
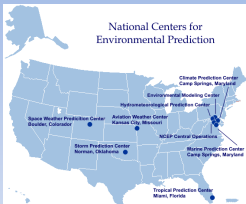


## Severe Weather Forecasting: A Western North Carolina Case Study

Laurence G. Lee  
 Science and Operations Officer  
 National Weather Service  
 Greer, SC

## National Weather Service

Plus...

- 13 River Forecast Centers
- 22 Center Weather Service Units at FAA Air Route Traffic Control Centers
- Spaceflight Meteorology Group – Houston, TX
- FAA Academy – Oklahoma City, OK

### WFO GREENVILLE - SPARTANBURG Forecast and Warning Area

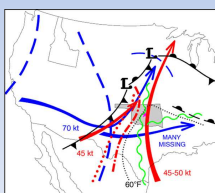


### WFO Greenville-Spartanburg Greenville-Spartanburg Airport




## Successful **Severe Weather**\* Forecasting and Warning

- Two Essential Components
  - Anticipating favorable environments
  - Recognizing severe storms after they develop






\*Tornado  
\*Thunderstorm Wind >50 kt (58 mph)  
\*Hail > One inch in diameter

Composite Chart 26/0000 Z March 1948 (Madden and Crisp 1959)

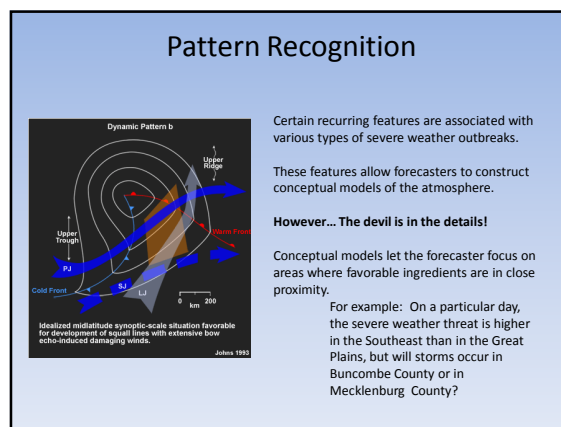
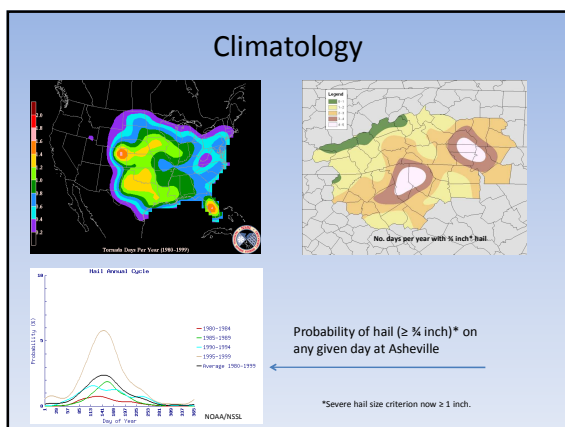
## Severe Storm Forecasting

- Regional and Local Severe Weather Climatology
- Synoptic Pattern Recognition (*i.e.*, conceptual models)
- Physical and Theoretical Understanding of Convective\* Processes
- Parameter Evaluation
  - Temperature
  - Dew Point
  - Wind
  - Instability
  - Shear
  - *ad infinitum*
- Forecaster Experience

