

P9.5 AN APPLICATION OF A CUTOFF LOW FORECASTER PATTERN RECOGNITION MODEL TO THE 30 JUNE – 2 JULY 2009 SIGNIFICANT EVENT FOR THE NORTHEAST

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Motivation

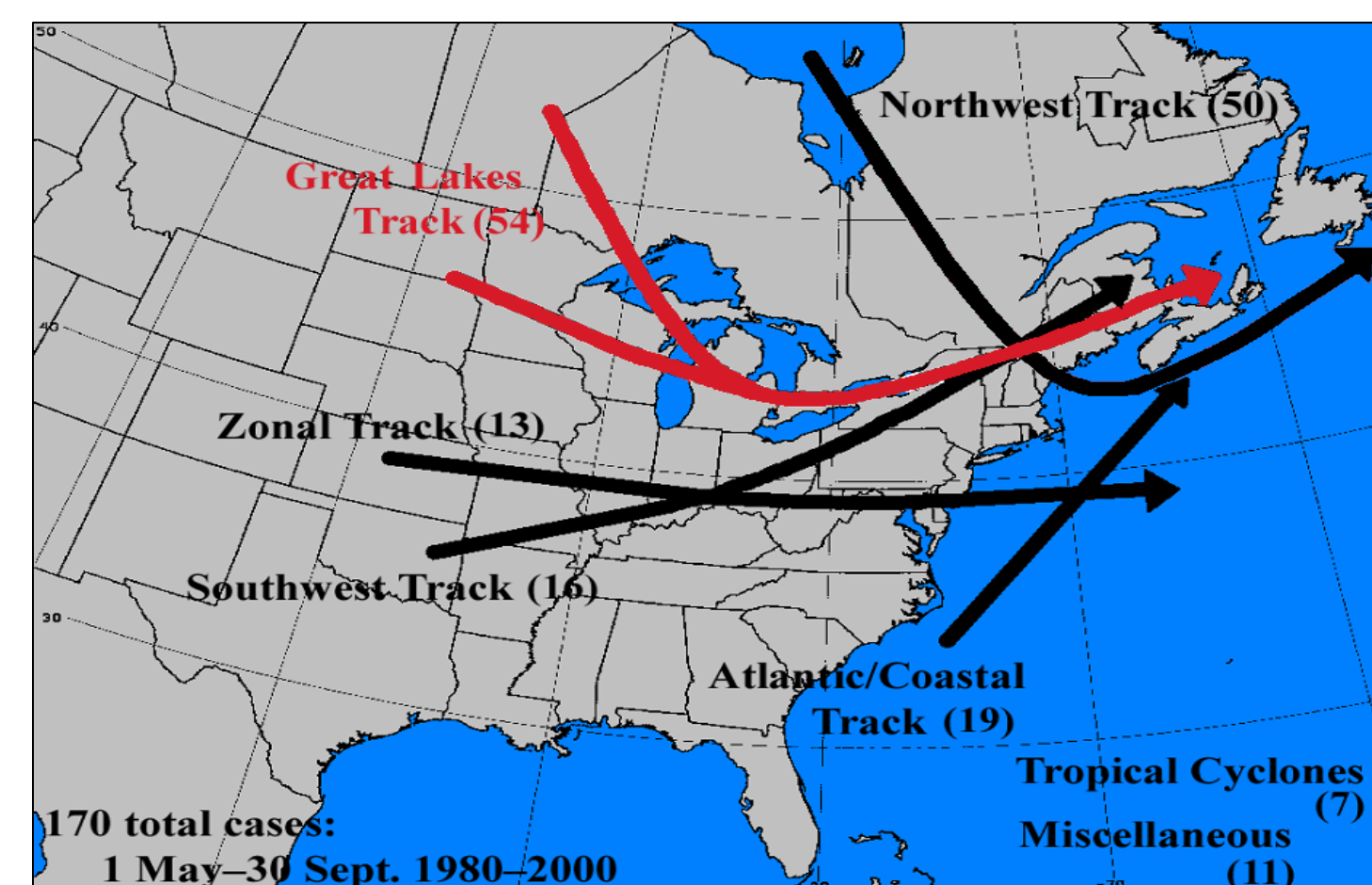
- CSTAR III with SUNYA at Albany (2007-2010) examined the sensible and extreme weather with warm season cutoffs
- Goal was to establish pattern recognition or conceptual models for significant weather cutoff days over the Northeast based on the tilt of the longwave 500 hPa trough
- Lower-, middle-, and upper-level synoptic and mesoscale features are examined (temperature and moisture profiles, jet streaks, anomalies, etc.) for each pattern

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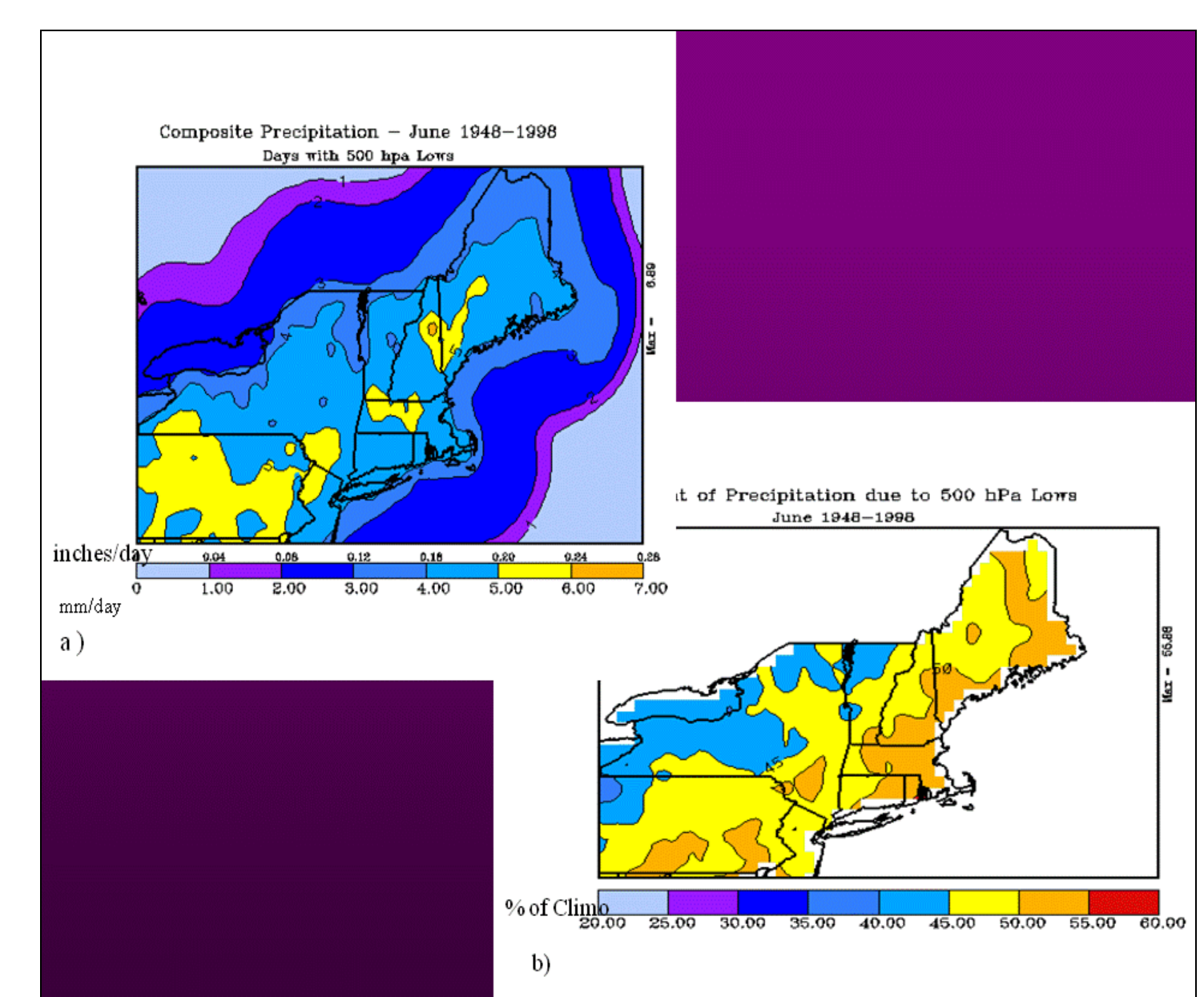
Some Results: CSTAR I-II Work (2000-06)

- Tracks or categories of warm season cutoff lows (Great Lakes and Northwest favored from May to September)
- Climatological daily rainfall distributions from cutoffs in the Northeast including % of normal precipitation (June-September 1948-1998) from cutoffs
- Movement of vorticity maxima's around cutoff based on tilt and the location of jet streaks can yield heavy rainfall events

