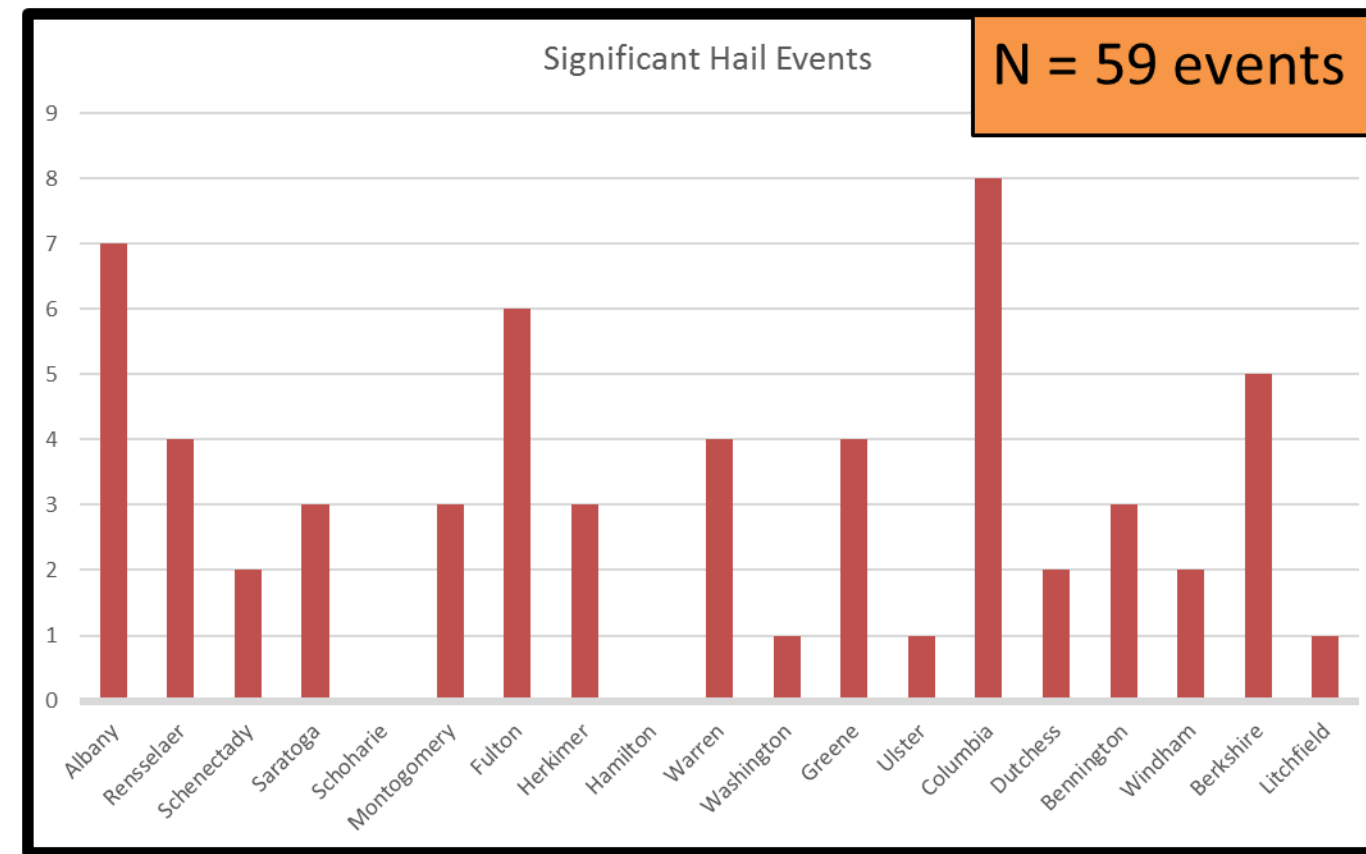


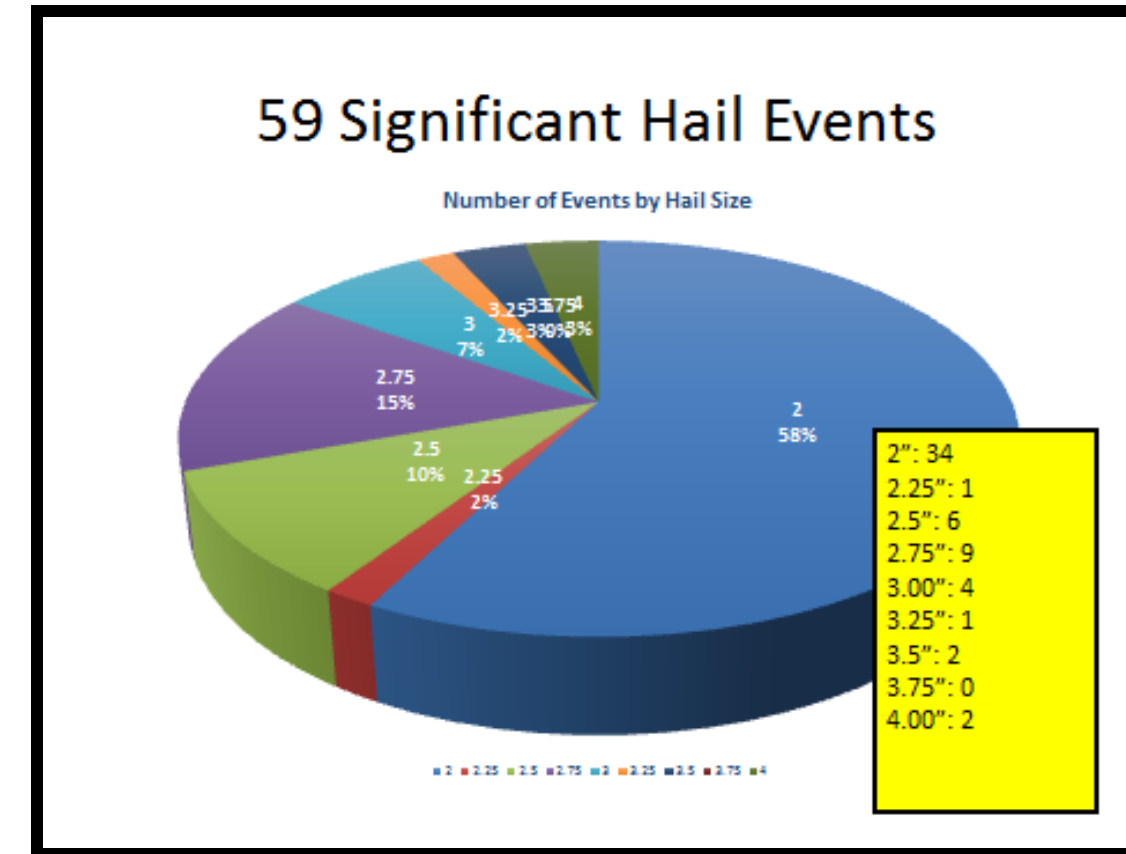
Thomas A. Wasula, Brian J. Frugis, & Daniel B. Thompson
NOAA/National Weather Service, Albany, NY