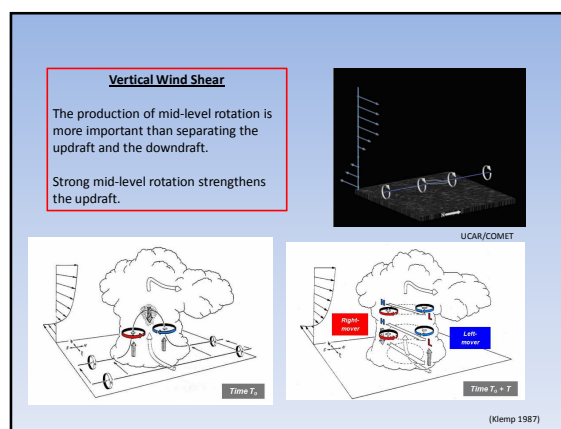
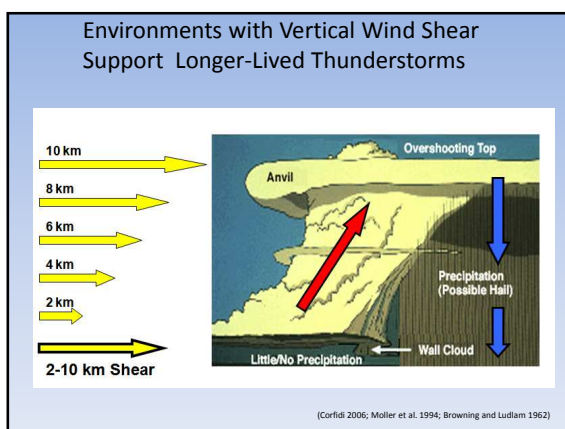
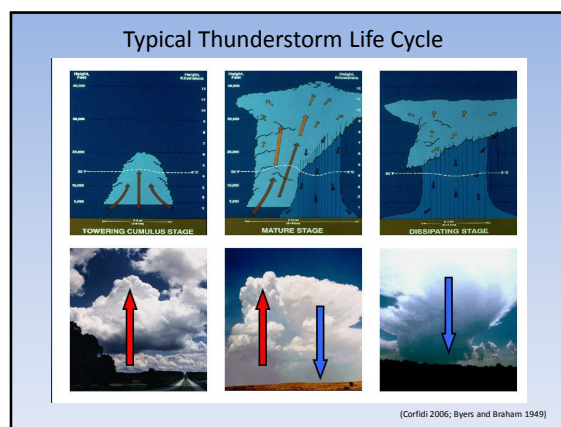
How do we anticipate ...