Subjective Climatology

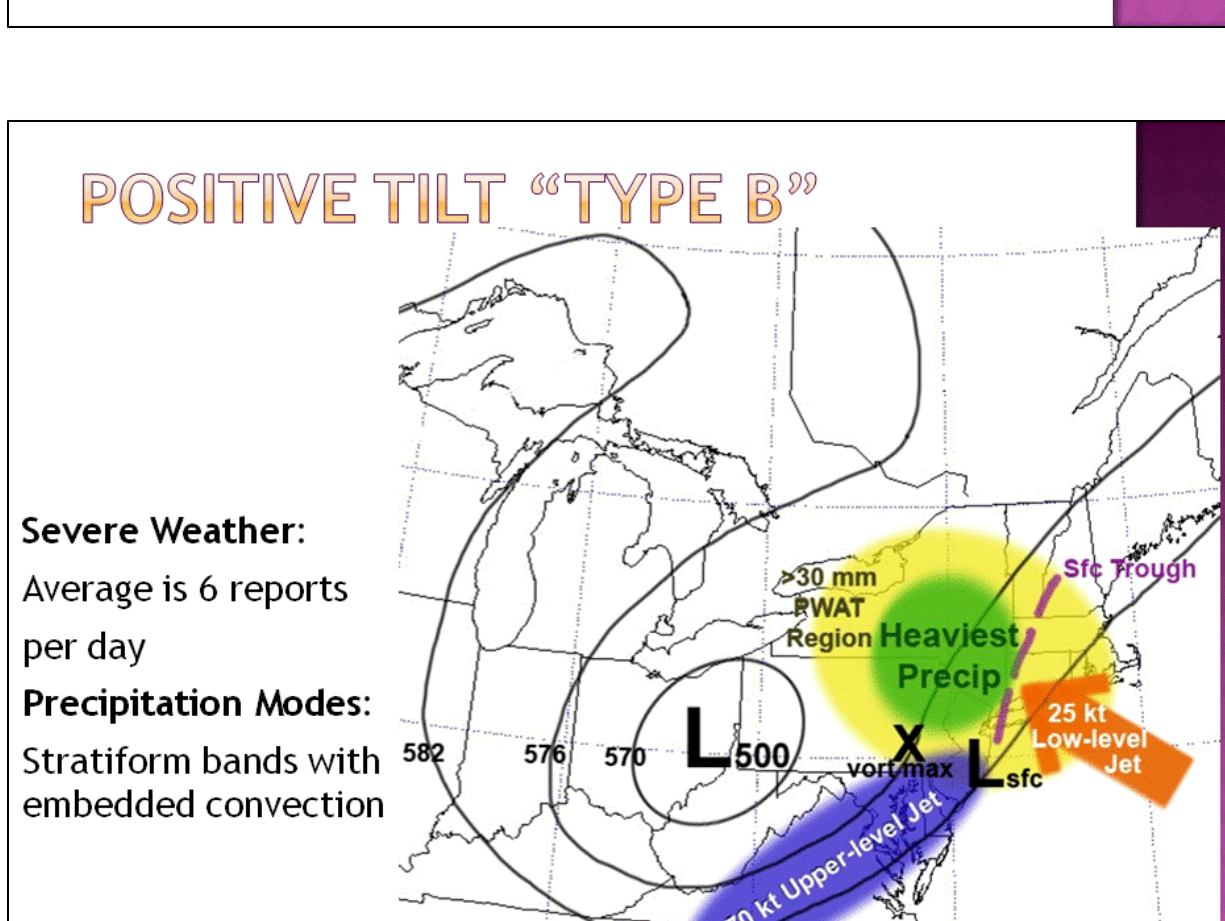
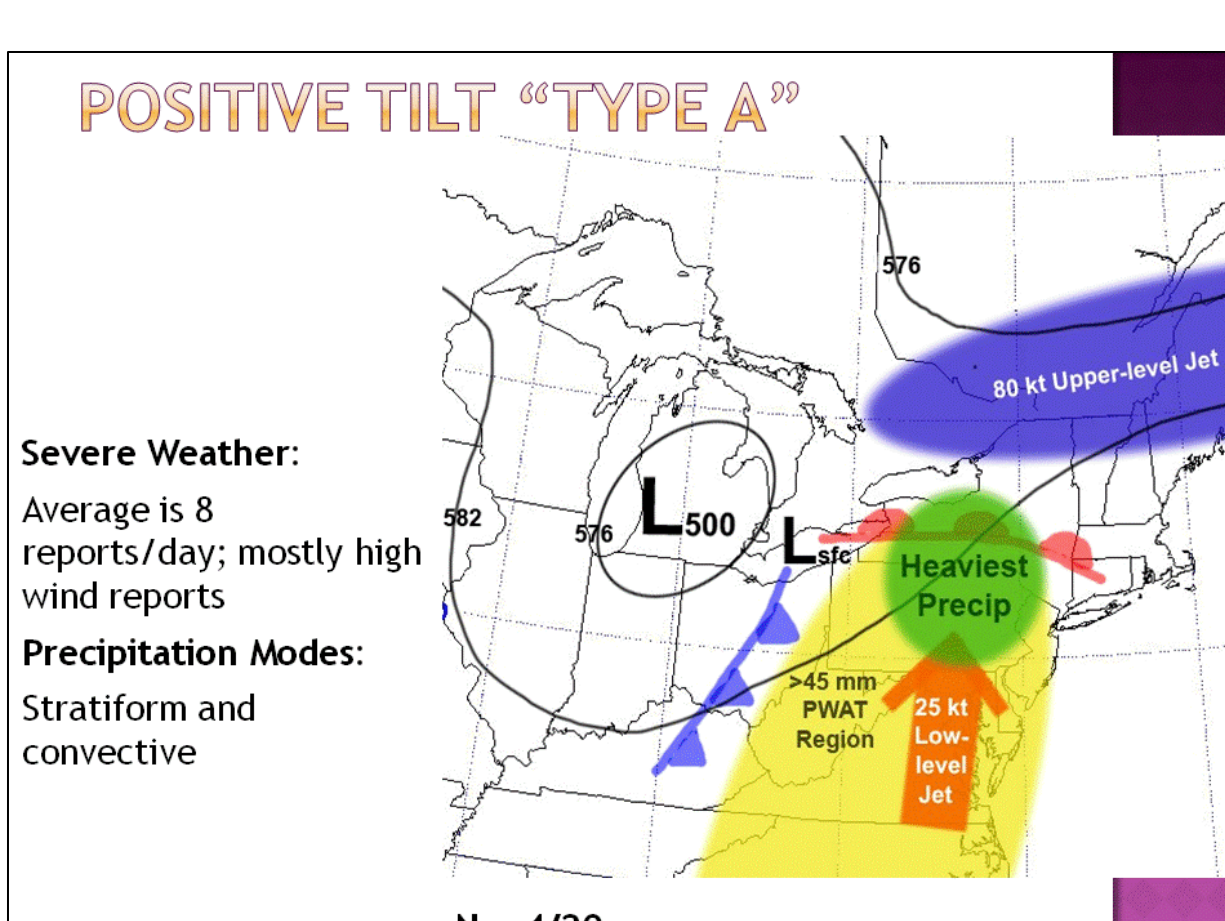
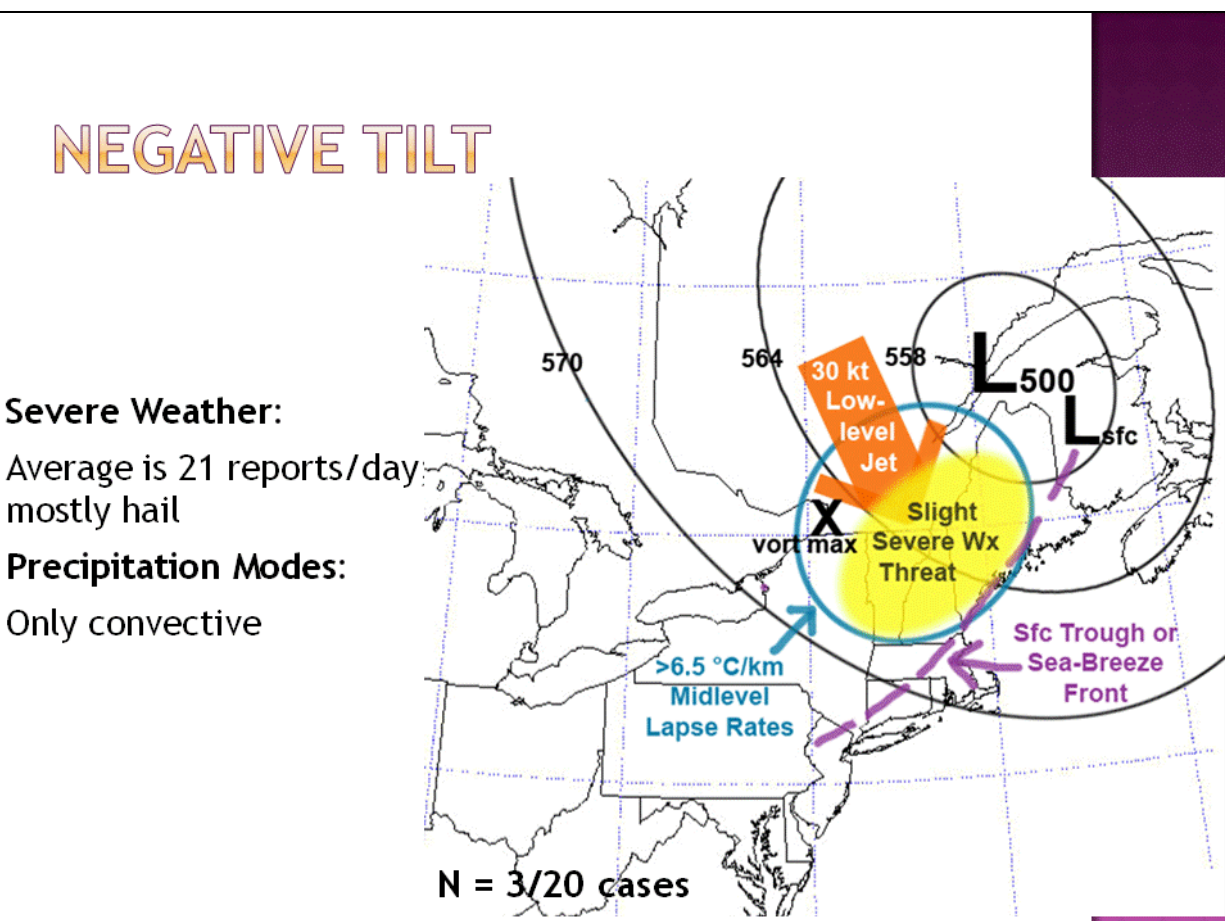
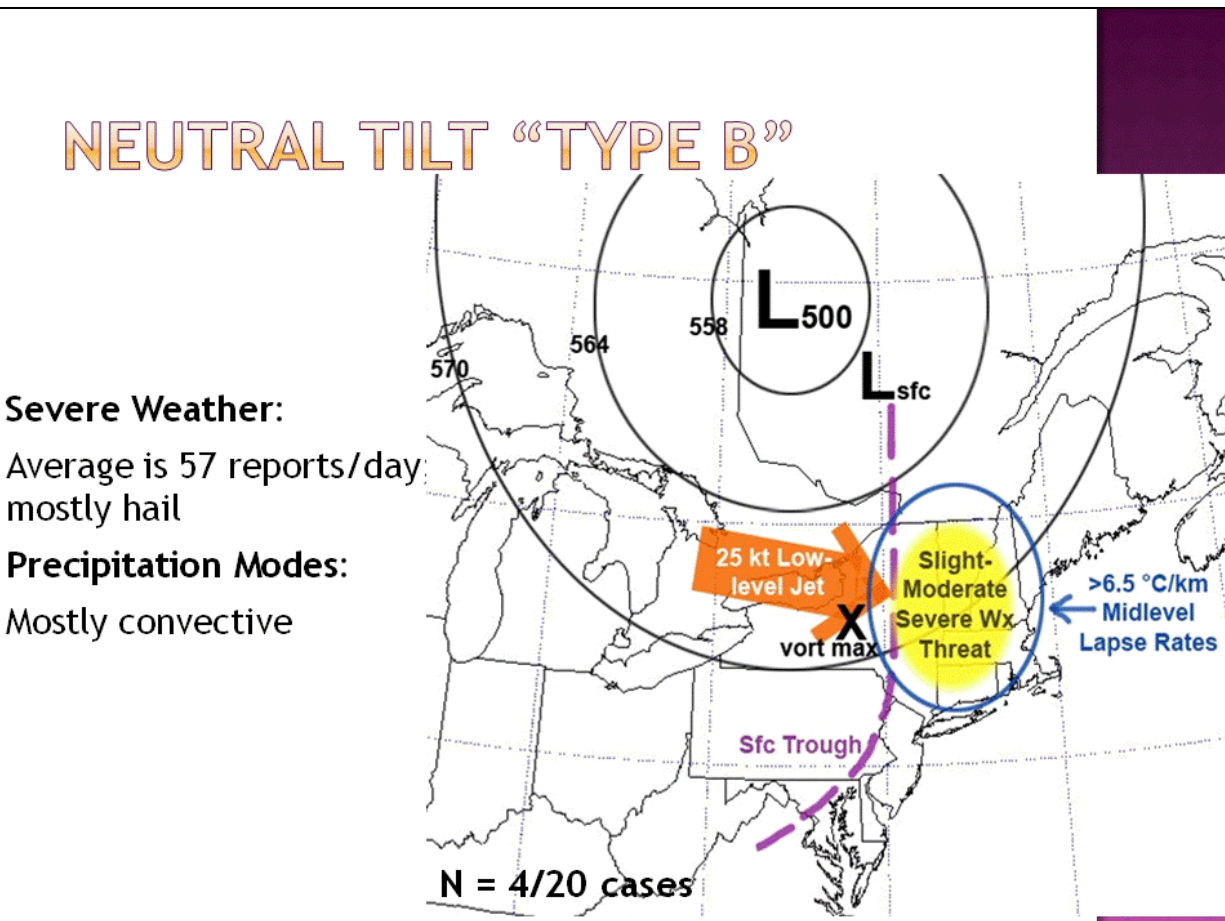
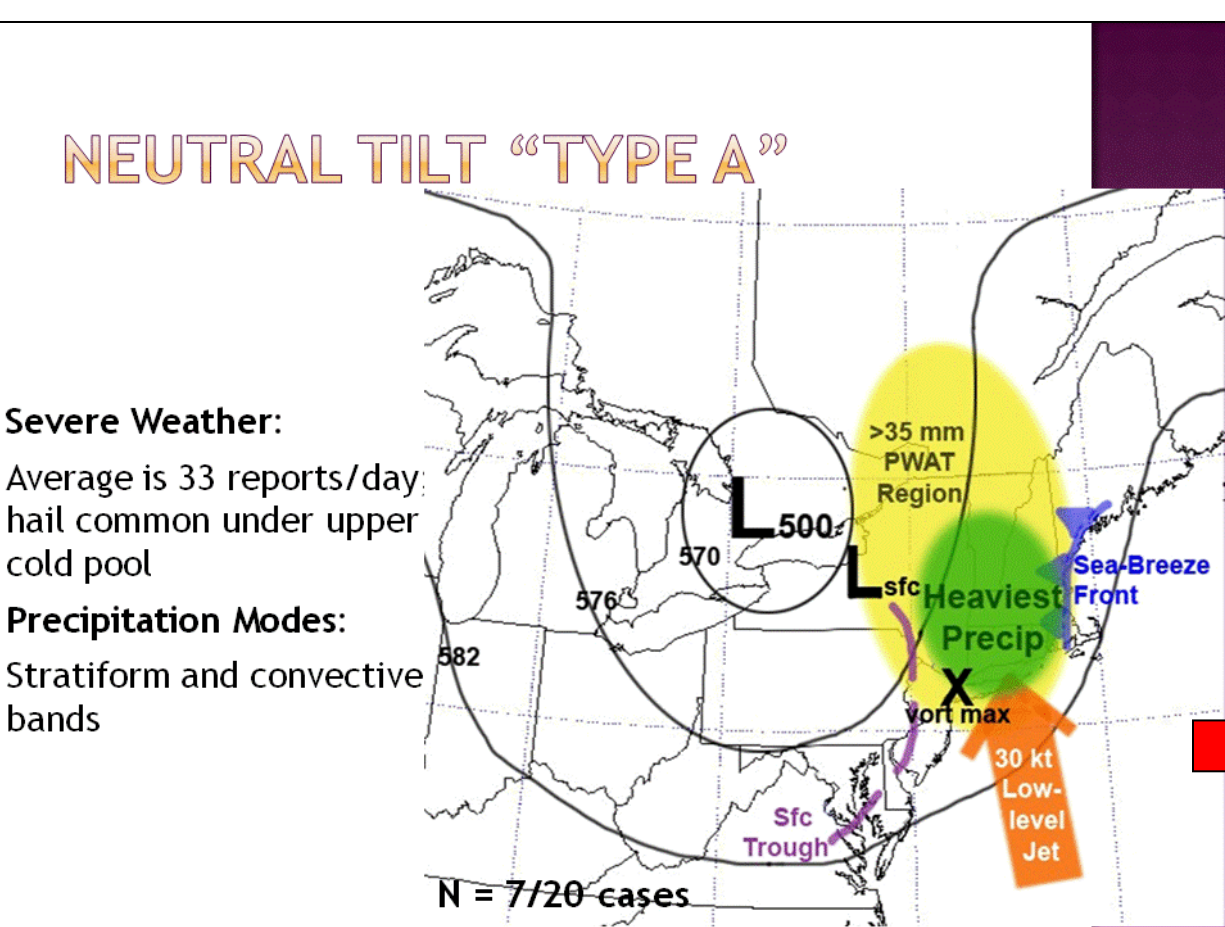


