

The Development of the College Park Tornado of 24 September 2001

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Introduction

- Third in a series of three tornadoes produced by a supercell storm
- Developed 3-4 km southwest of College Park at approximately 2116 UTC, dissipated over eastern Howard County at 2150 UTC
- The supercell tracked 120 km from Stafford County, Virginia to eastern Howard County, Maryland in about 126 minutes

Introduction

- o Produced heavy damage from just west of the campus of University of Maryland to downtown Laurel.
- o Damage in Maryland was estimated to be over \$73 million :
 - o Univ. of MD: \$15 million - 10 destroyed trailers, several heavily damaged buildings, many tossed and destroyed vehicles and **two fatalities**.
 - o U.S. Department of Agriculture Research Center: \$41 million

Previous Research

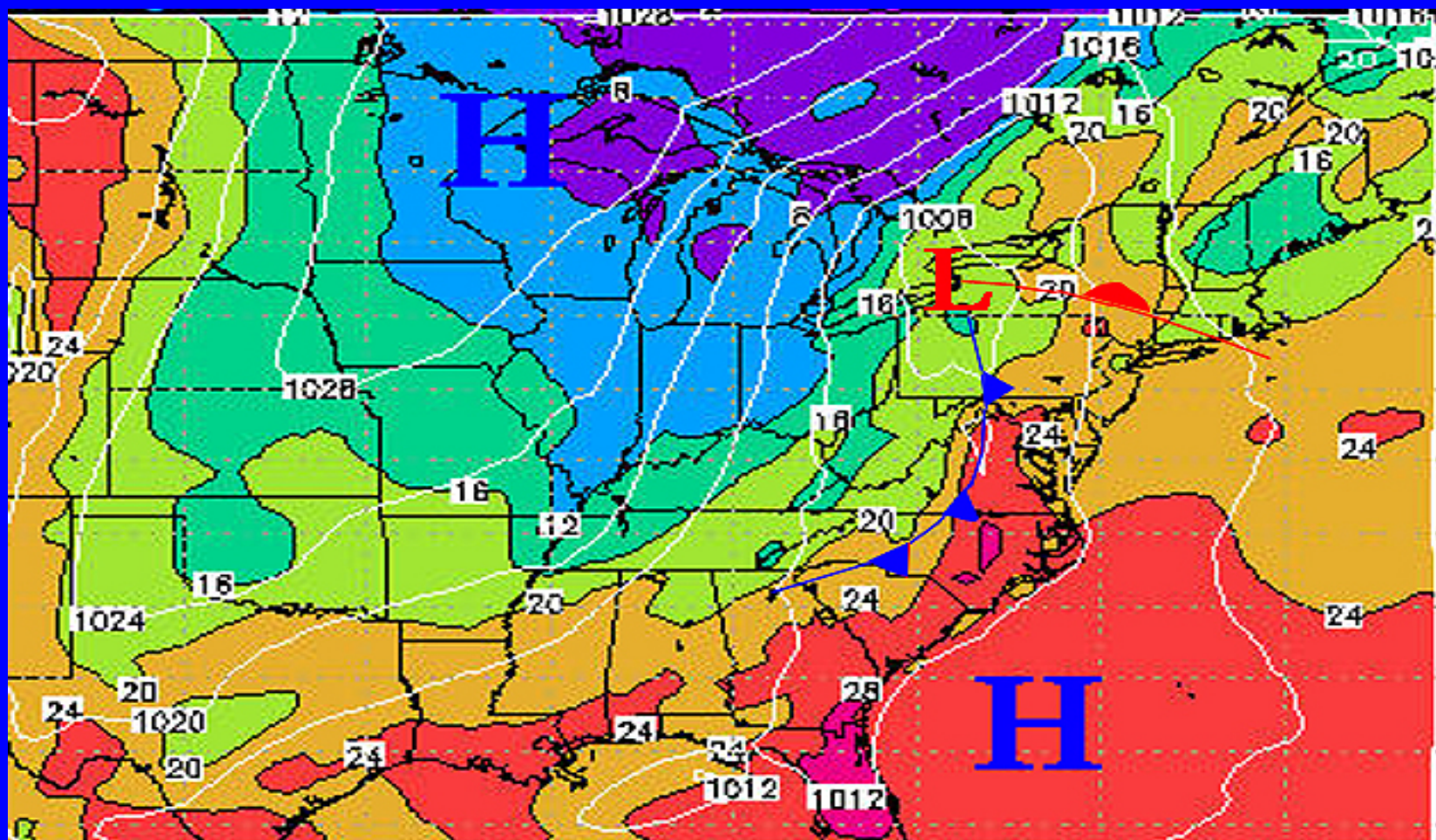
- 3 May 1999 Oklahoma City Tornado:
 - Strong tornado that had a major impact on a metropolitan area
 - Data from multiple radars at close range to the tornado
 - Investigate the structure, evolution and the rotational flows surrounding the tornado as well as the relationship of the radar signatures to tornado intensity

Previous Research

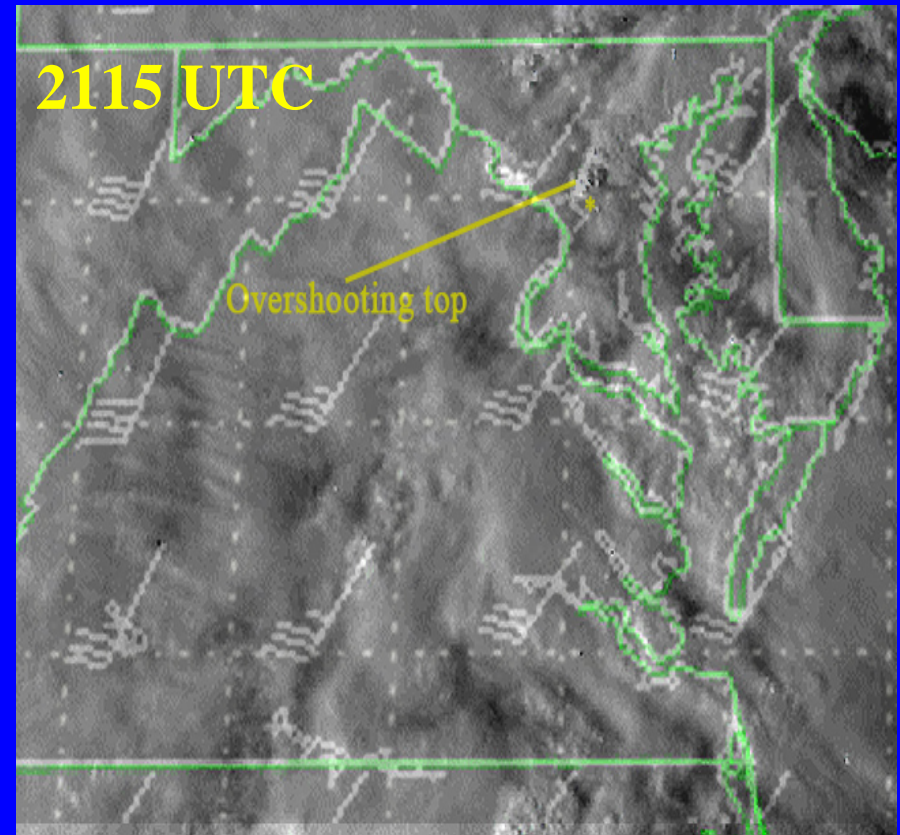
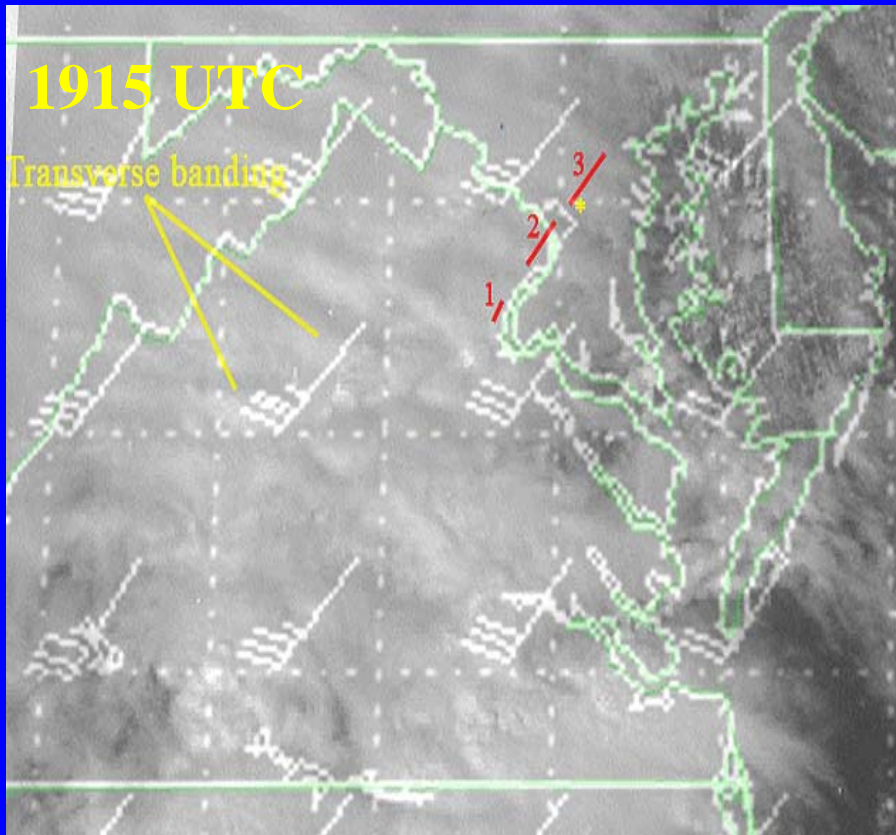
- Other events that served as a model for this study:
 - Union City, Oklahoma tornado of 24 May 1973
 - Stillwater, Oklahoma tornado of 13 June 1975,
 - Binger, Oklahoma tornado of 22 May 1981
- Identified TVS, low-level reflectivity maximum