ALY County Warning Area Significant Hail Climatology 1950 - March 2018

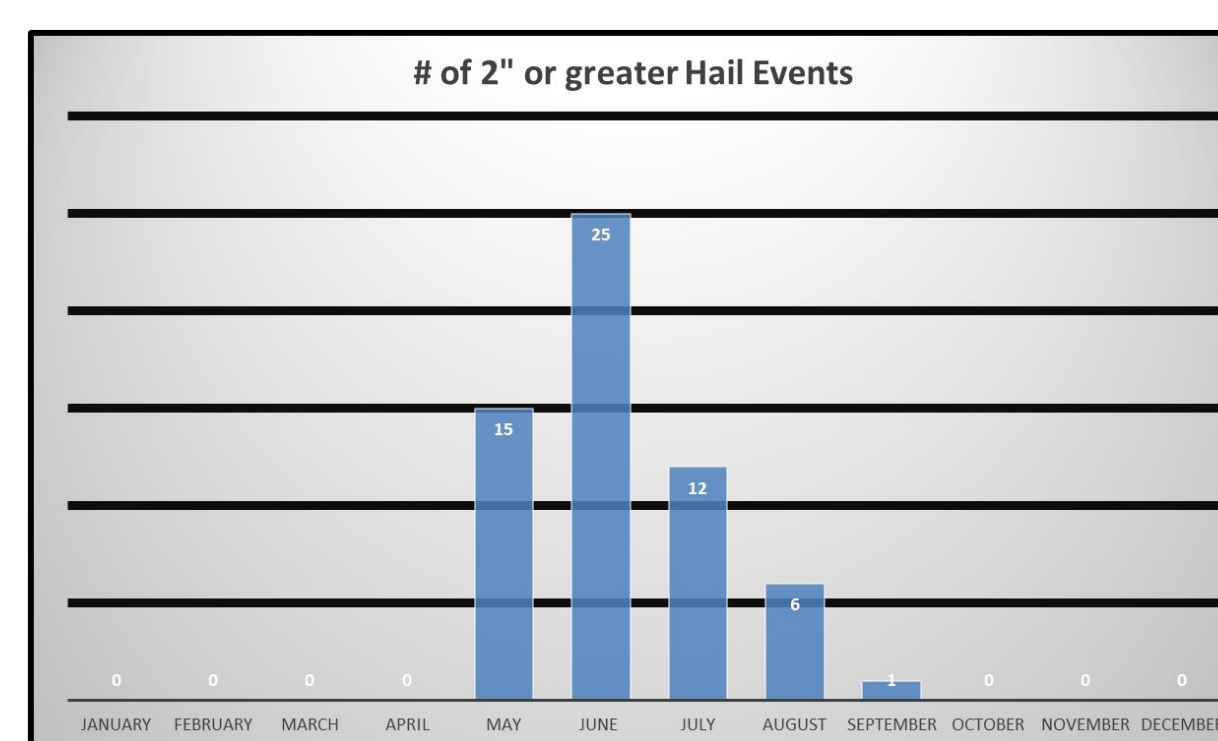
Reports vs. Counties in WFO Albany CWA



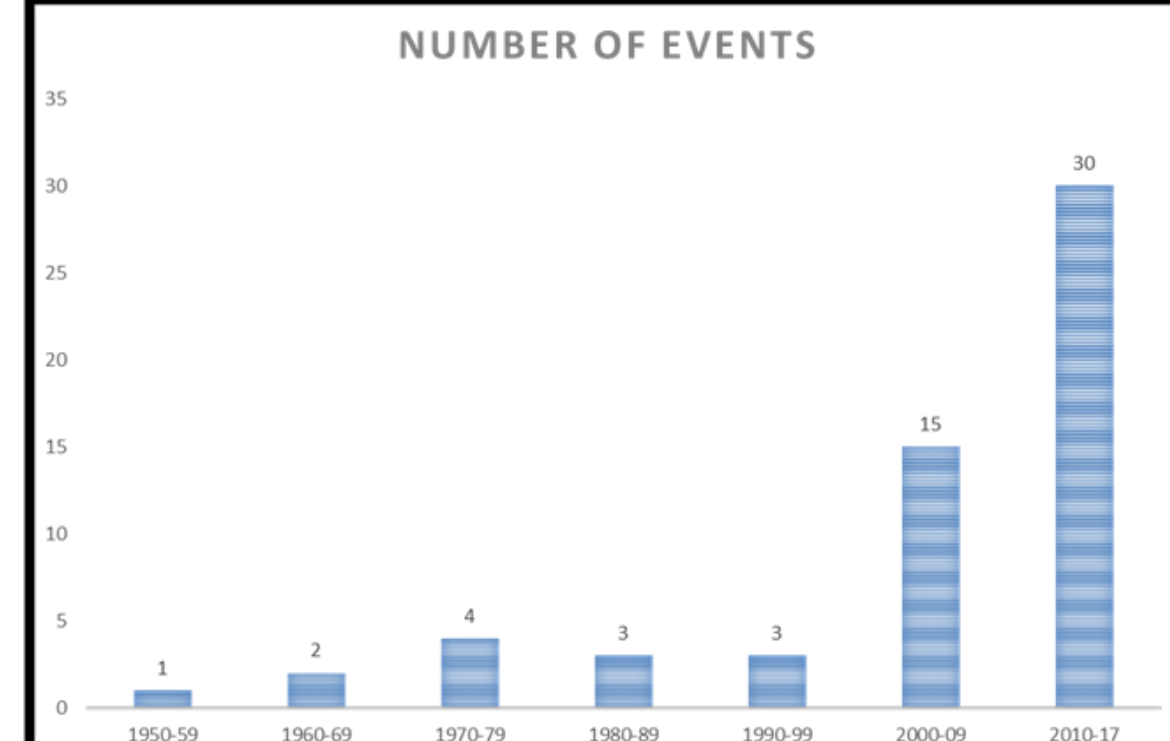
Reports by Significant Hail Size



1950 to March 2018 WFO ALY Significant Hail Climatology by Month



WFO ALY Significant Hail by the Decade (n=59)