170 total cases: 1 May-30 Sept. 1980-2000
Source: (Novak et al. 2002) -> See preprint for reference



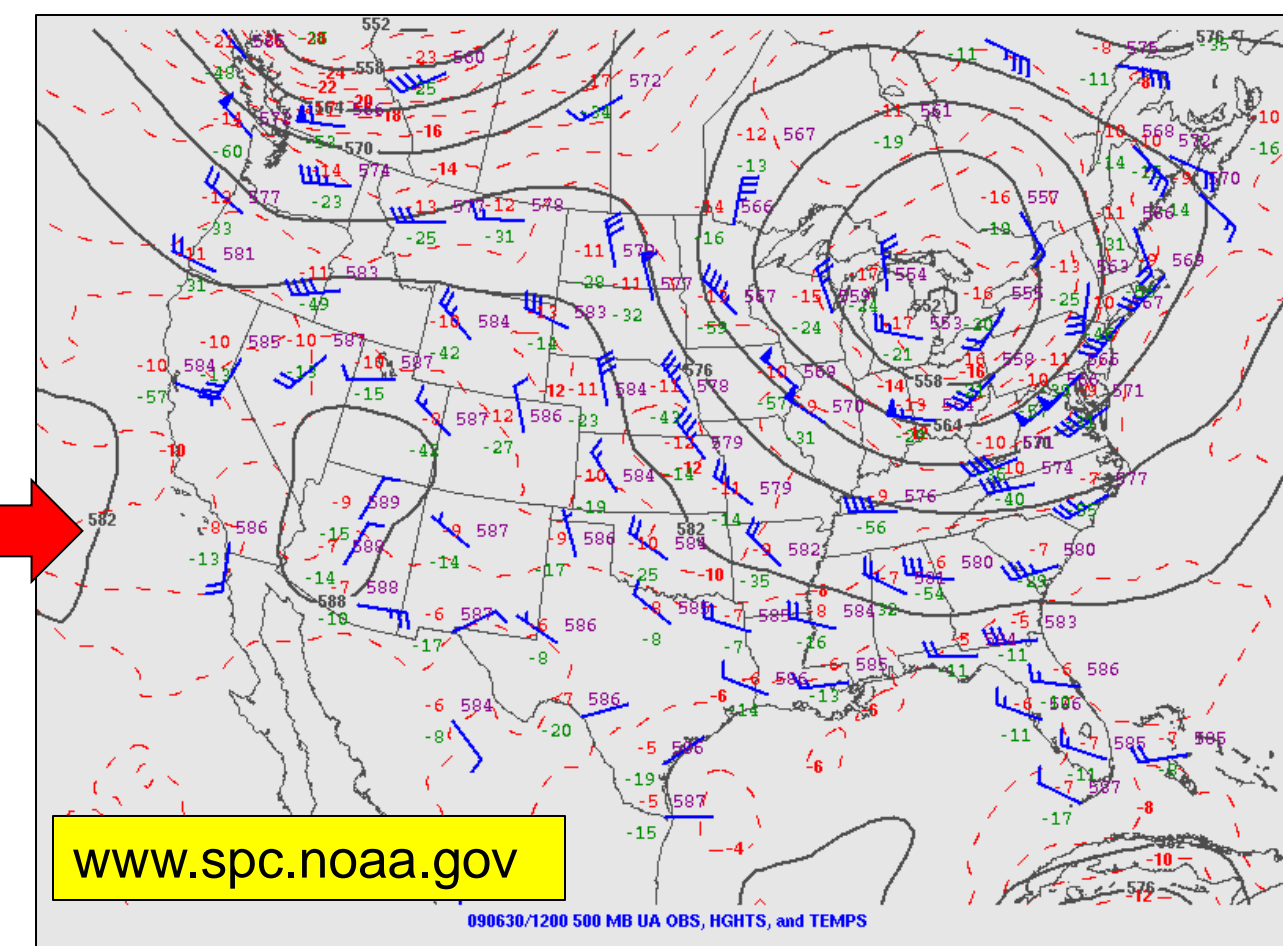
1948-1998 June a) Composite Precipitation Days from Cutoffs daily values and b) % of Climatology Precipitation due to Cutoffs
Source: (Najuch 2004) -> See preprint for reference

5 Pattern Recognition Schematics or Conceptual Models based on the Tilt of 500 hPa Cutoff

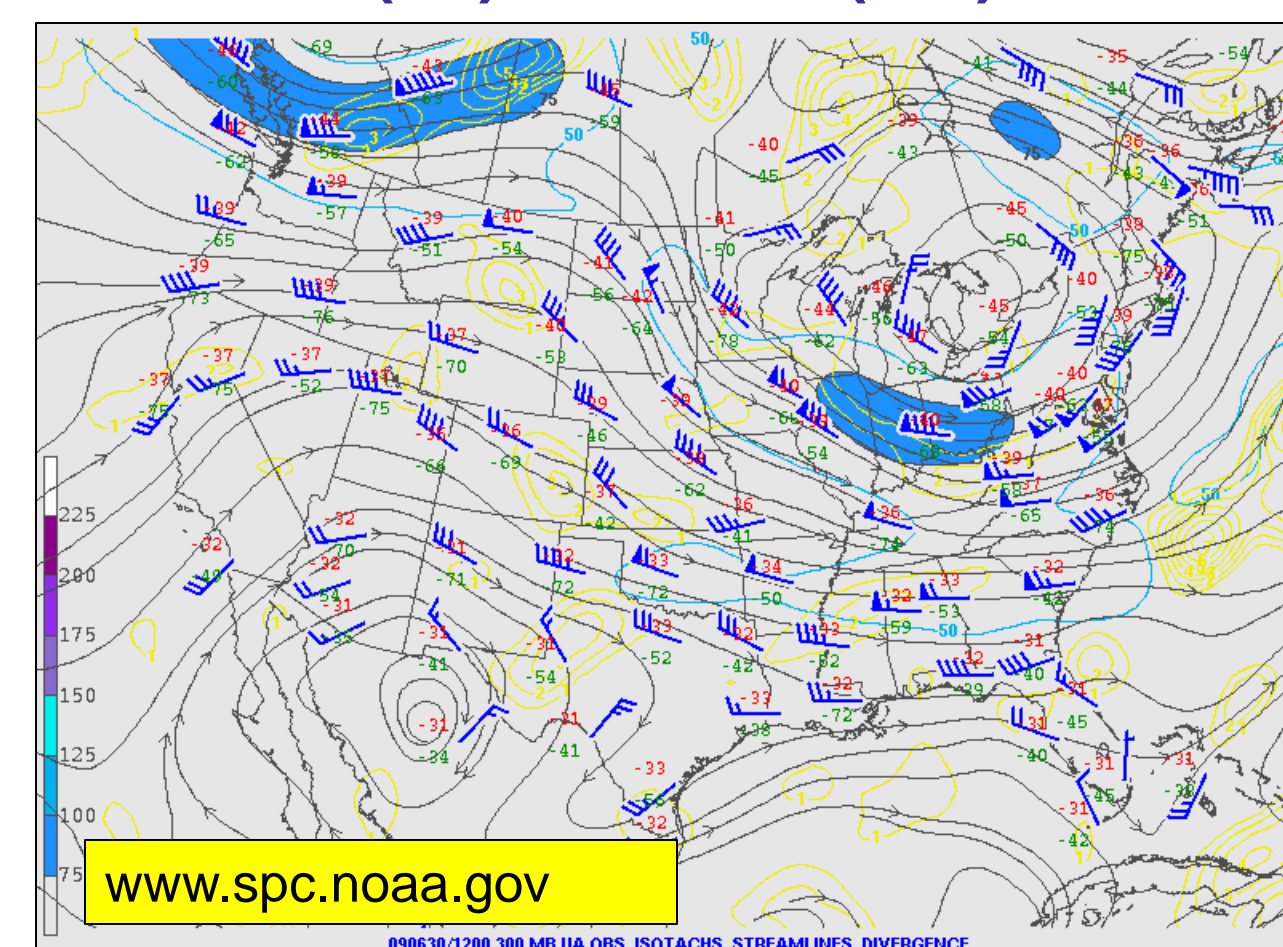


Scalora (2009) examined 20 warm season cutoff cases from June to Sept 2000-08 based on 45 "Storm Days". One of these days was classified based on precipitation (fraction in domain), precipitable water and wind anomaly data in conjunction with synoptic-scale pattern and storm reports.

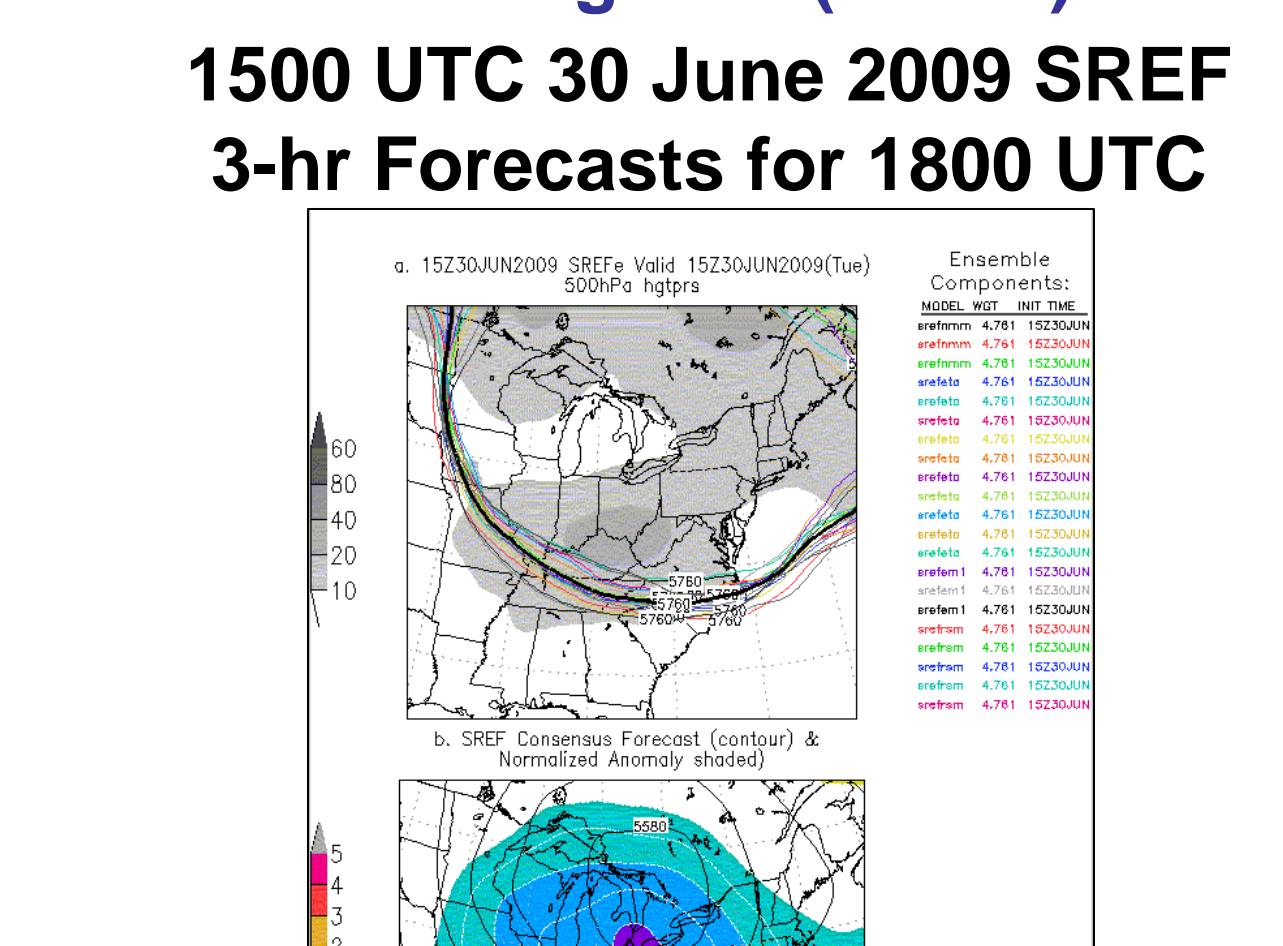
1200 UTC 30 June 2009 Upper Air Analysis