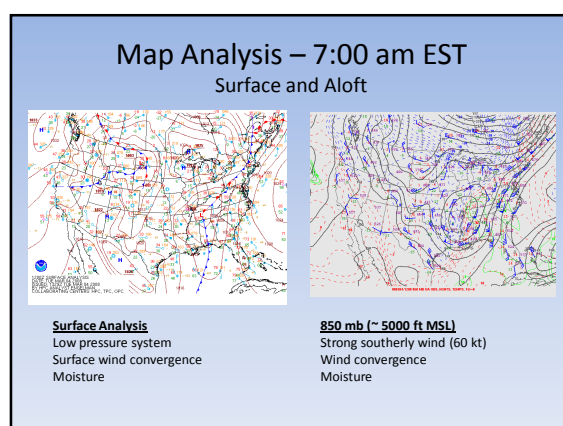
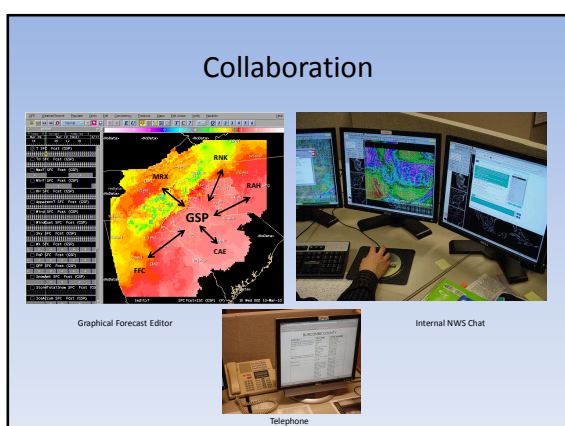
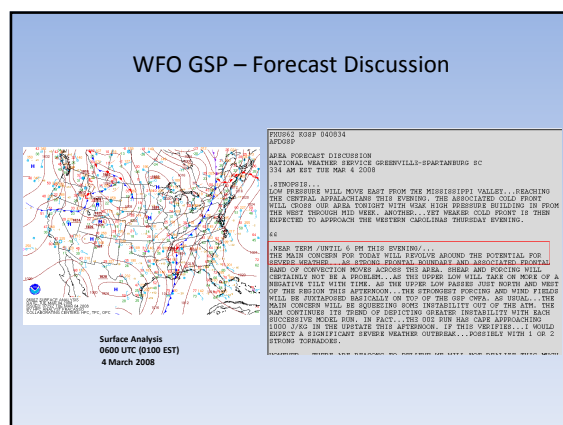
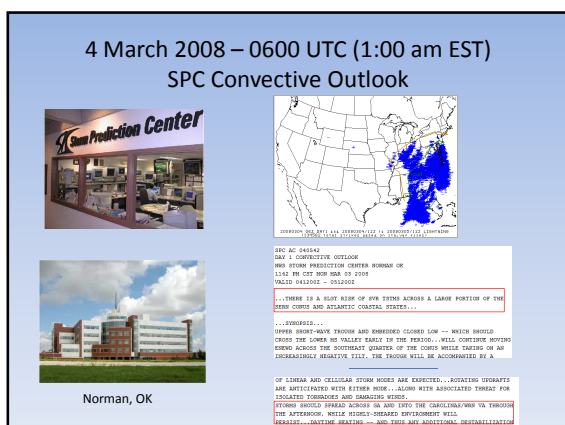
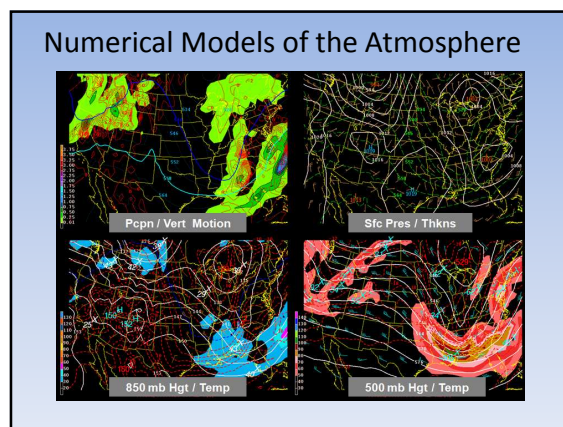
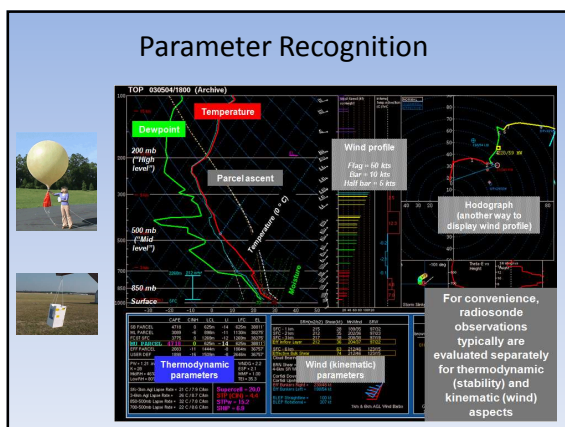

or

or

?