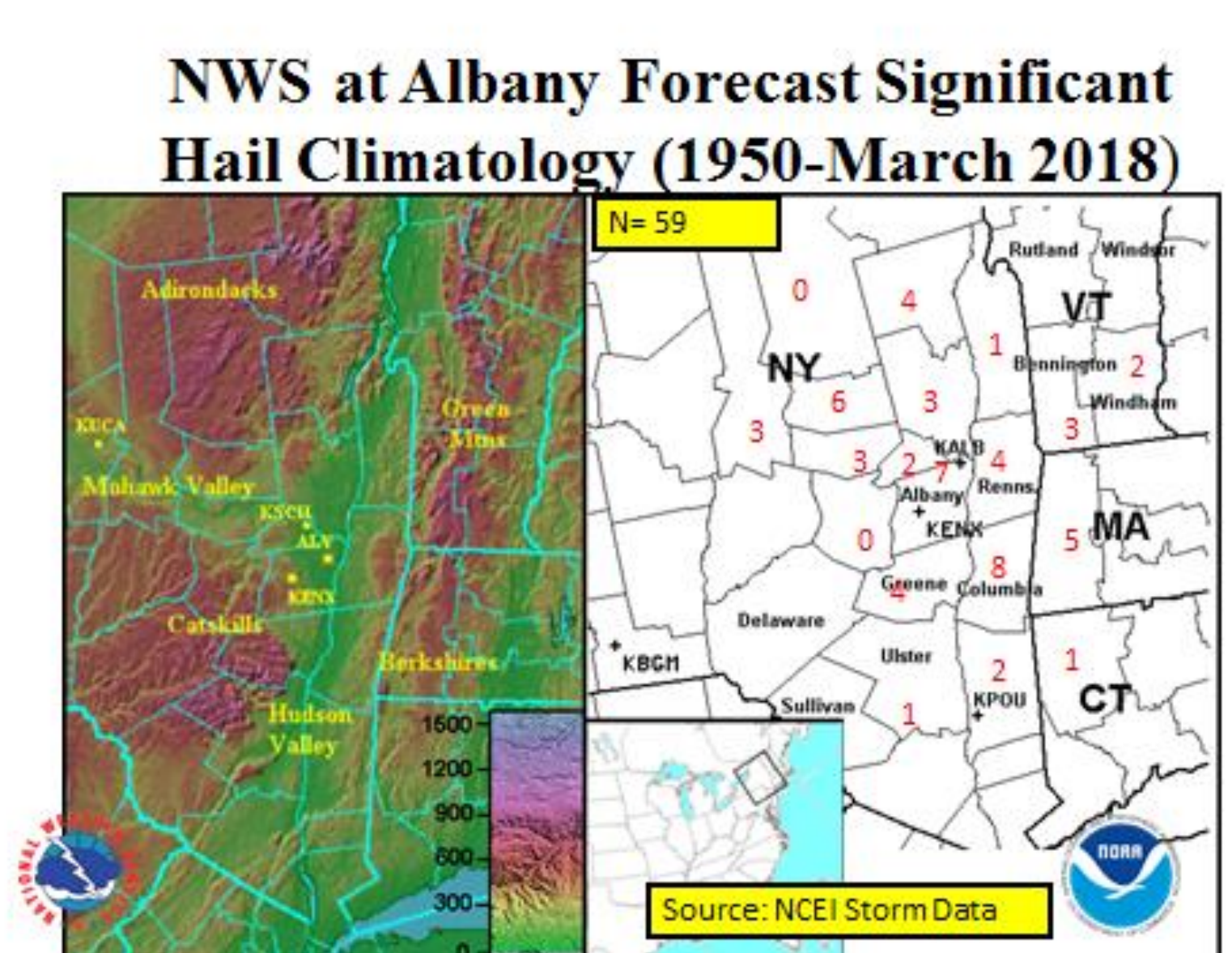
Motivation

- Five "historical" or significant hail events have occurred in the ALY forecast area since 2011 (poster will briefly review 2 of them)
- CSTAR VI with SUNY Albany Goals (2016 – Present)
- (1) To examine a variety of severe weather topics including: "an expansion of the ALY 1" hail study, tornado climatology and Vr-shear study, role of complex terrain, and the used of dual polarization data in severe weather operations."
- (2) Key Question: What caused the anomalously "large" hail stones?