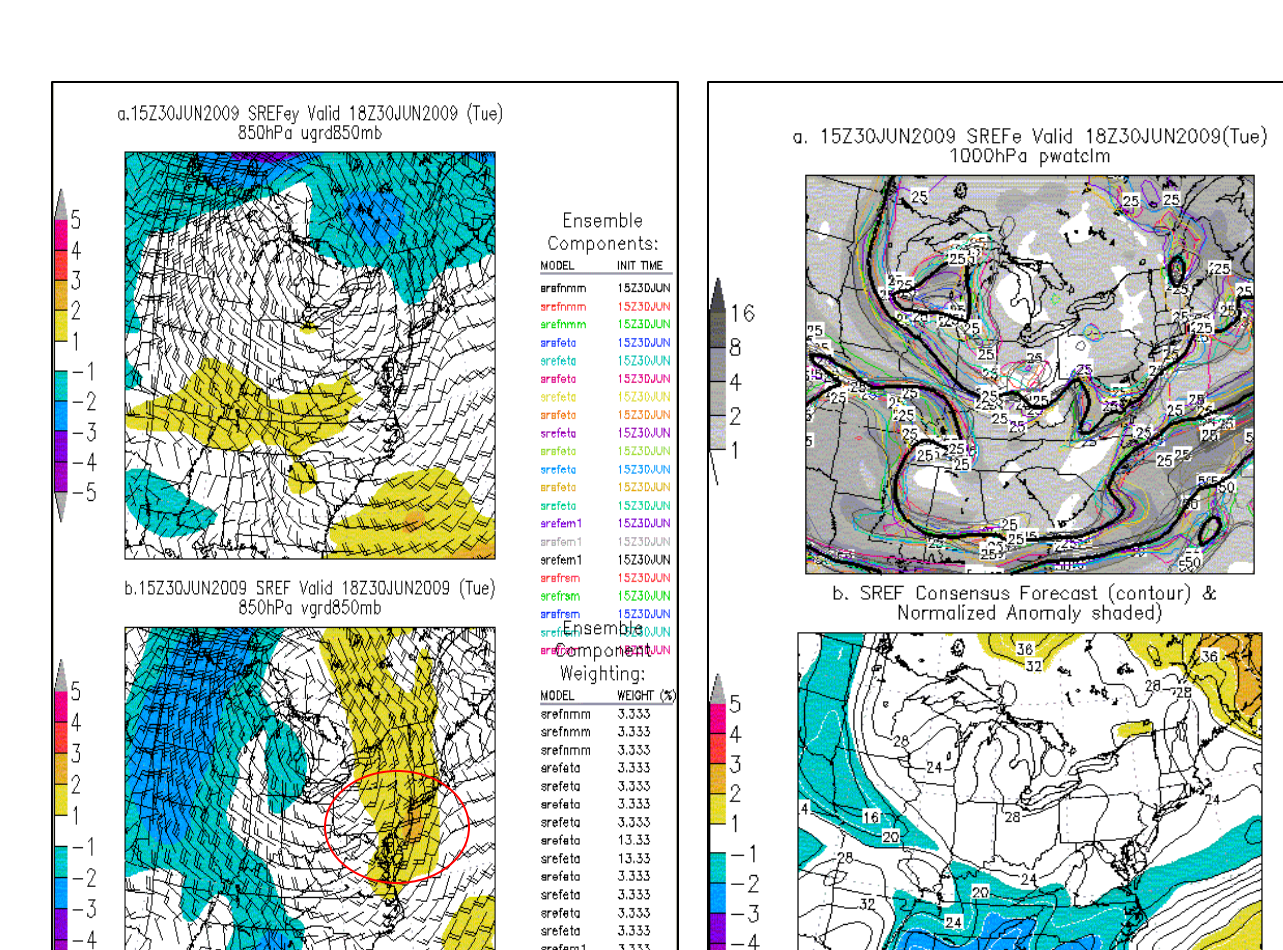
500 hPa Heights (dam), Temps (°C) & Winds (kts)



300 hPa Heights (dam), Streamlines & Divergence (10⁻⁵s⁻¹)