Synoptic Overview

2000 UTC MM5 Surface Analysis

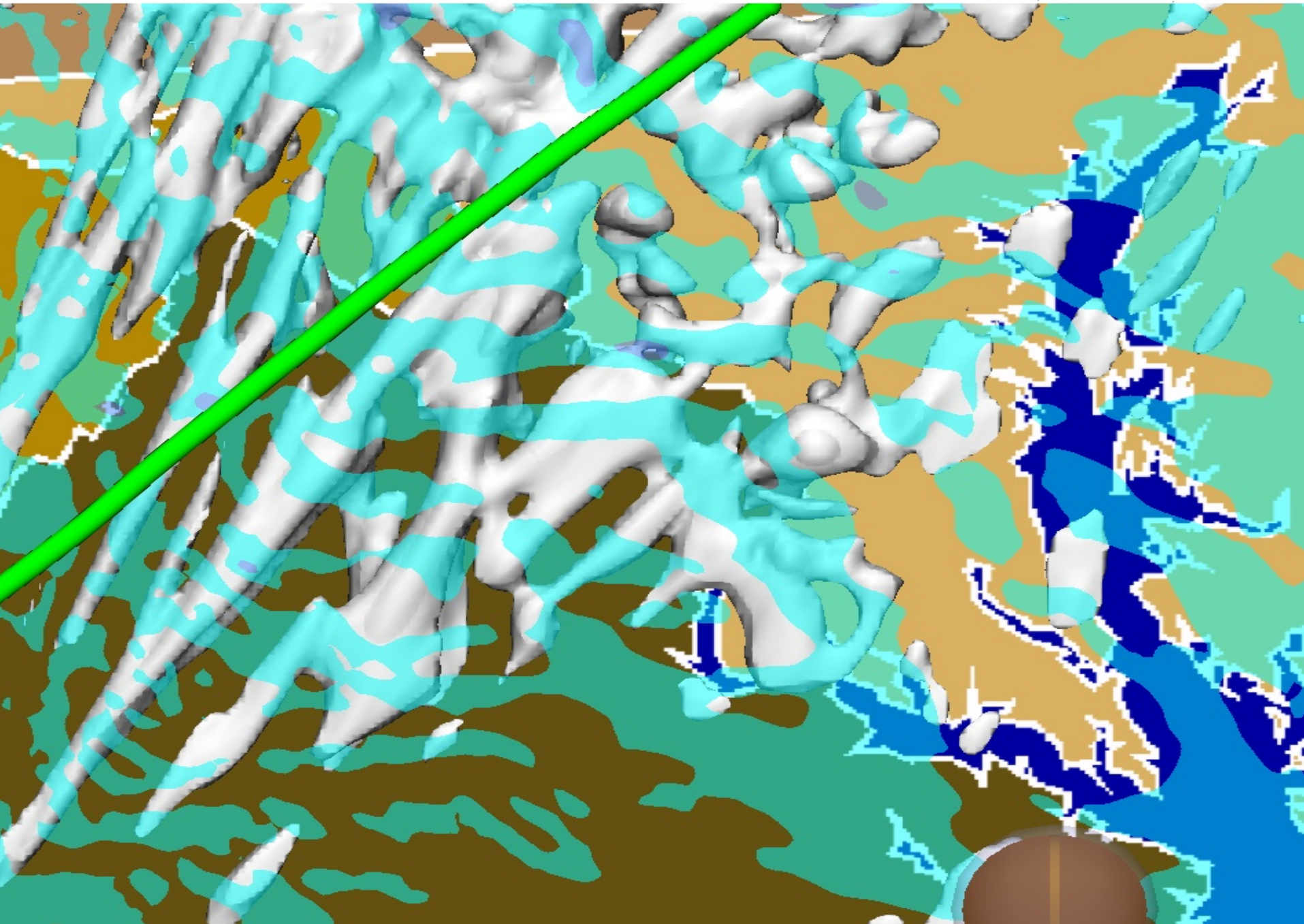


MM5 300 mb winds (knots) overlying GOES-8 visible satellite imagery

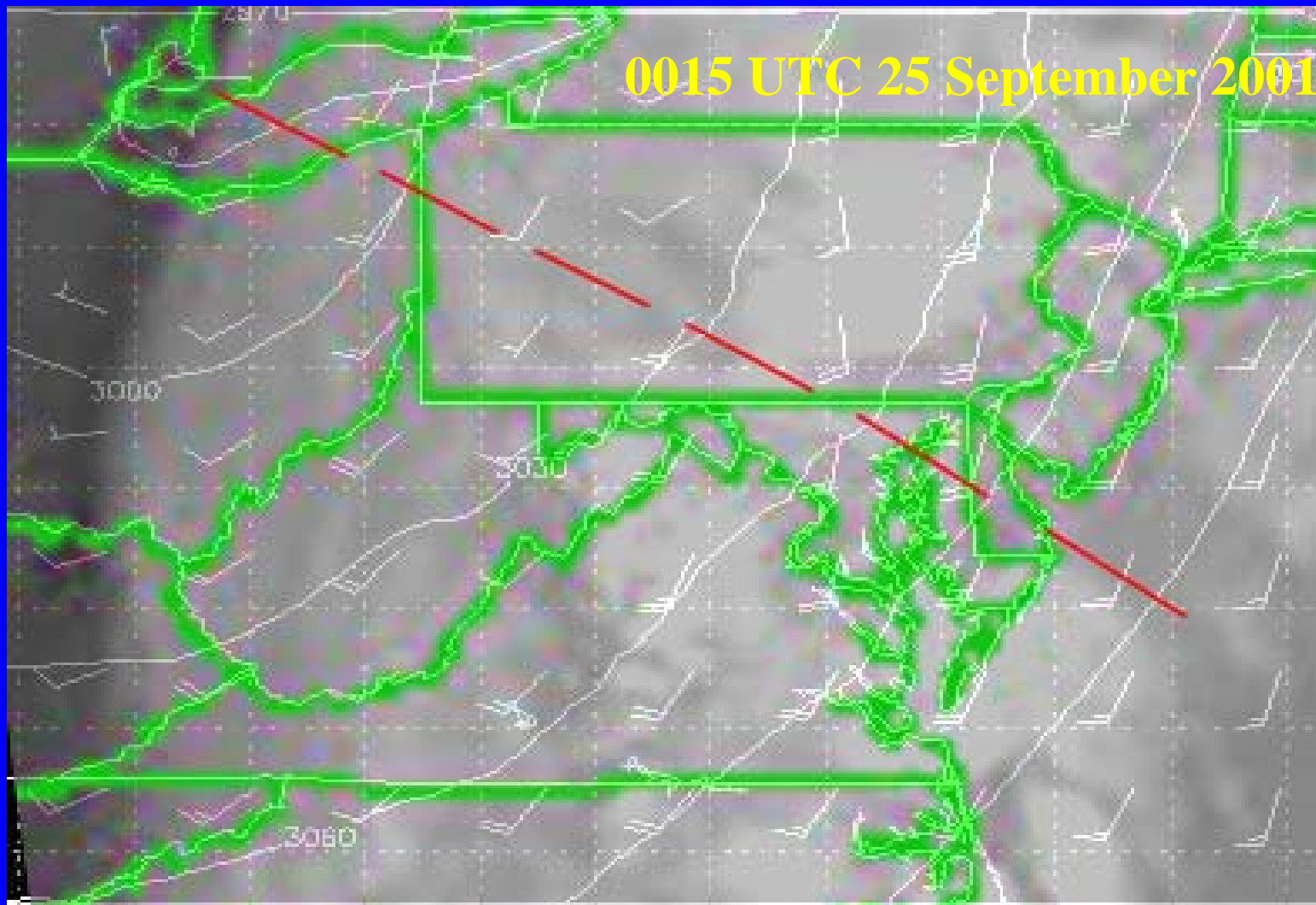


COLLEGE PARK TORNADO DAY SEPTEMBER 24, 2001; 1730EST

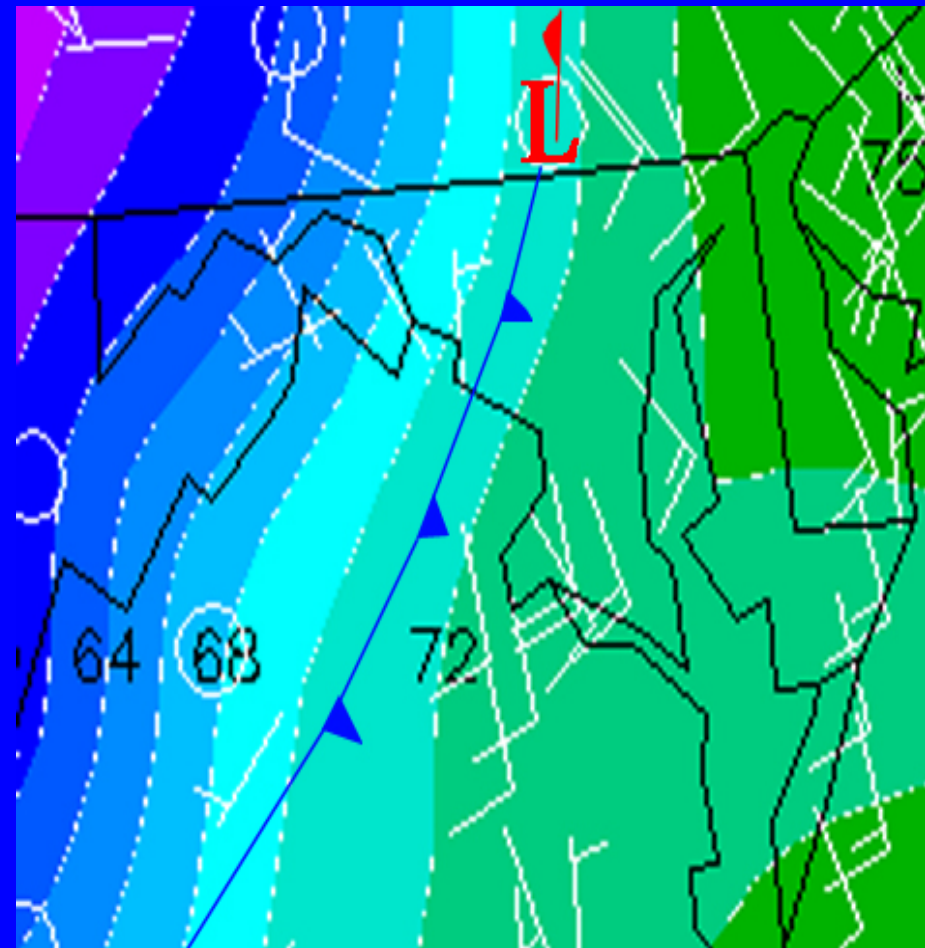
