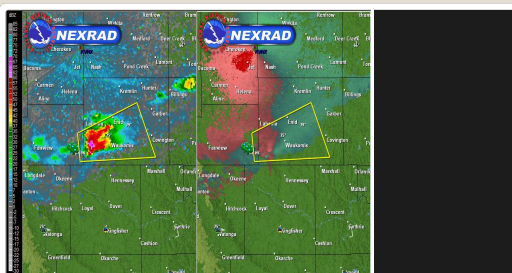
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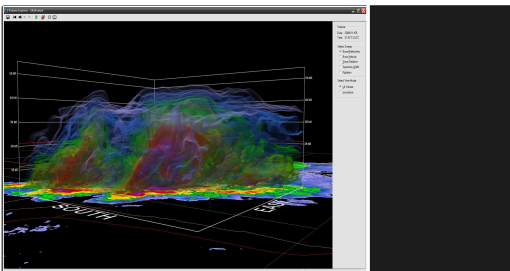
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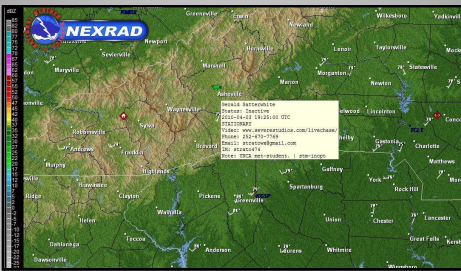
**GR Level 2 Analyst**  
<http://www.grlevelx.com/>




**LIVE streaming**  
Dashboard cams show weather as it happens



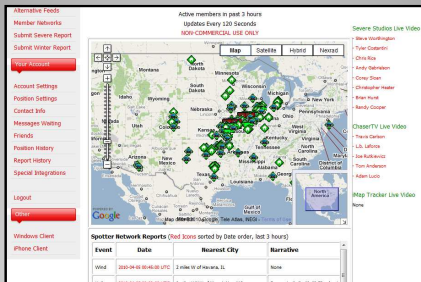
**LIVE chase cams**  
[chasertv.com](http://chasertv.com) | [severestudios.com](http://severestudios.com)



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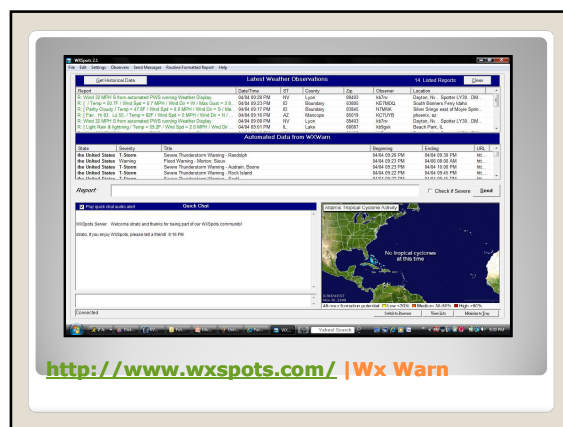
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**spotternetwork.org**



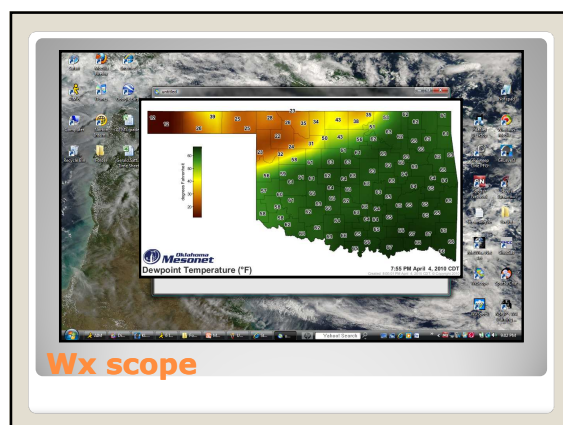
[spotternetwork.org](http://spotternetwork.org) | client



<http://www.wxspots.com/> | Wx Warn



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Wx scope

Sources/Links to Photos in Presentation

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- [http://www.erh.noaa.gov/ftp/features/2006/07\\_18/images/lancaster\\_vt.gif](http://www.erh.noaa.gov/ftp/features/2006/07_18/images/lancaster_vt.gif)
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- <http://www.spc.noaa.gov/misc/AbdDerechos/loopimages/jul151999/ops/jul151999sabf.gif>
- [http://1.bp.blogspot.com/\\_ESzWn4goorRj/FEtoYW8IAAAAAAABIAqSxmiCwhC\\_4s400/7Z3px-Greensburg\\_Tornado\\_Radar.gif](http://1.bp.blogspot.com/_ESzWn4goorRj/FEtoYW8IAAAAAAABIAqSxmiCwhC_4s400/7Z3px-Greensburg_Tornado_Radar.gif)
- [http://3.bp.blogspot.com/\\_ESzWn4goorRj/FEtoYW8IAAAAAAABIAqSxmiCwhC\\_4s400/7Z3px-GREENSBURG.gif](http://3.bp.blogspot.com/_ESzWn4goorRj/FEtoYW8IAAAAAAABIAqSxmiCwhC_4s400/7Z3px-GREENSBURG.gif)
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