Mean 500 hPa Heights & Anomalies

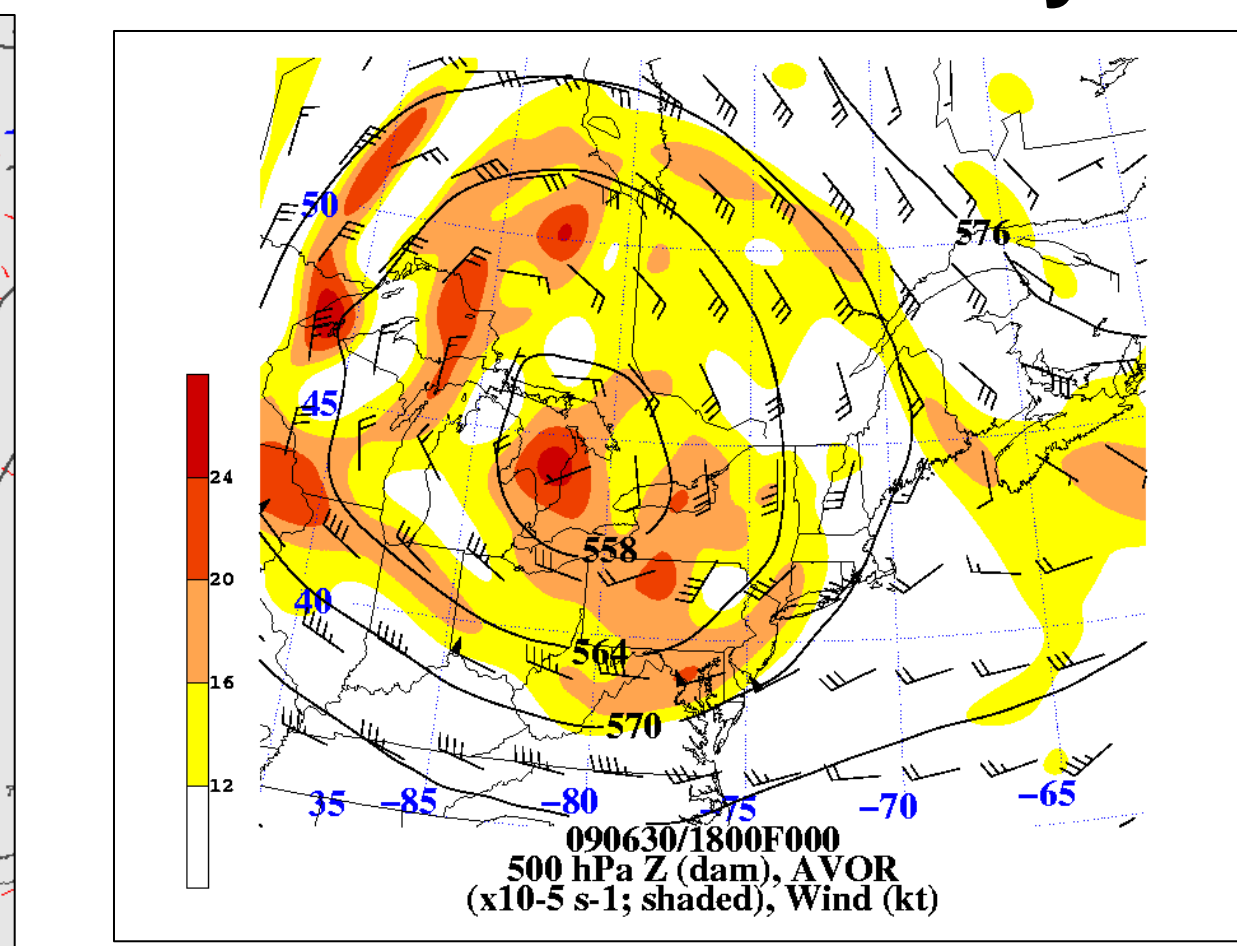


850 hPa U & V Wind Anomalies

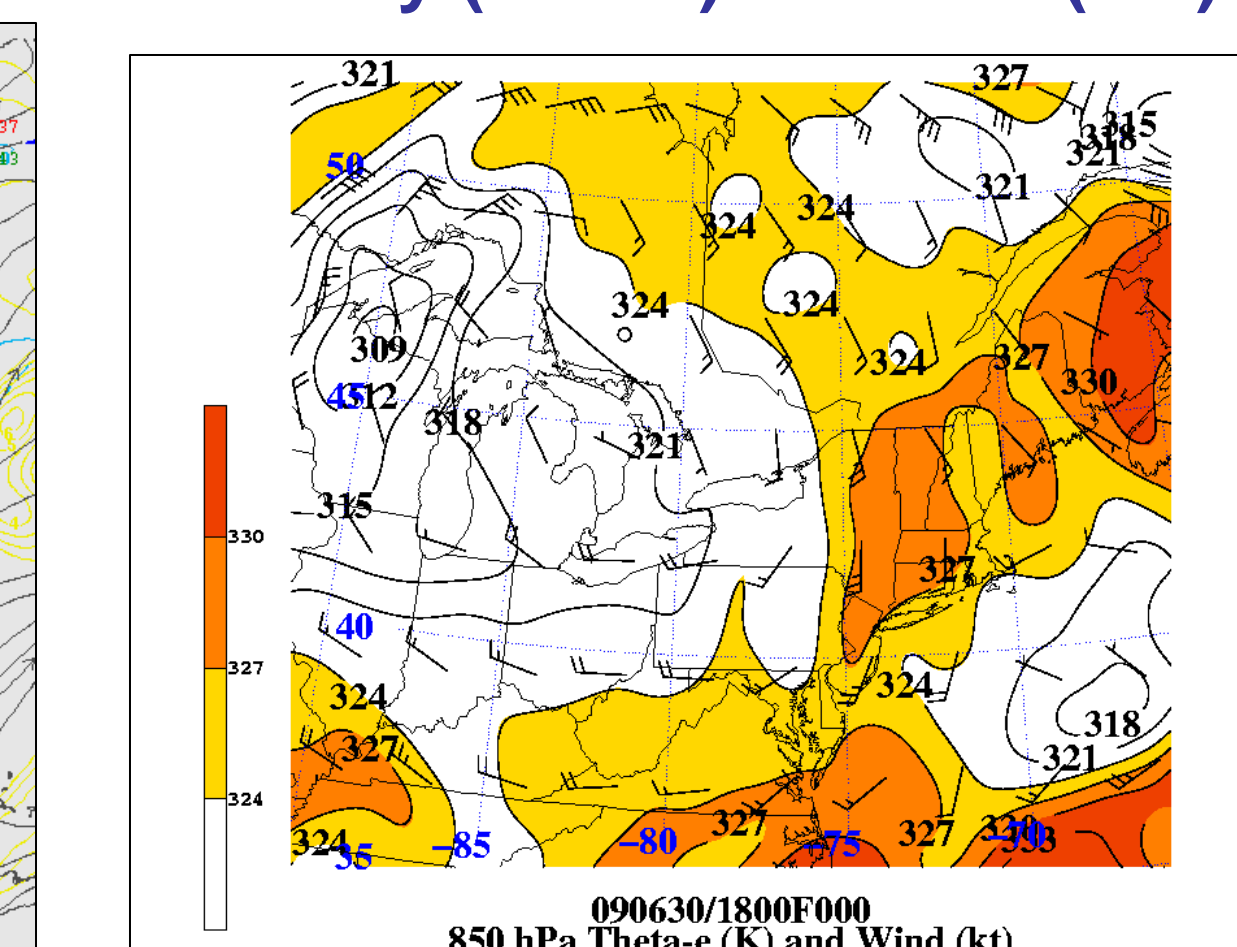


30 June 2009 Case

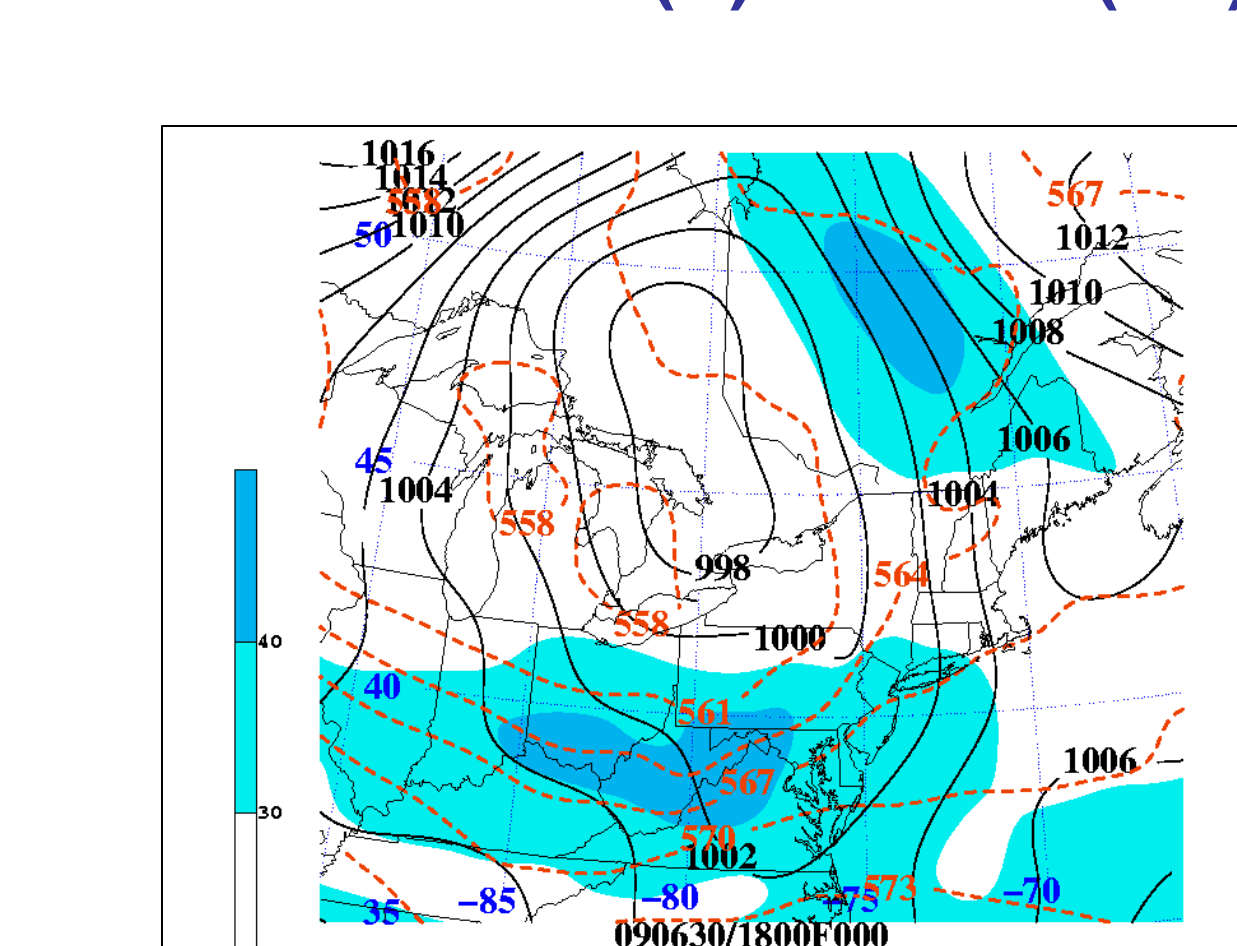
1800 UTC 30 June 2009 0.5° GFS Initial Analysis



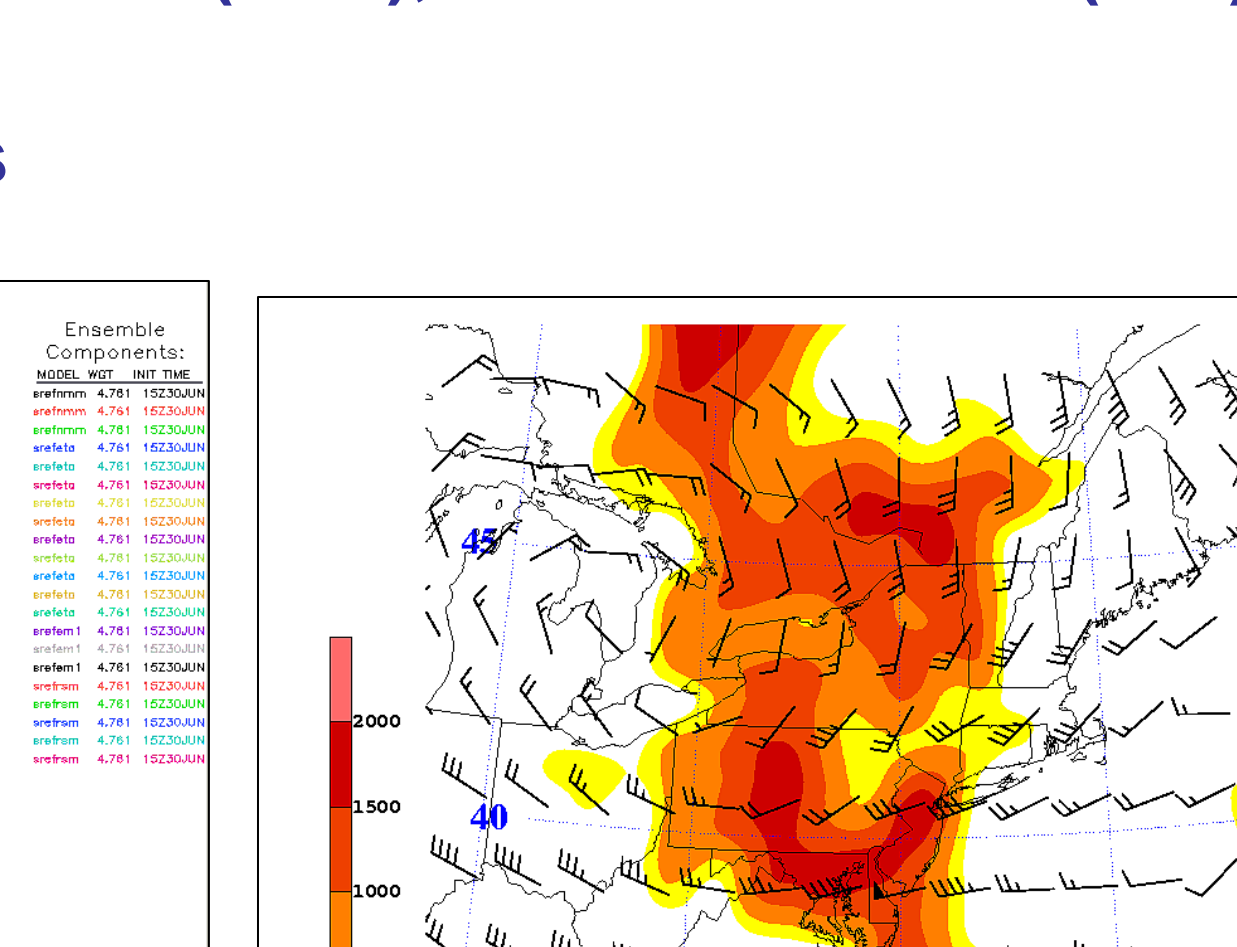
500 hPa Heights (dam), Absolute Vorticity (10⁻⁵s⁻¹) & Winds (kts)



850 hPa Θe (K) & Winds (kts)



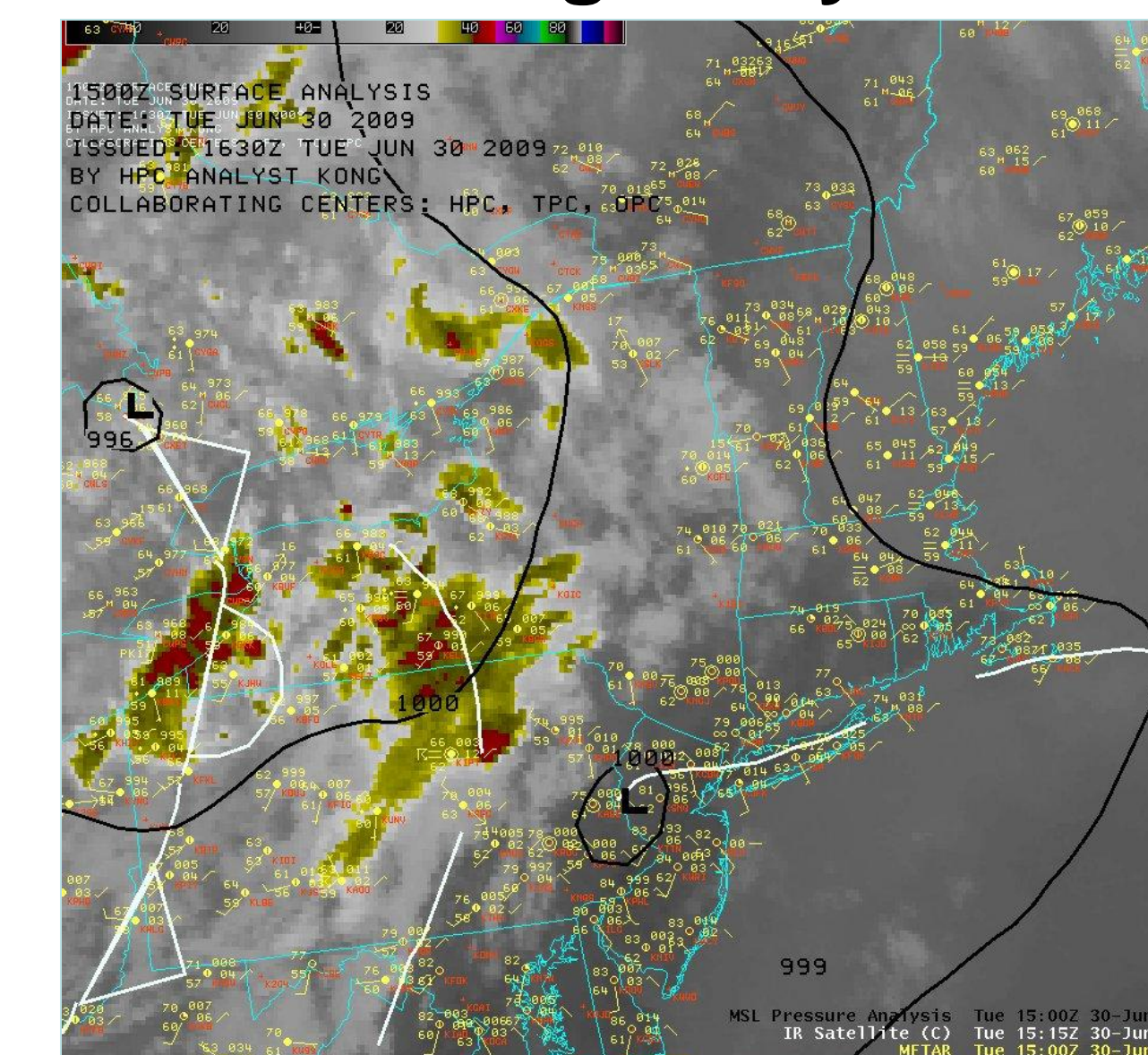
MSLP (hPa), 1000-500 hPa Thickness (dam), & 250 hPa Winds (m/s)