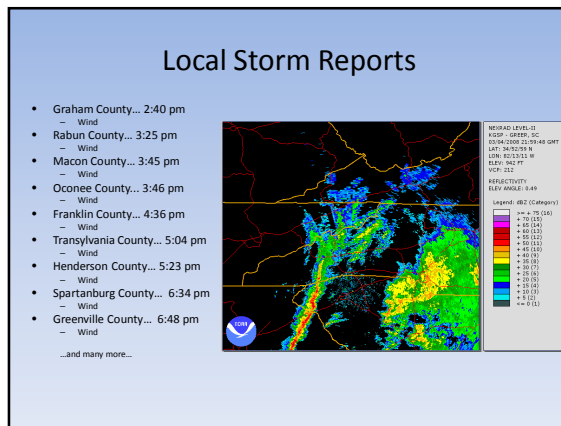
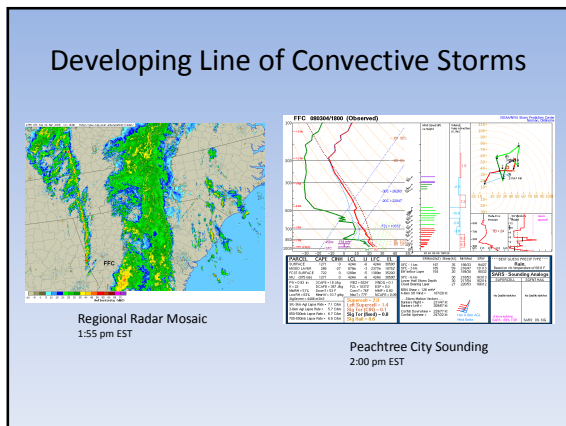
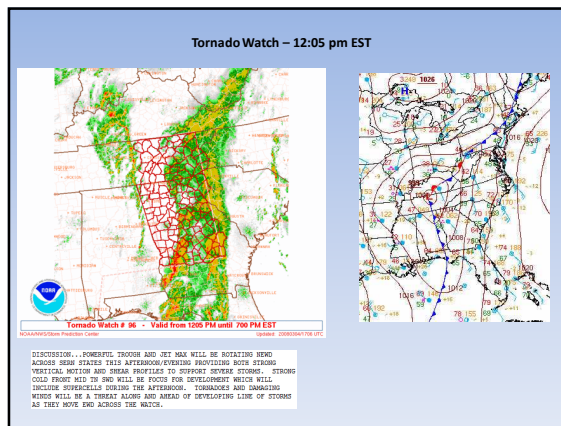
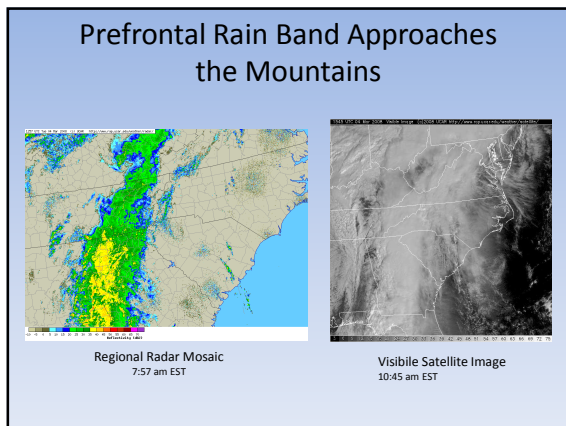
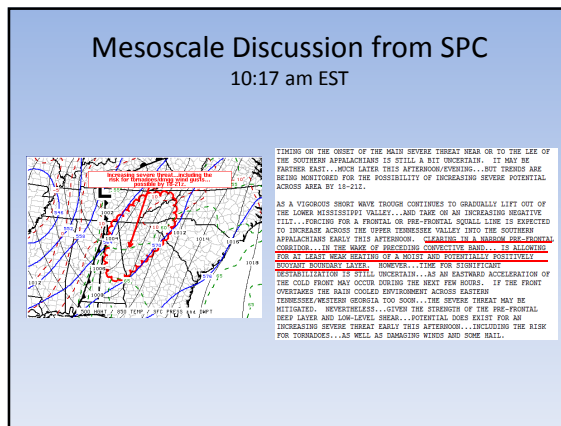
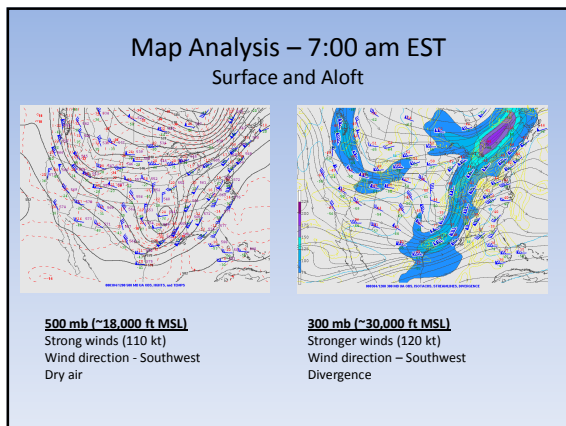
\*Convection: Motion within a fluid (e.g., air) that transports and mixes the properties of that fluid