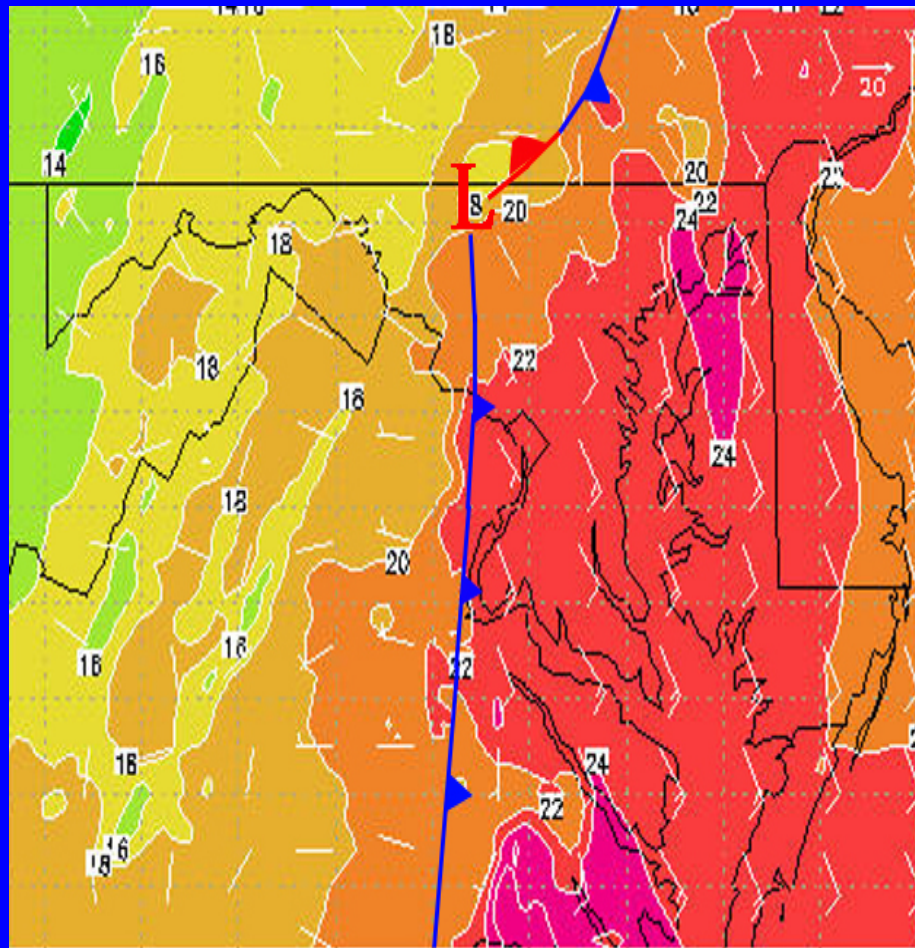
ISOSURFACE OF CLOUD ICE (4 kg/kg) ; VERTICAL VELOCITY AT LEVEL 19 (100mb) ; JET (100mb) 1730EST 9-24-01



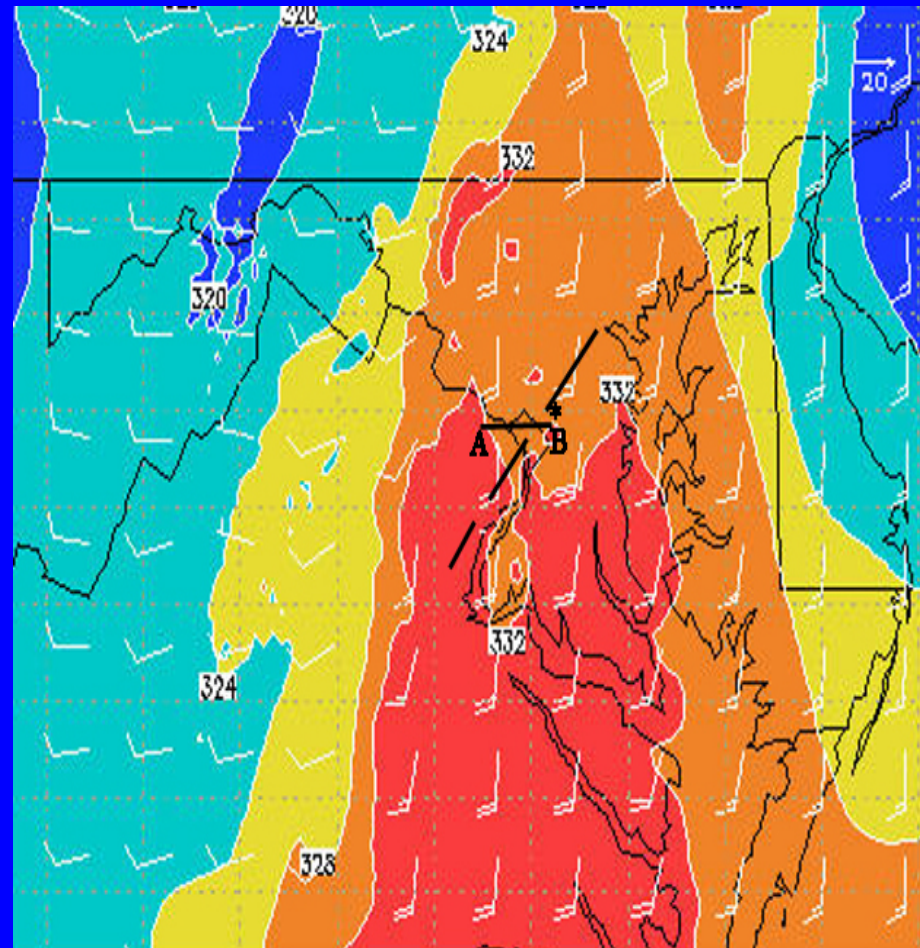
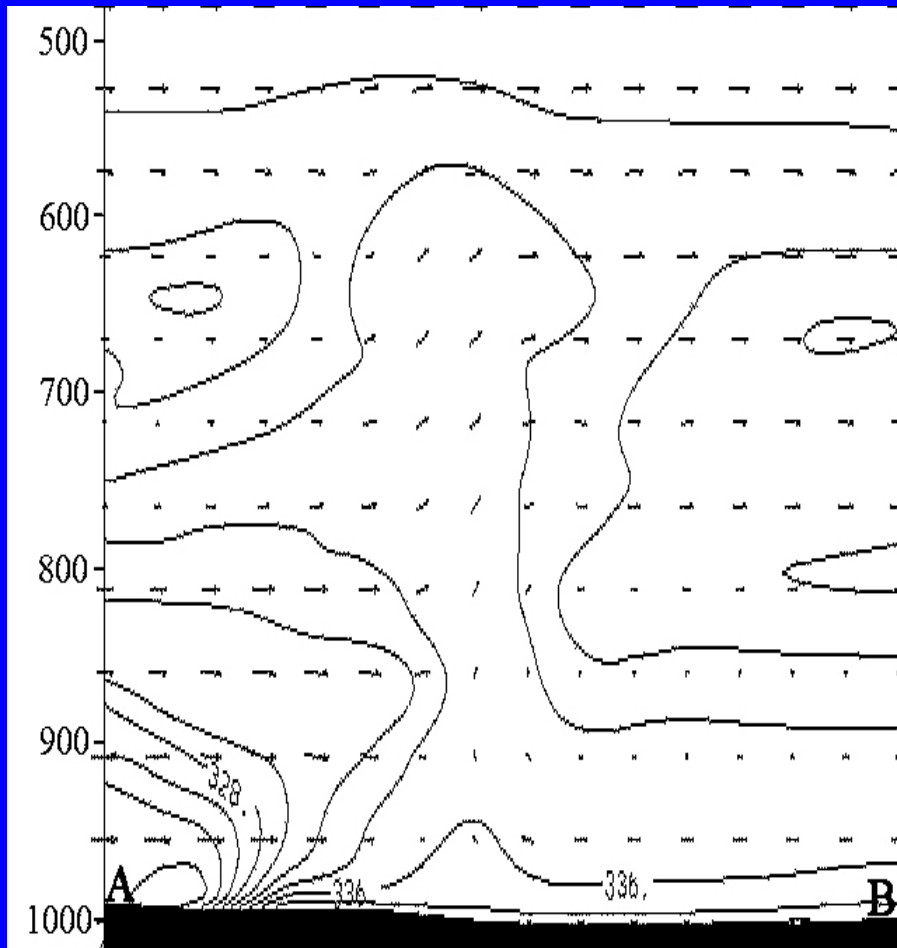
MM5 700 mb height and winds overlying GOES-8 water vapor image