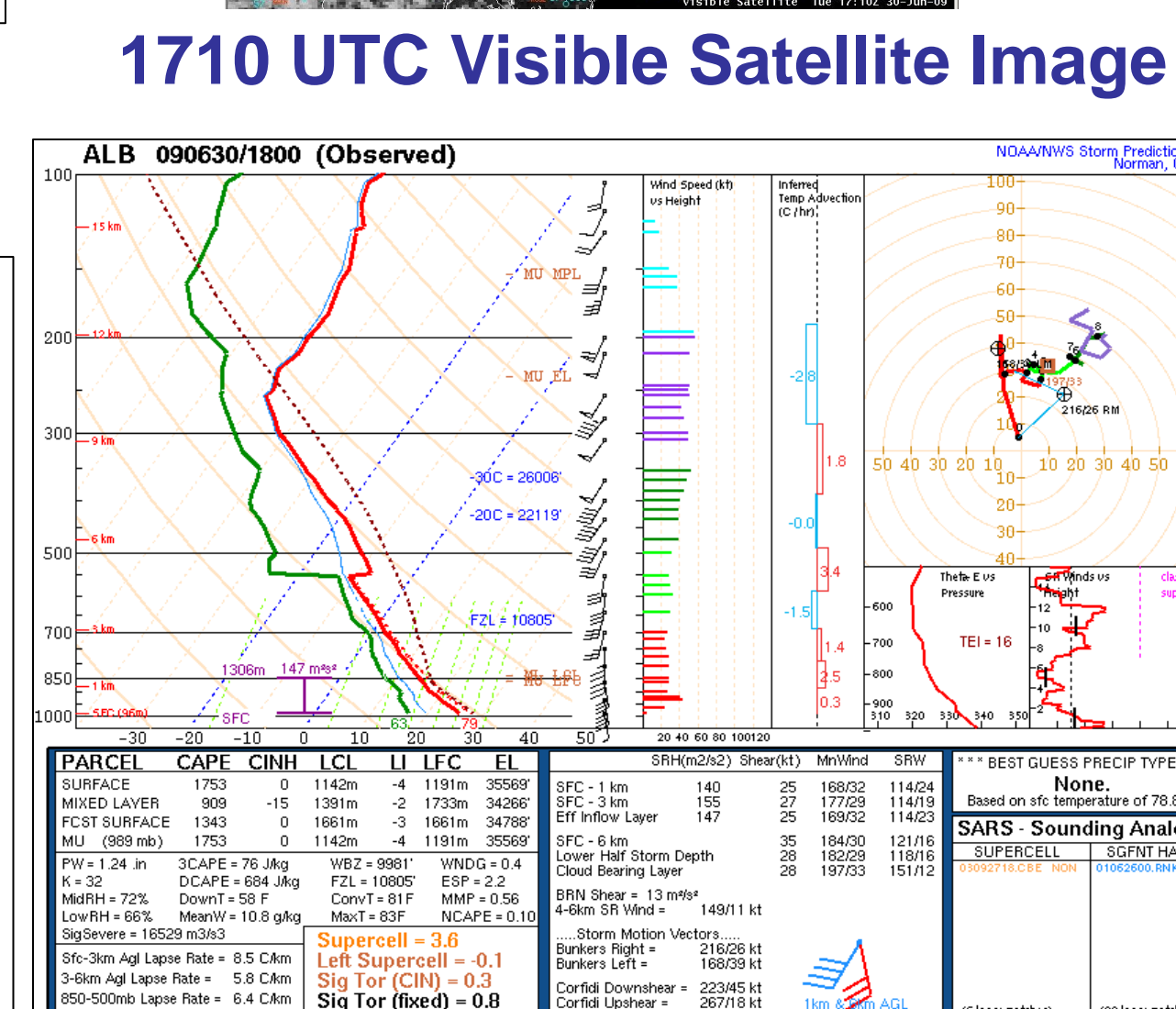
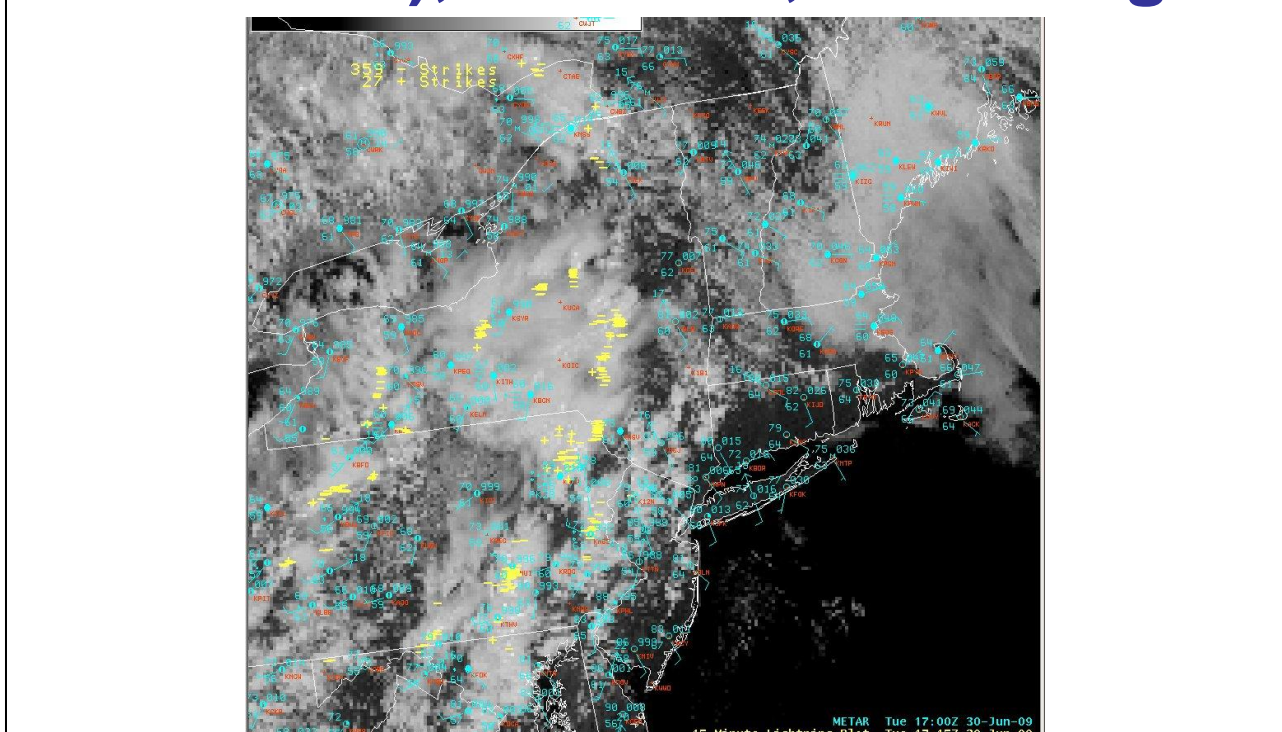
SBCAPES (J kg⁻¹) & 1000-500 hPa Shear (kts)