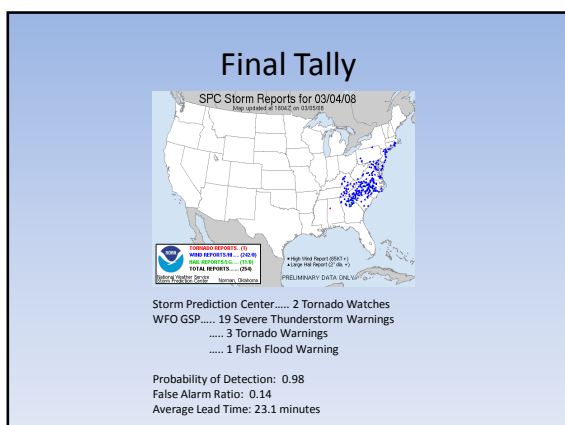
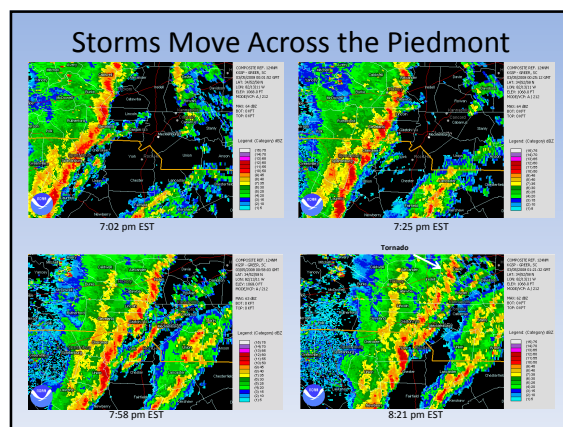
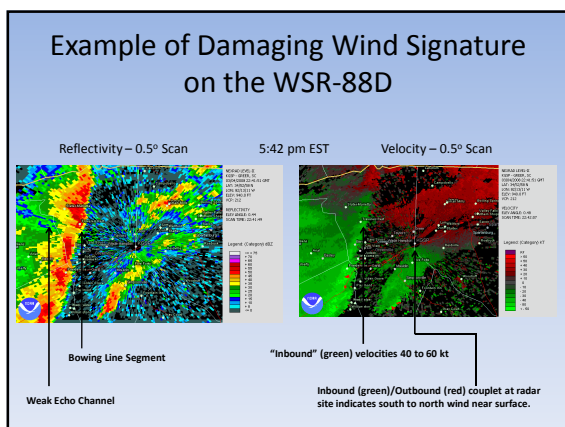


- ### Physical and Theoretical Understanding of Convective Processes
- **Ingredients for Deep, Moist Convection** (Doswell 1987)
    - **Moisture**
      - Surface and aloft
    - **Instability**
      - Temperature lapse rates and boundary layer moisture
    - **Lift**
      - Physical mechanism that allows a lifted parcel to reach the level of free convection\* and become positively buoyant
- \*Level of free convection: The point at which a lifted parcel of air becomes warmer than its surroundings.









- ### Review: Fundamental Components of Severe Weather Forecasting
- **Anticipate Favorable Environments**
    - Climatology
    - Synoptic Pattern Recognition (Conceptual Models)
    - Physical and Theoretical Understanding of Convective Processes
    - Parameter Evaluation
    - Forecaster Experience
  - **Recognize Severe Storms After They Develop**
    - Radar (Primary Tool)
      - Must understand radar signatures within the context of their environment
    - Forecaster Experience

### REFERENCES

Browning, K.A. and Ludlam, F.H. (1962): Airflow in convective storms. *Quart. J. Roy. Meteor. Soc.*, **88**, 117-135.

Byers, H.R., and R.R. Braham, 1949: The Thunderstorm Project. U.S. Weather Bureau, U.S. Department of Commerce Tech. Rep., 287 pp [NTIS PB234515]

Corfidi, S., 2006: An Introduction to Severe Weather Forecasting. National Severe Weather Workshop, Midwest City, OK, 2-4 March 2006, Slide Show, 93 slides.

Doswell, C.A., 1987: The Distinction between Large-Scale and Mesoscale Contribution to Severe Convection: A Case Study Example. *Wea. Forecasting*, **2**, 3-16.

Klemp, J. B. 1987: Dynamics of tornadic thunderstorms. *Annual Reviews Fluid Mechanical*, **19**, 369-402.

Moller, A.R., C.A. Doswell, M.P. Foster, and G.R. Woodall, 1994: The Operational Recognition of Supercell Thunderstorm Environments and Storm Structures. *Wea. Forecasting*, **9**, 327-347.