2200 UTC Surface Analysis: MM5 vs. Observed

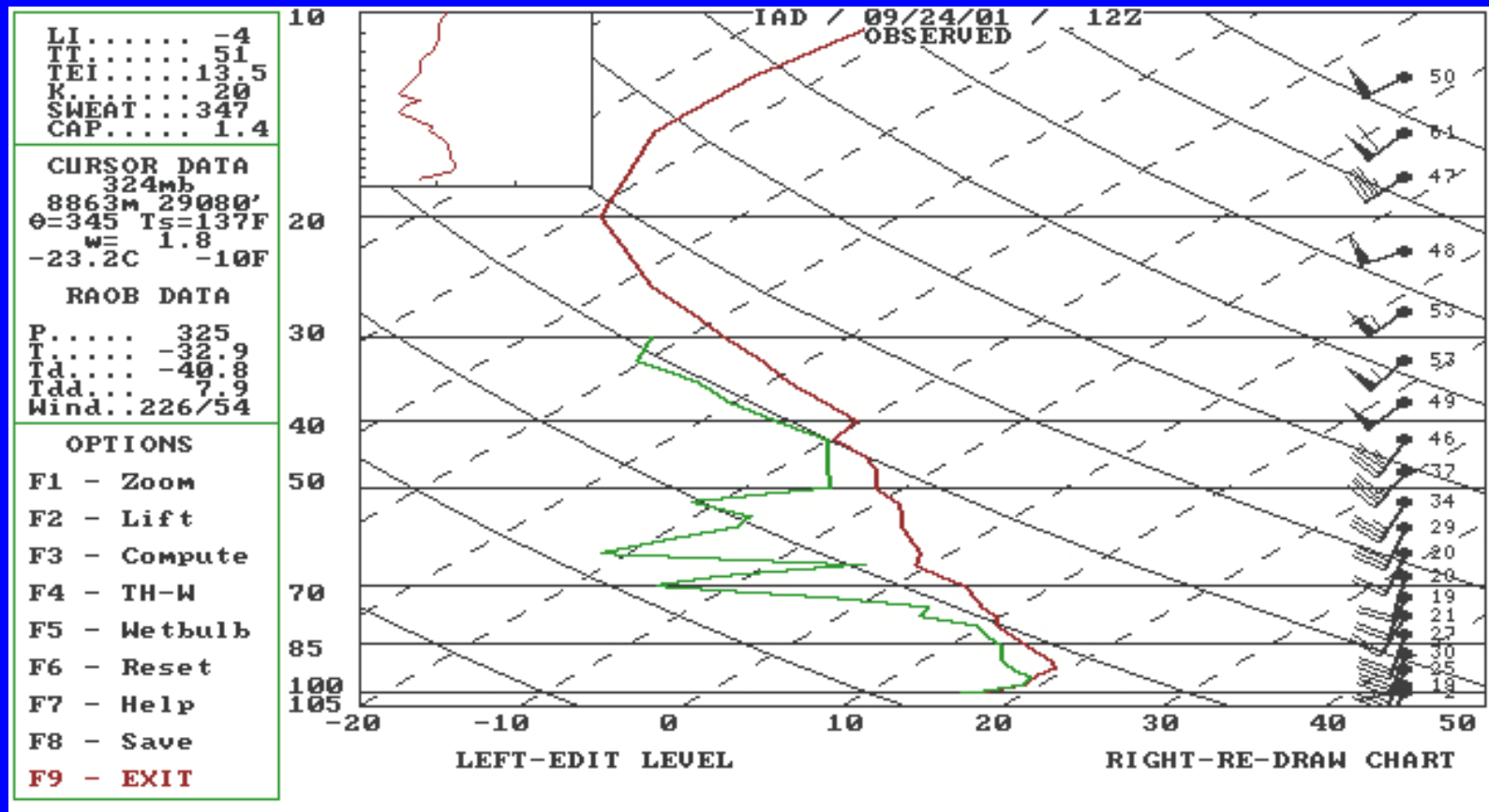


2200 UTC MM5 θ_e and Winds

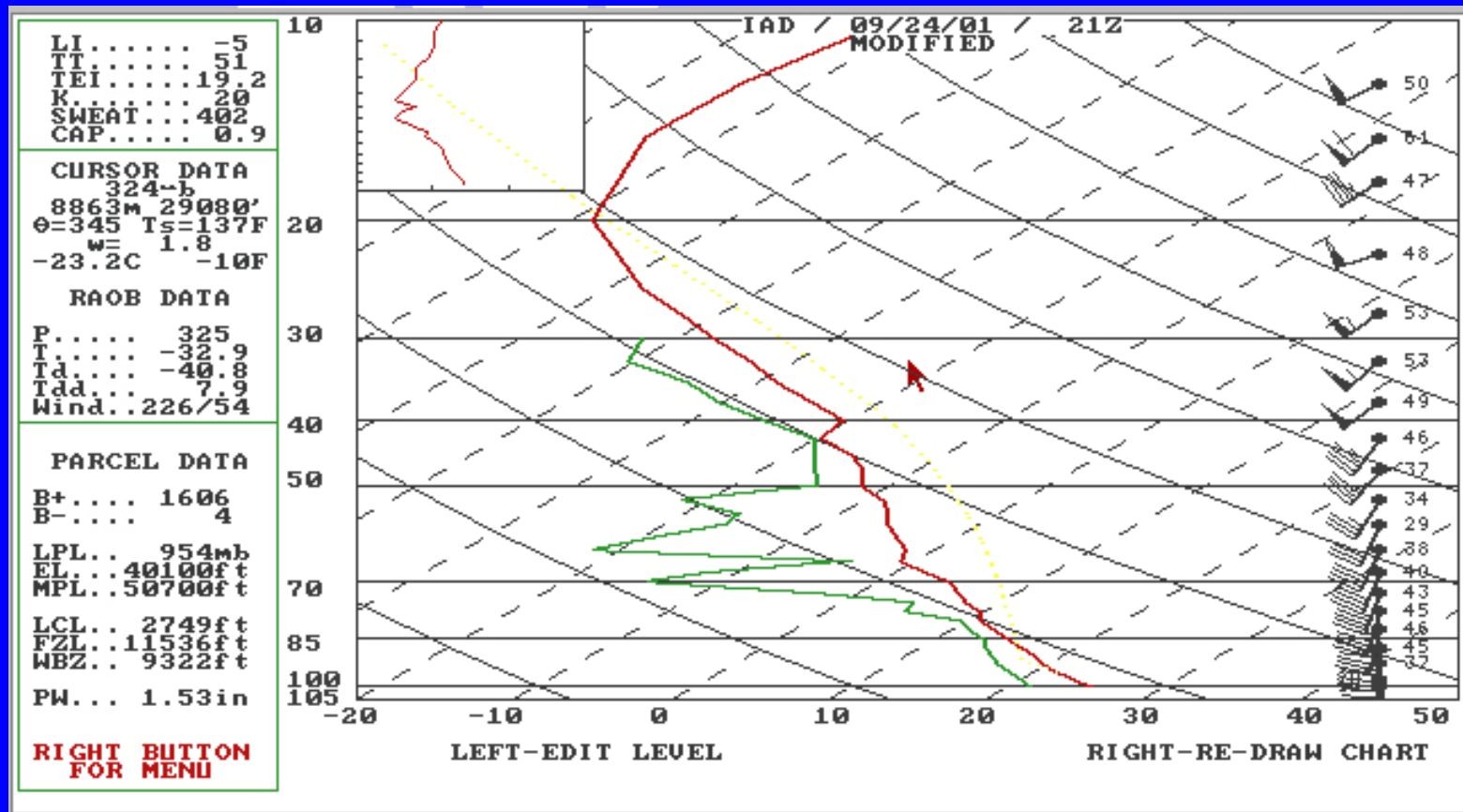


Mesoscale Overview

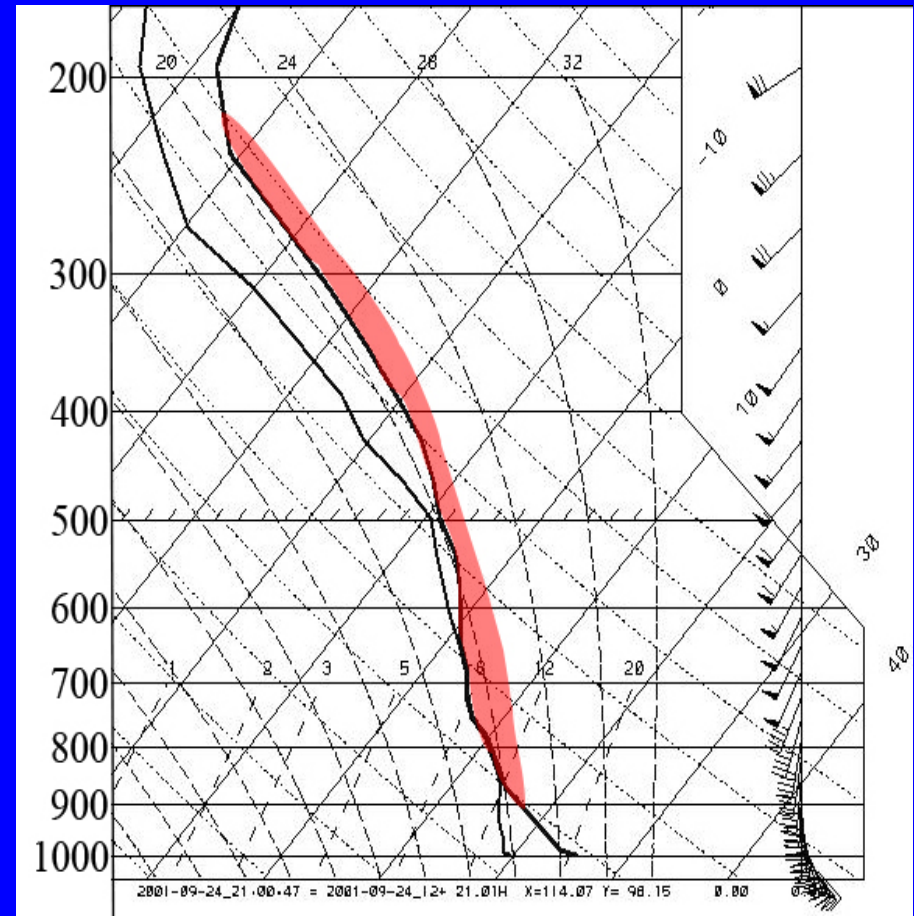
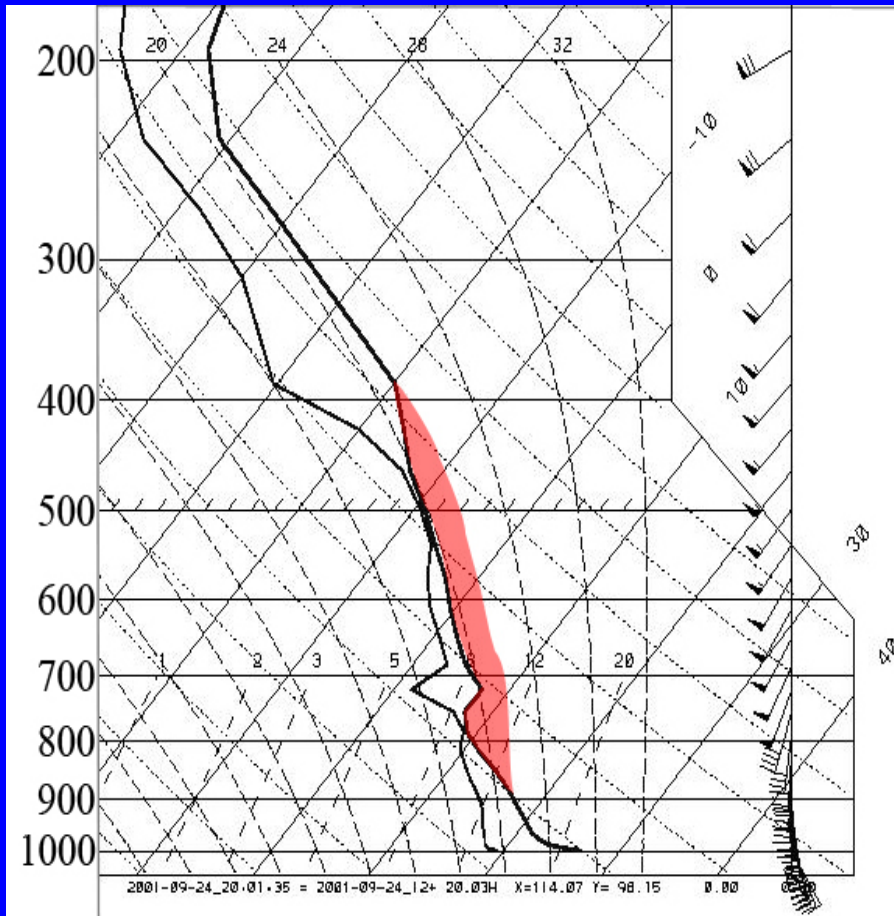
Dulles Airport (RAOB) at 1200 UTC