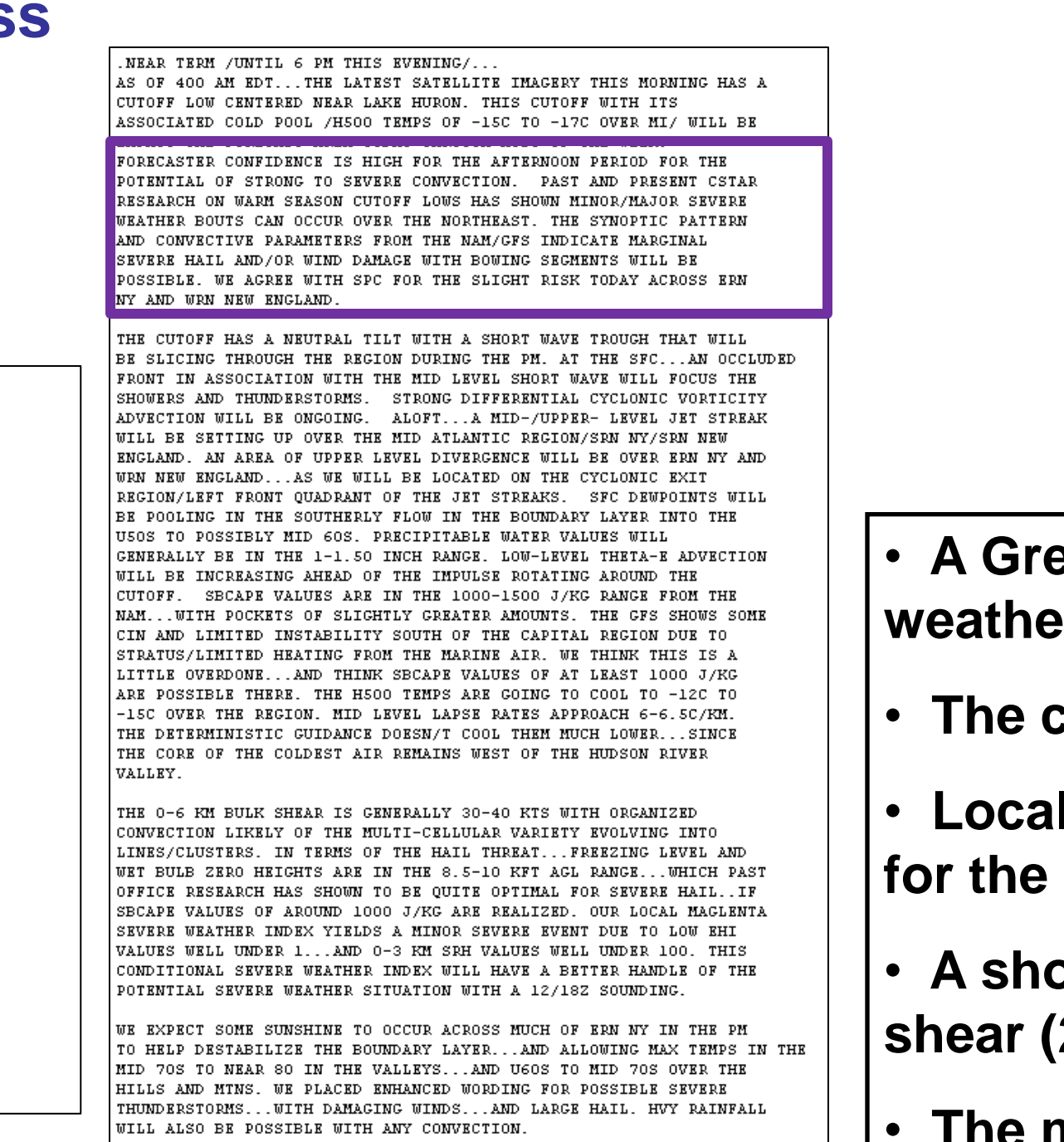
Satellite, Surface & Sounding Analysis



1500 UTC Surface Map (MSLP and Fronts), METARS, & IR Image



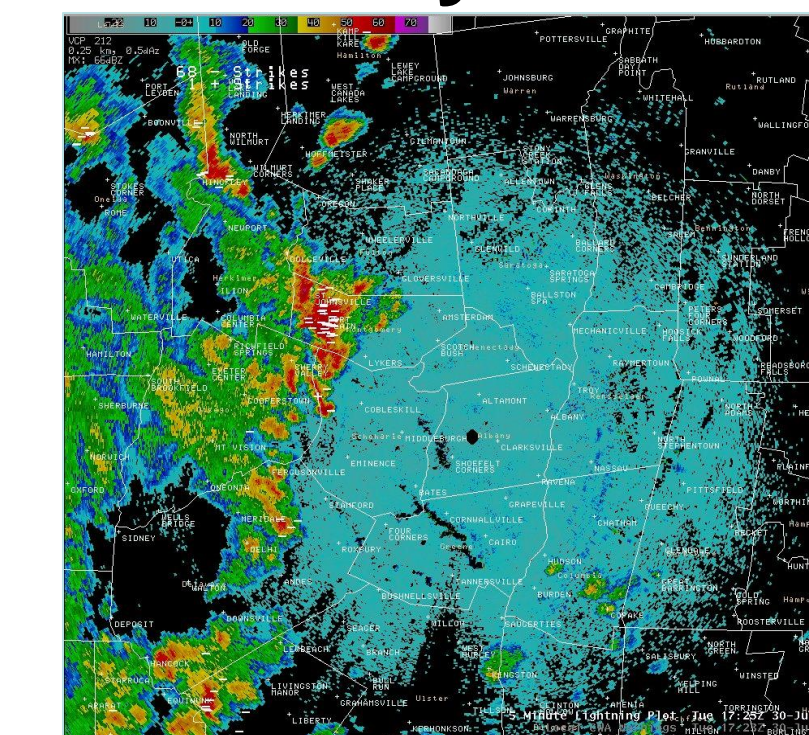
1800 UTC KALB Sounding



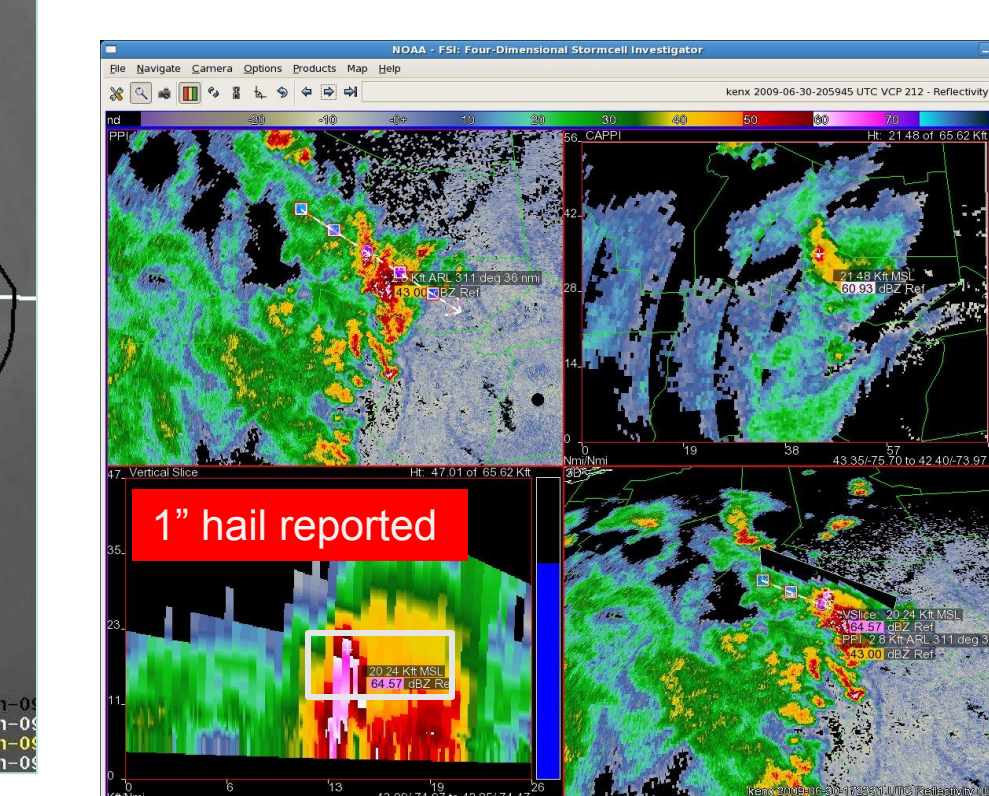
WFO ALB 30 June 2009 4 AM Discussion

Summary of the 4 AM discussion from WFO ALB on 30 June 2009.

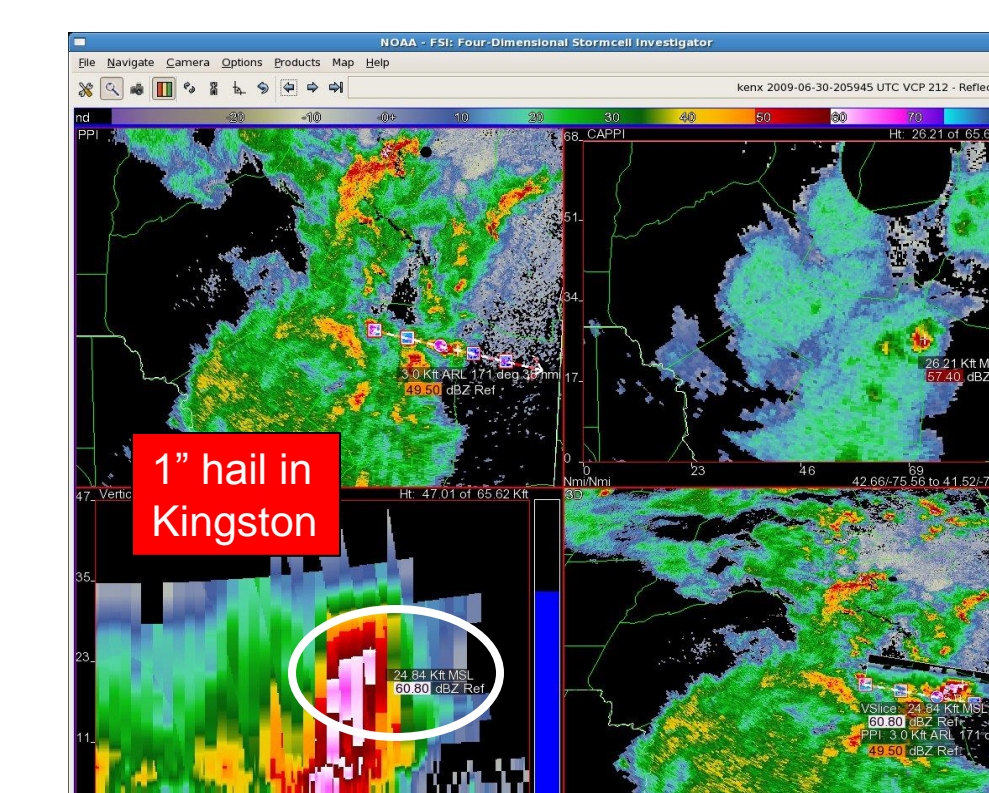
Storm-Scale Analysis



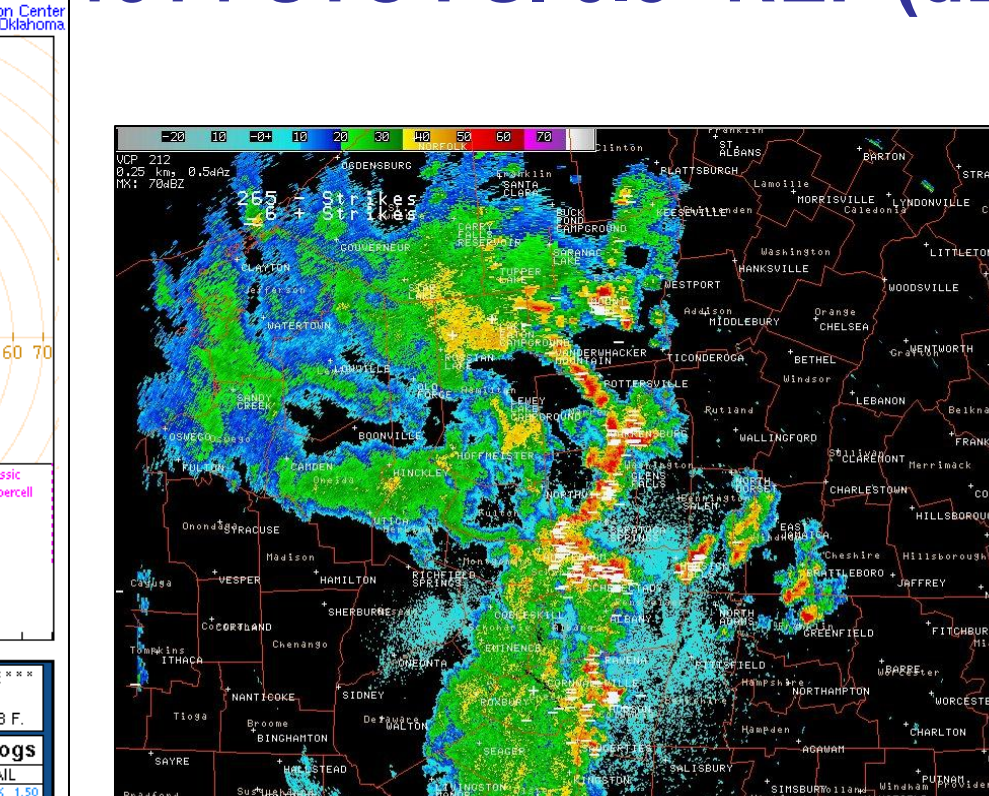
1723 UTC 0.5° KENX Base REF (dBZ) and Lightning



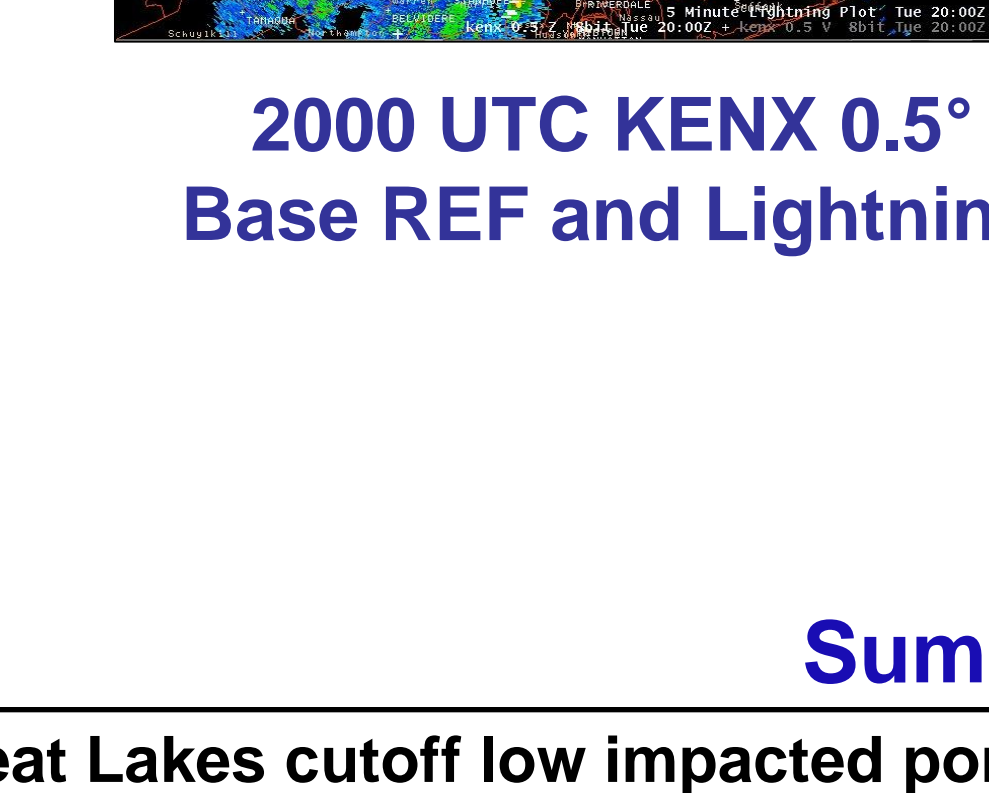
1723 UTC FSI 0.5° REF (dBZ)