Dulles Airport (RAOB) at 2100 UTC

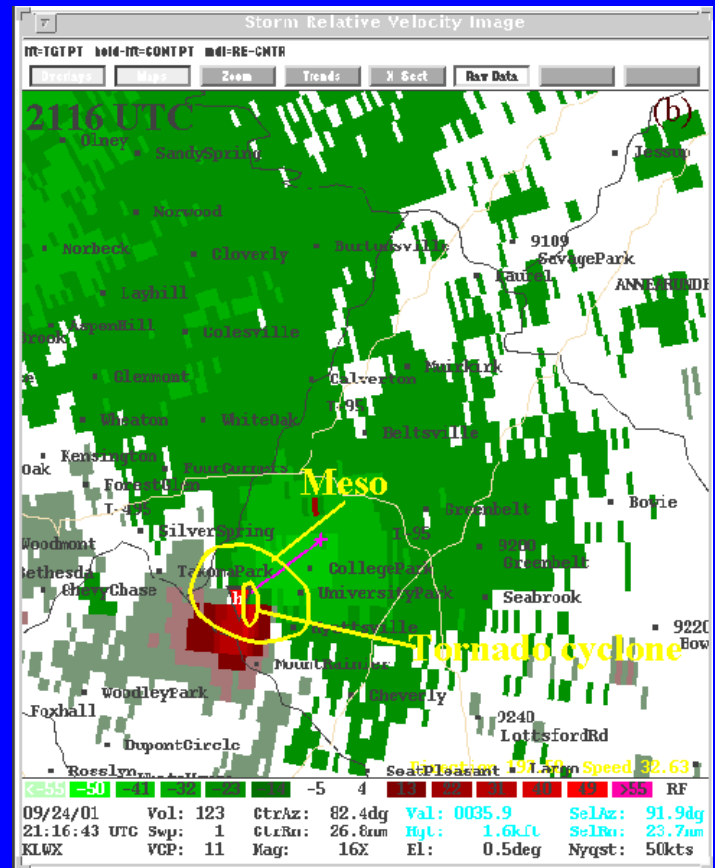
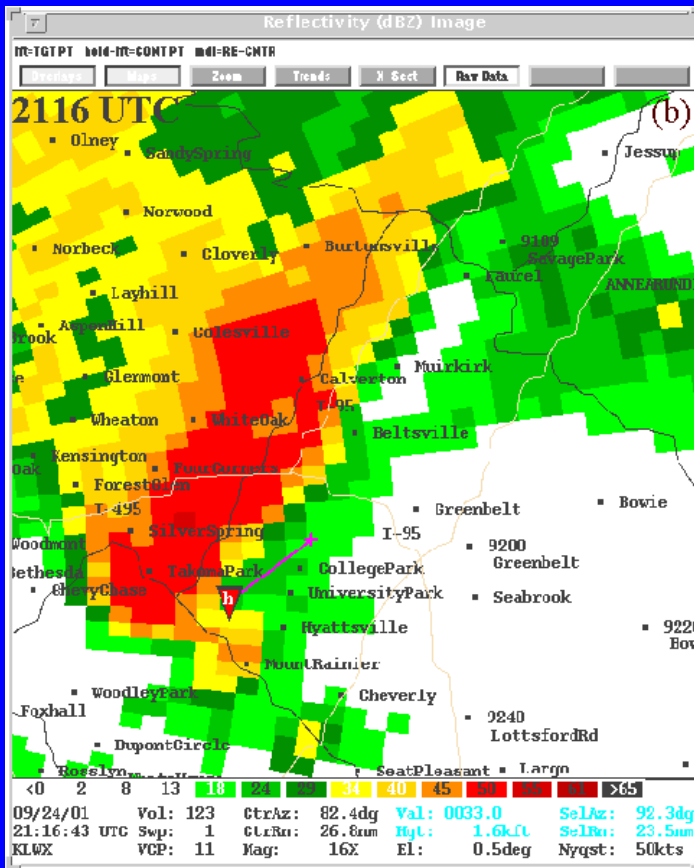


MM5 soundings at 2000 UTC and 2100 UTC

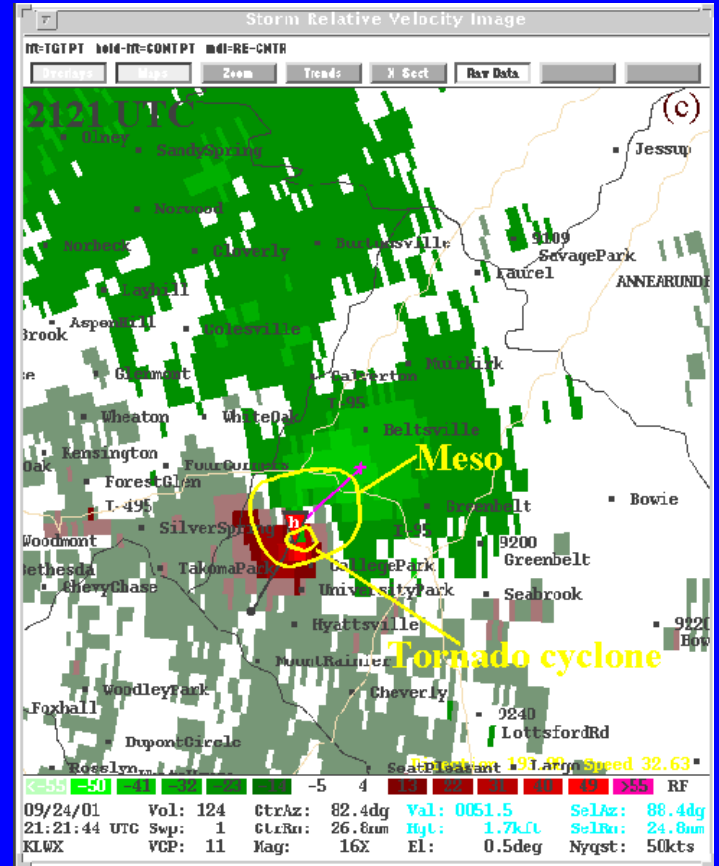
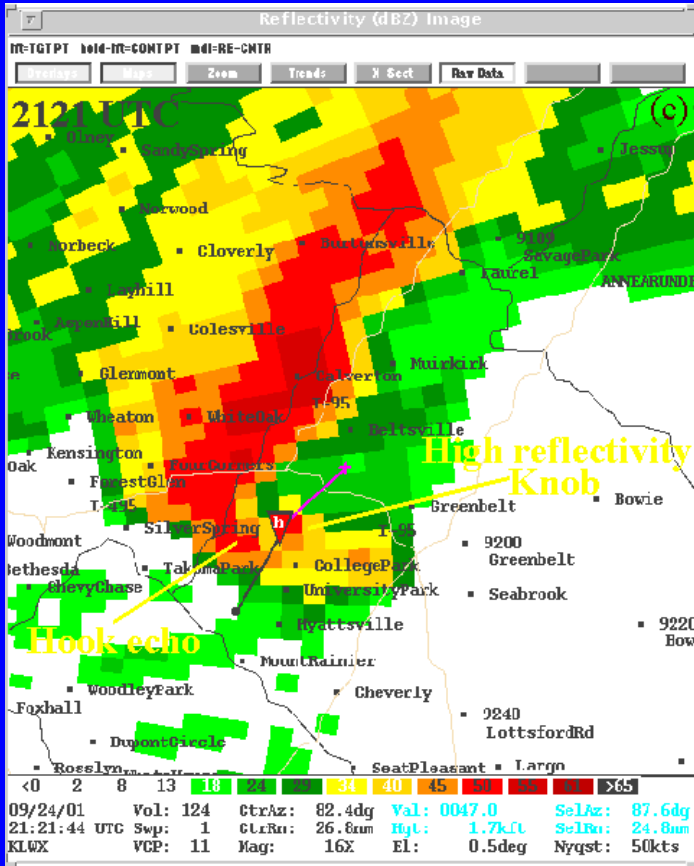


Radar Morphology

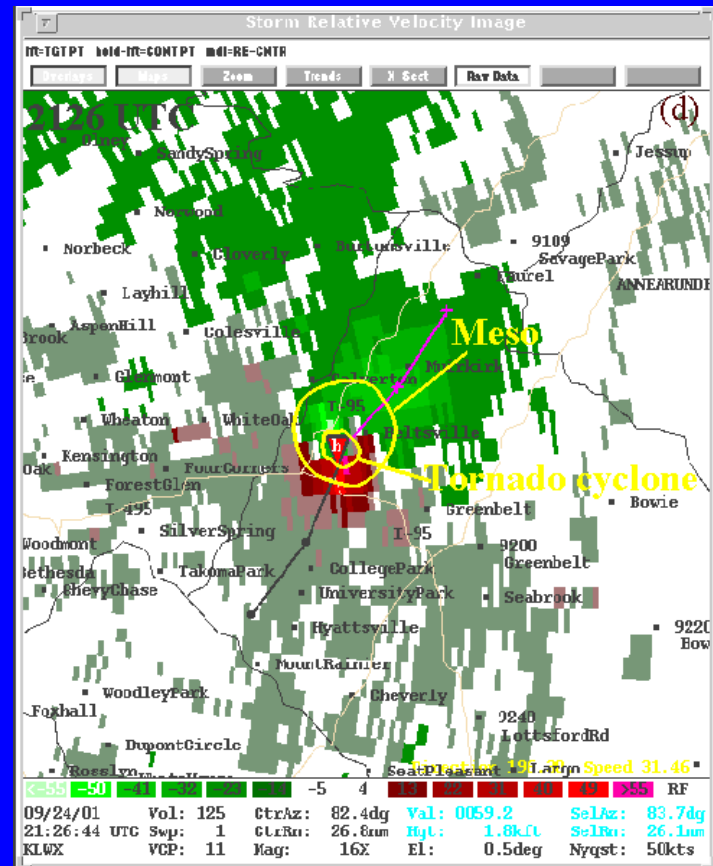
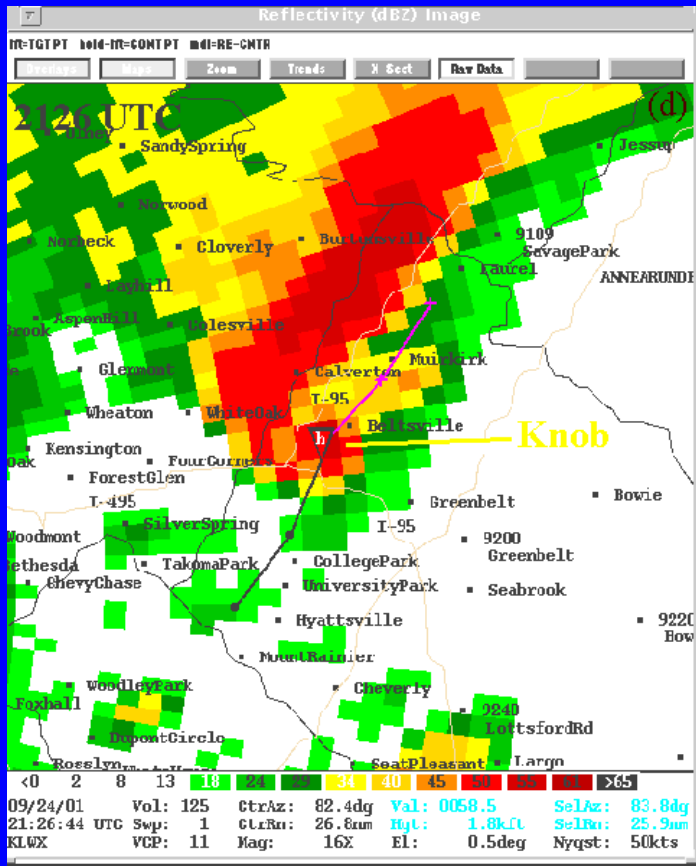
KLWX WSR-88D



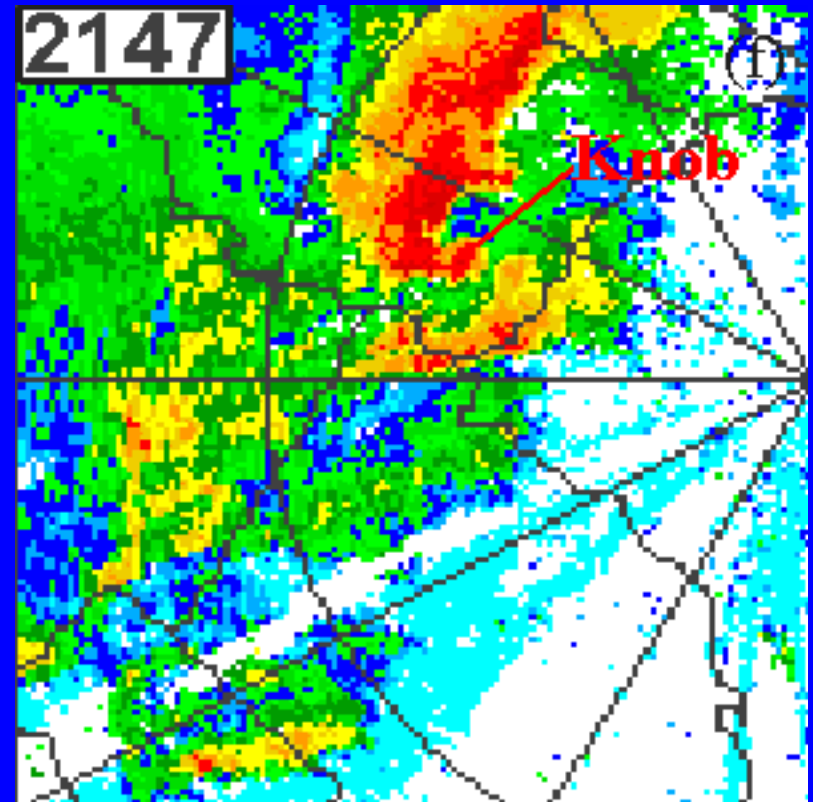
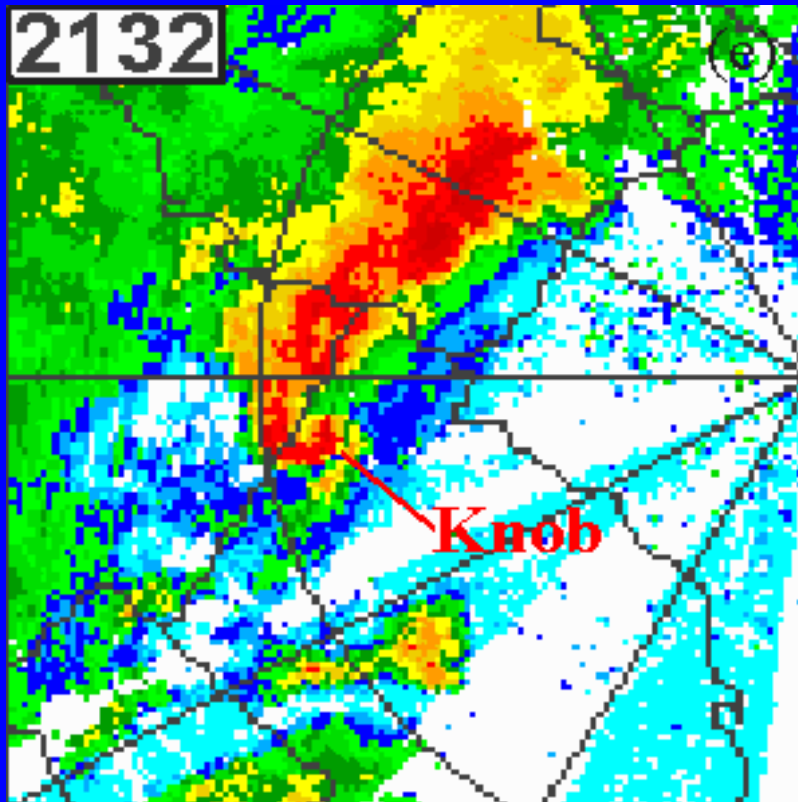
KLWX WSR-88D



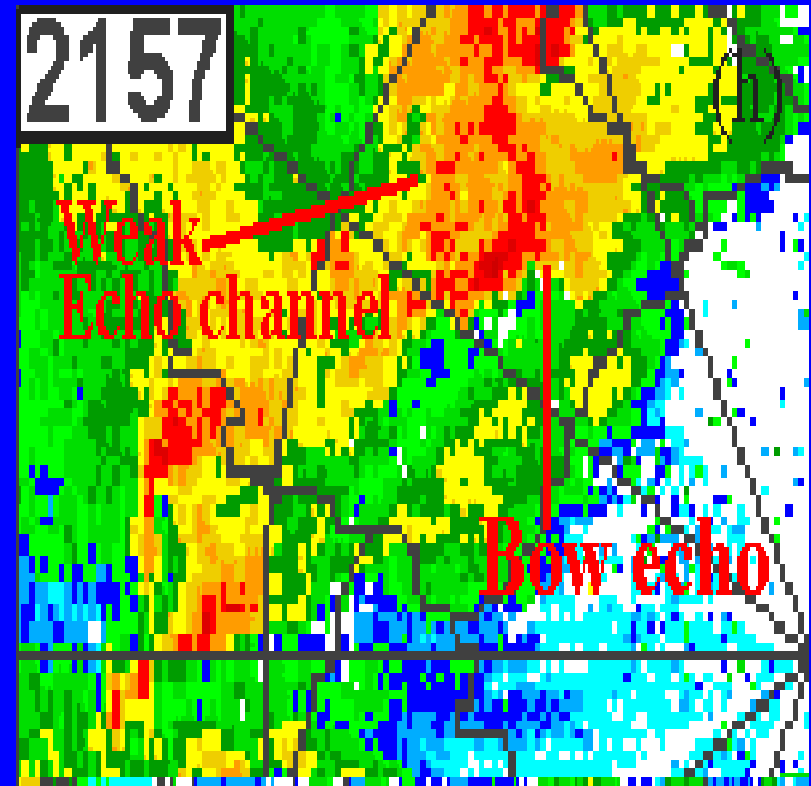
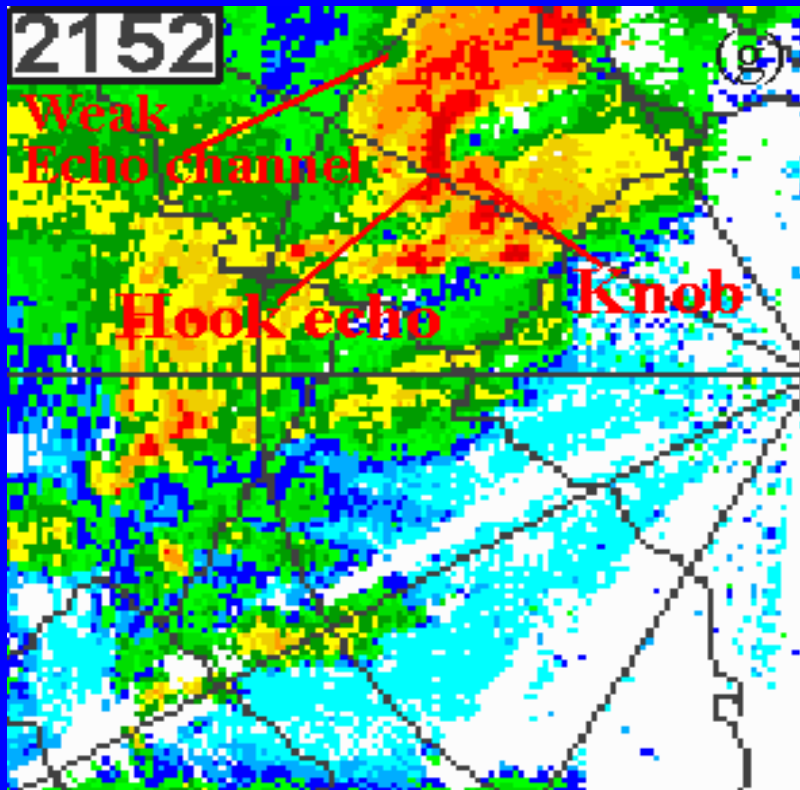
KLWX WSR-88D