1914 UTC FSI 0.5° REF (dBZ)



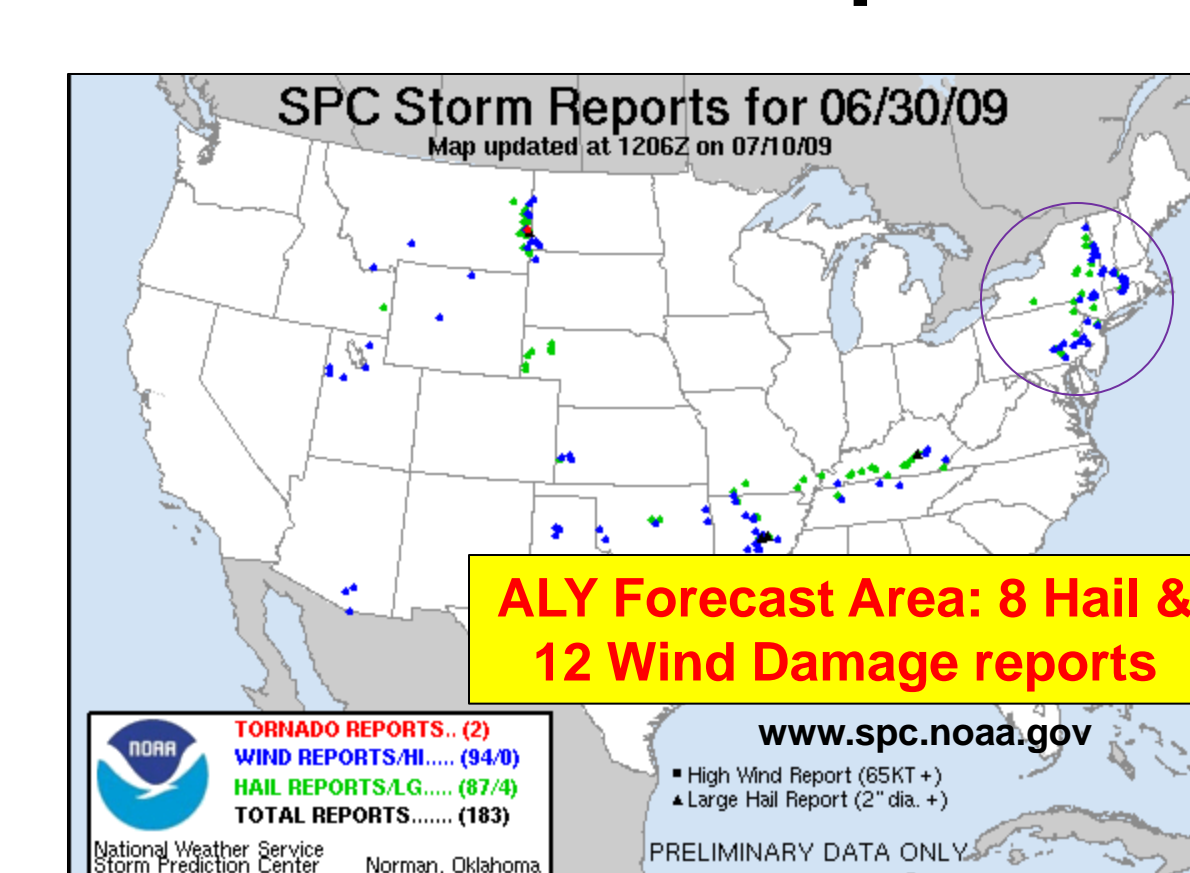
2000 UTC KENX 0.5° Base REF and Lightning



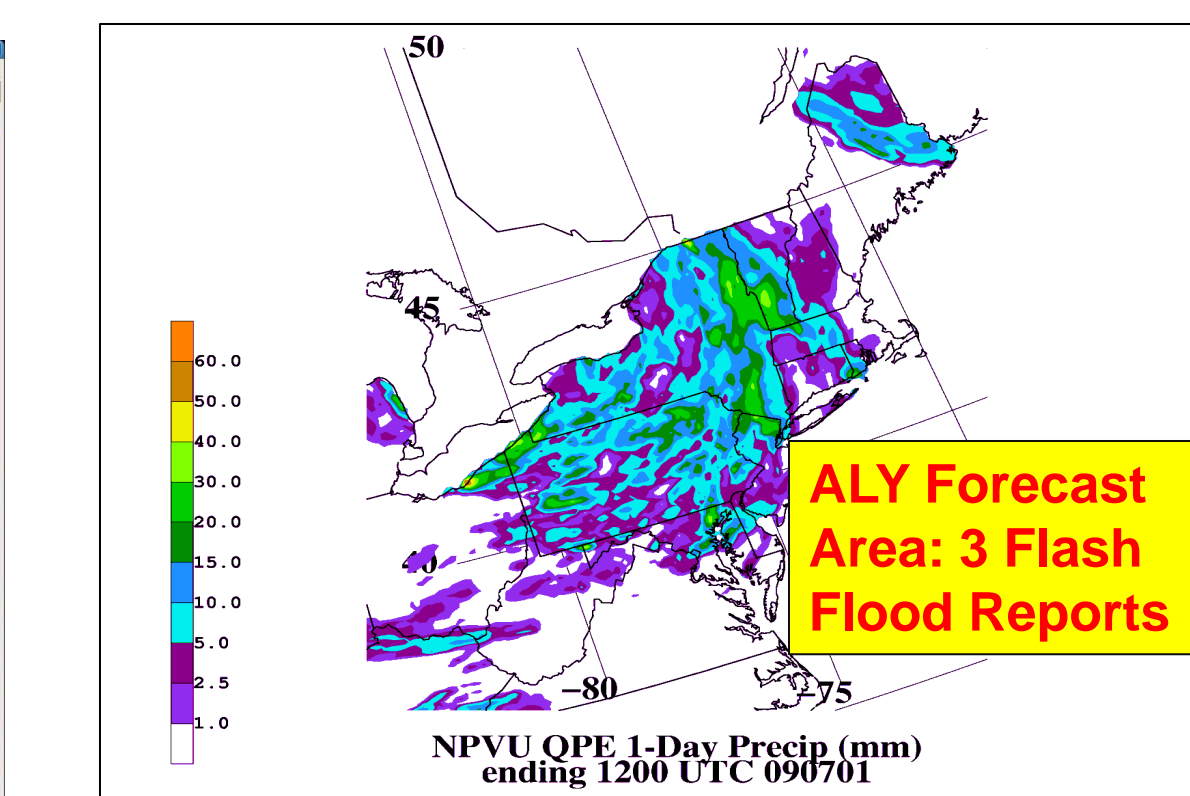
Summary

- A Great Lakes cutoff low impacted portions of the Northeast with severe weather (around 40 reports) and isolated flash flooding on 30 June 2009
- The cutoff fit well into the Neutral-Tilt "Type A" conceptual model
- Local forecast discussions identified the key synoptic and mesoscale features for the potential severe weather with the conceptual model
- A short-wave trough and favorable jet dynamics coupled with adequate deep shear (25-35 kts) and large instability allowed multicell clusters to form
- The mid-level lapse rates were marginal, but low wet-bulb zero heights, and freezing levels favored large hail
- Low-level 850 hPa +V anomalies (1 to 3 standard deviations above normal) advected in Atlantic moisture (PWATs not anomalously high) for heavy rainfall and flooding due to training convection (June 30th and July 1st)

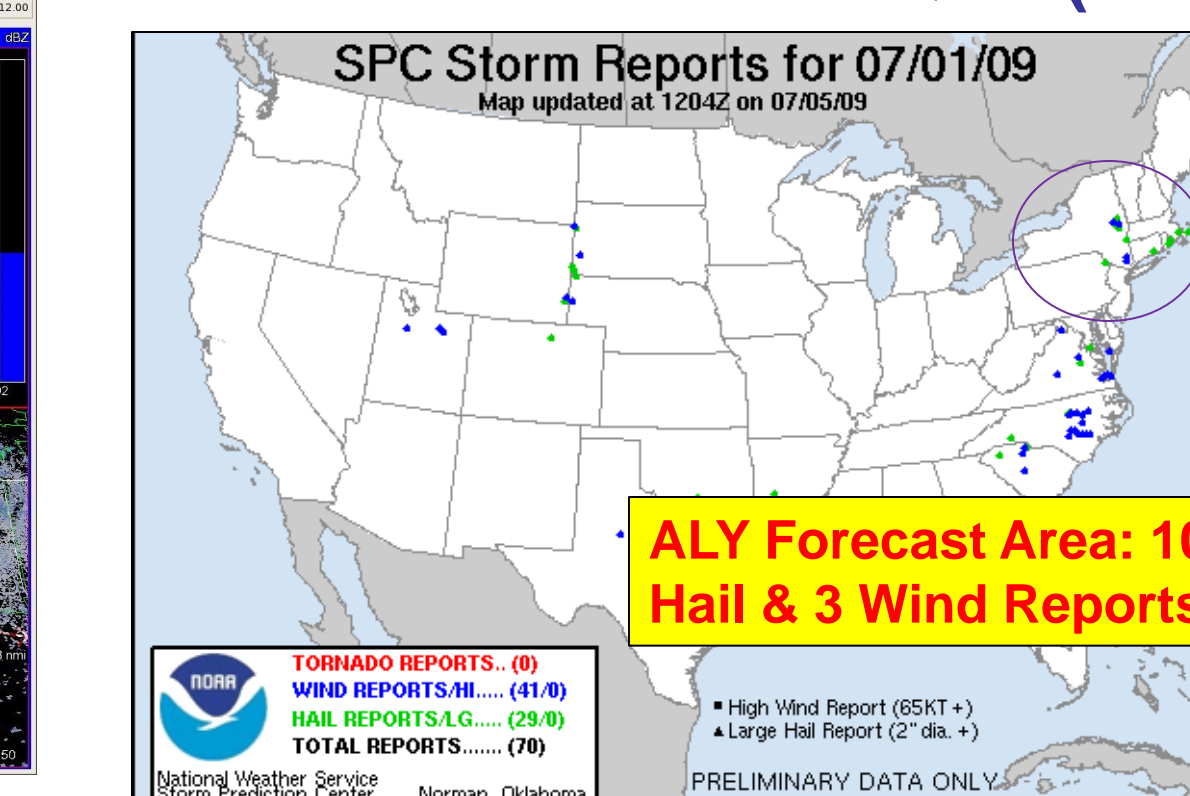
Cutoff Low Impacts



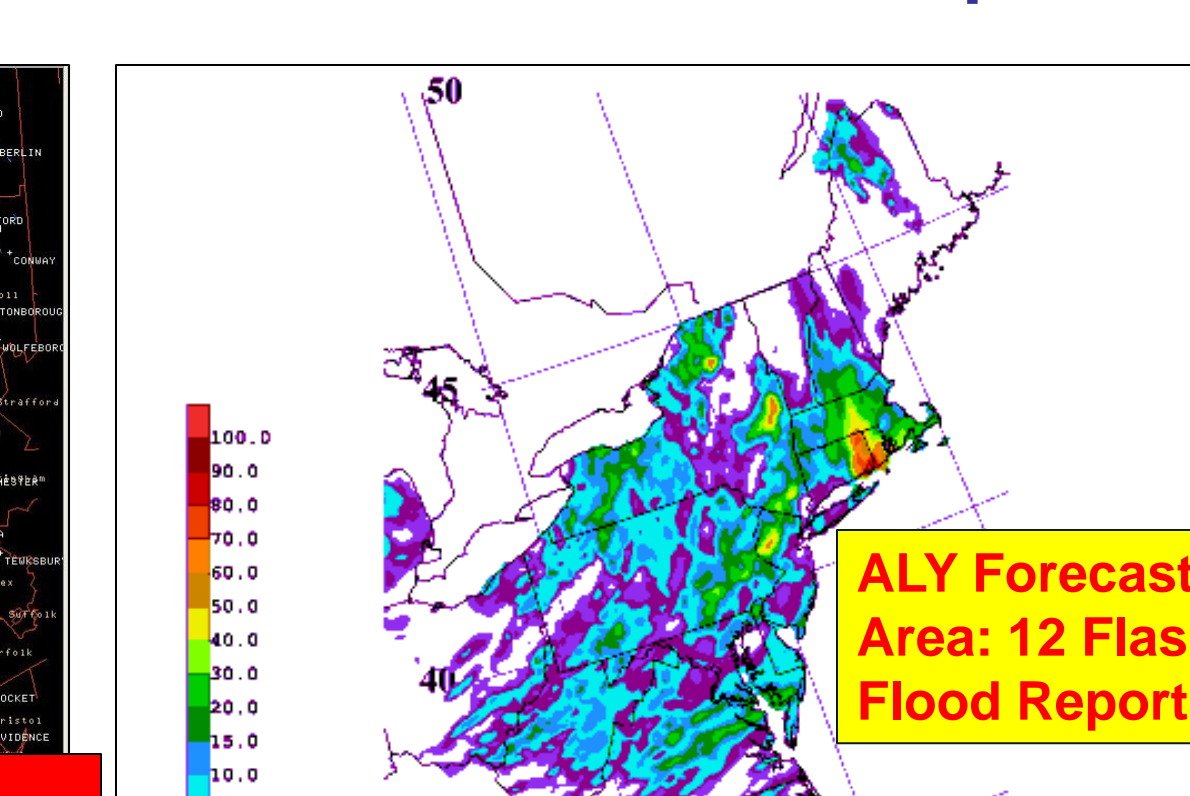
30 June 2009 Storm Reports



NWS National Precipitation Verification Unit 24-hr QPE (mm)



1 JUL 2009 Storm Reports



NWS National Precipitation Verification Unit 24-hr QPE(mm)



Neil Stuart in flood waters near Albany