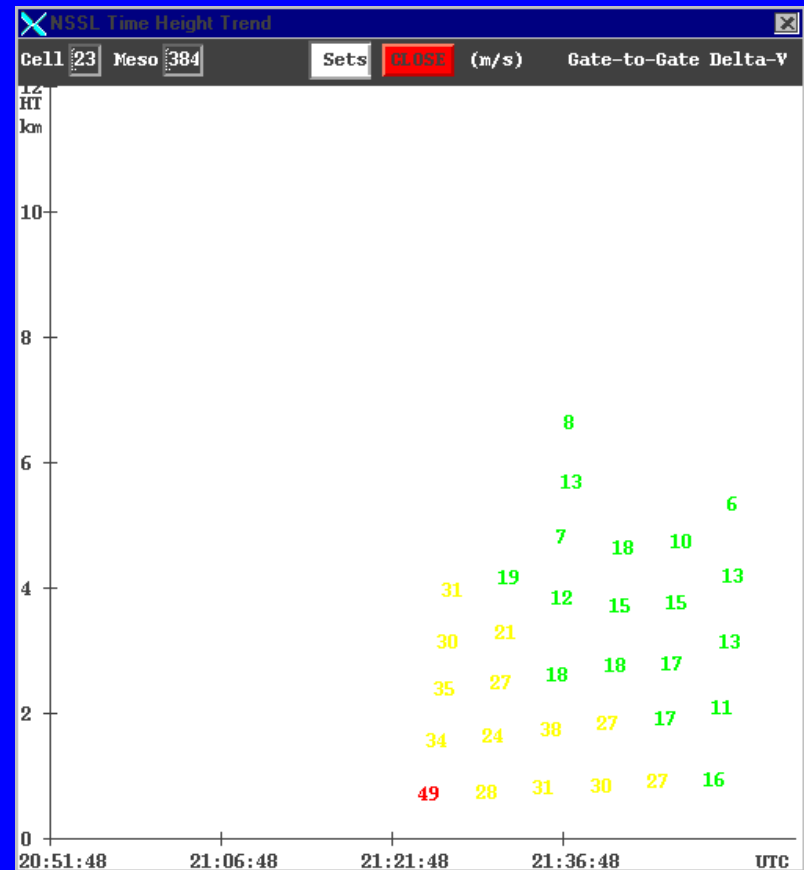
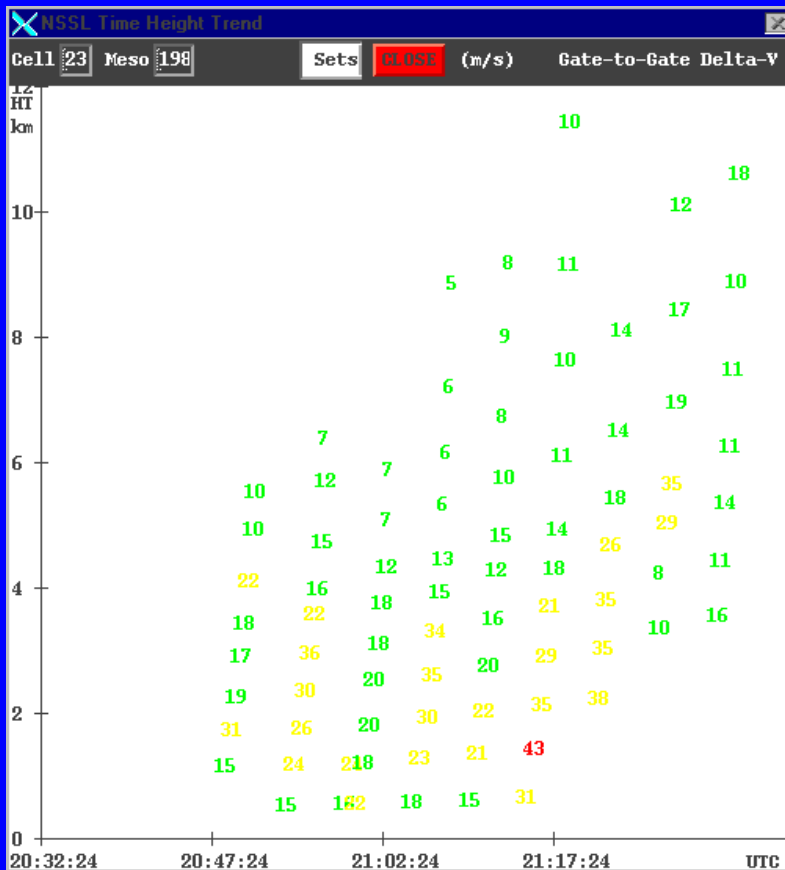
KBWI TDWR reflectivity



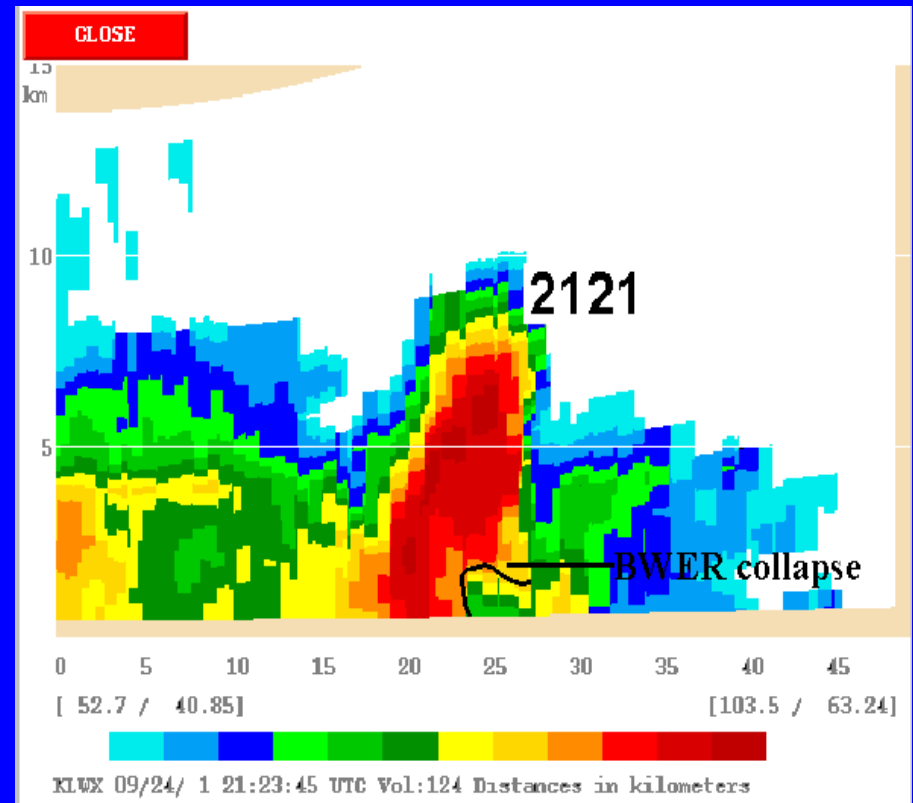
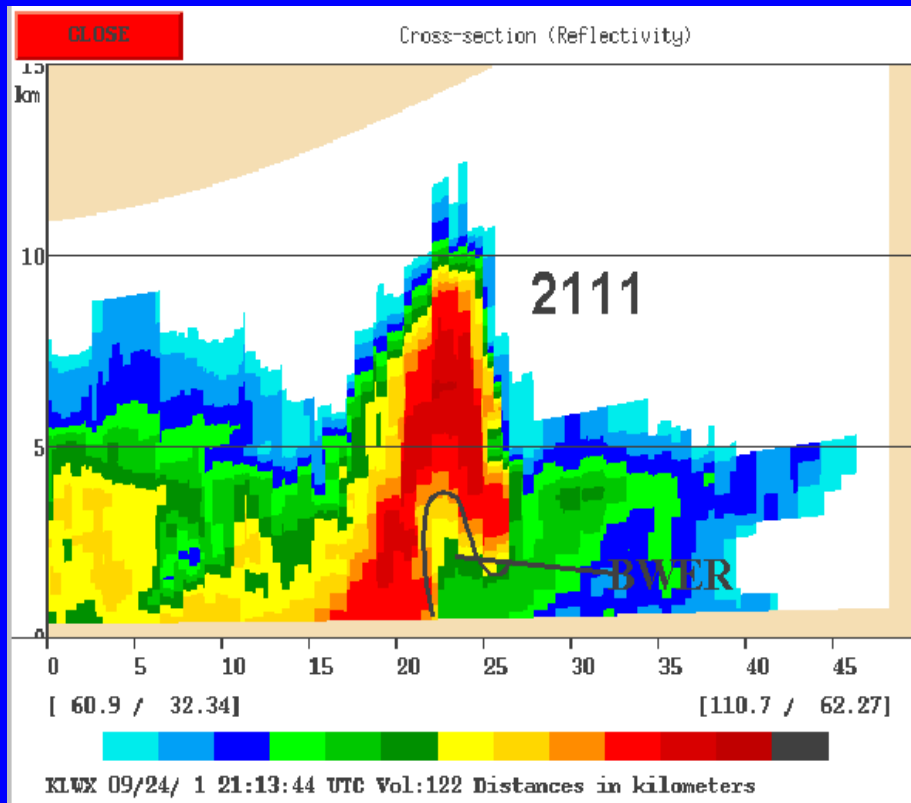
KBWI TDWR reflectivity



Time-height section of TCS Delta-V

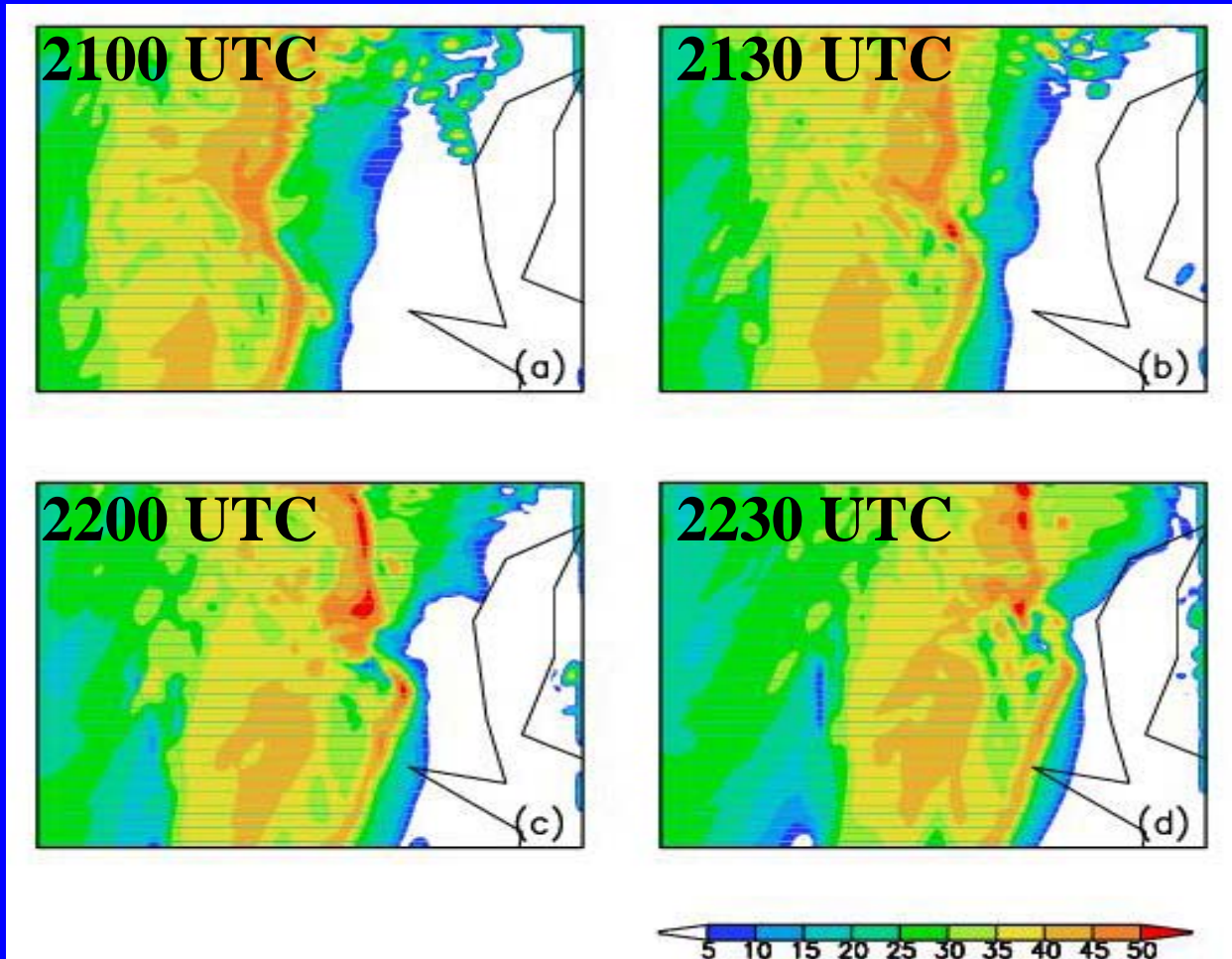


KLWX reflectivity cross-section

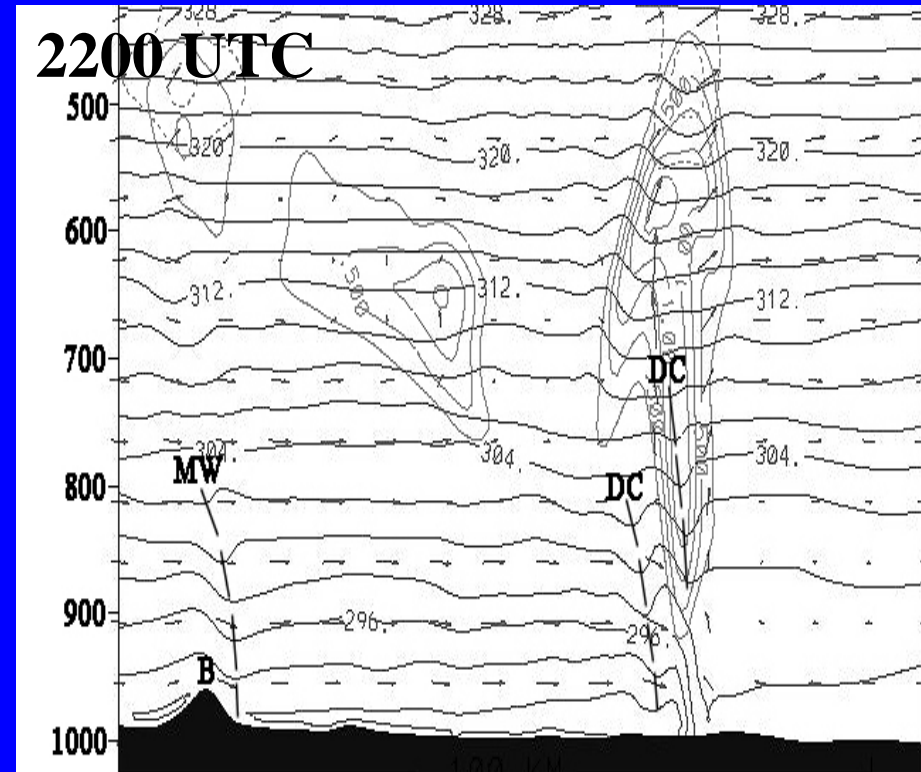
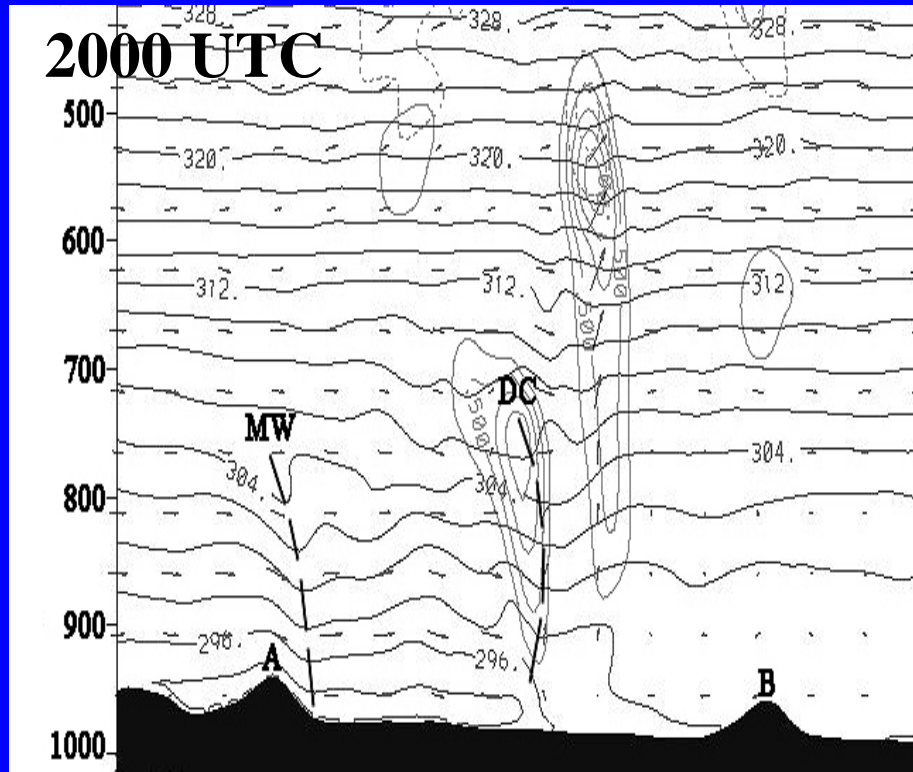


Model Prediction

MM5 simulated radar reflectivity



MM5 cross sections of theta, cloud liquid water, flow vectors



Conclusions

- GOES imagery revealed many critical elements of the tornadic event
 - Environment: Buoyancy and Wind Shear
- WSR-88D and TDWR signatures were shown to have utility in detecting and monitoring the College Park tornado:
 - TCS, echo evolution, flow field surrounding the tornado

Conclusions

- The MM5 forecast, initialized at 1200 UTC, captured many observed key factors on the synoptic scale and mesoscale.
- Identified a solitary wave associated with a density current-cold front:
 - Role in triggering deep convection during the afternoon of 24 September.

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