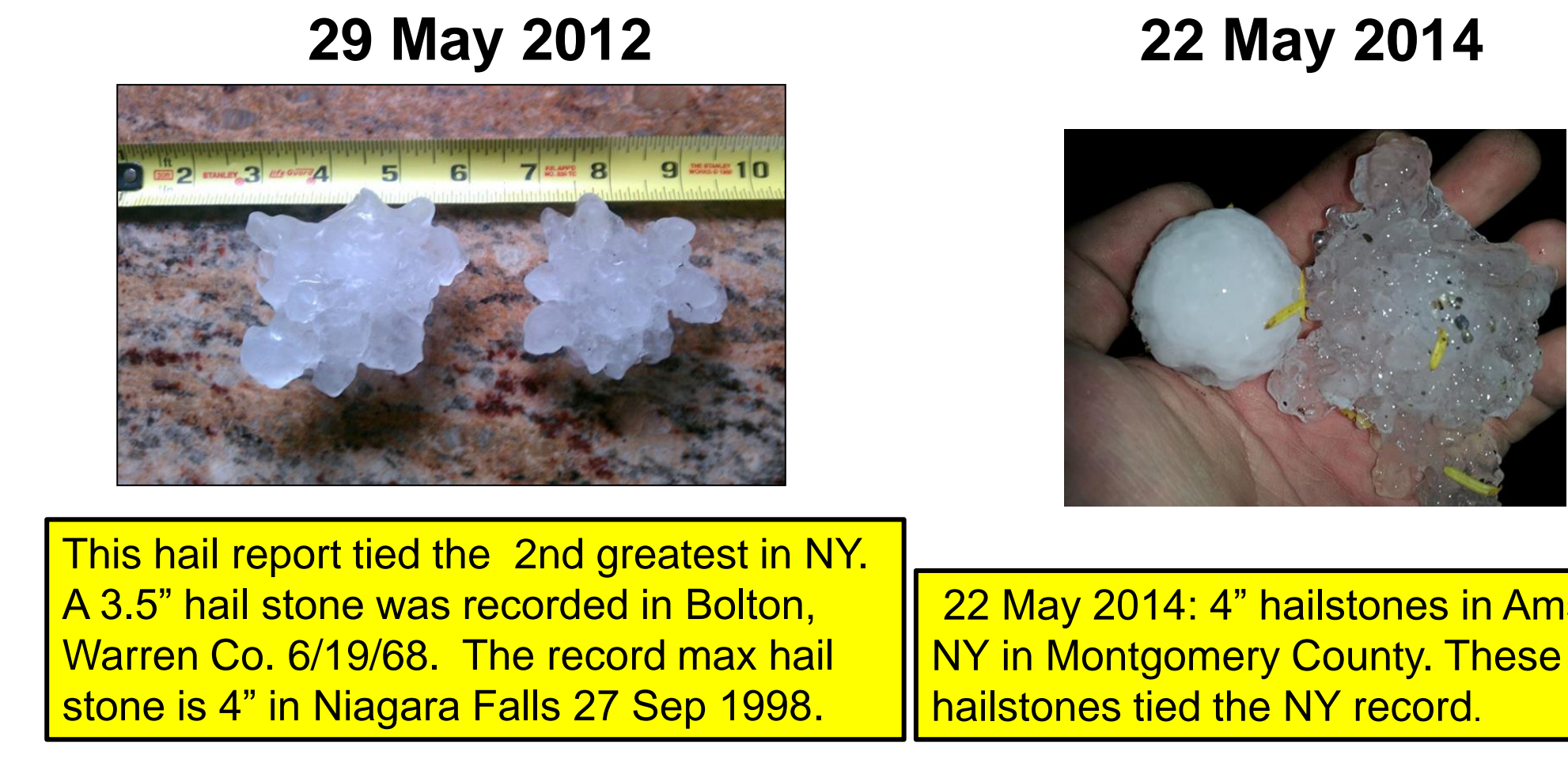
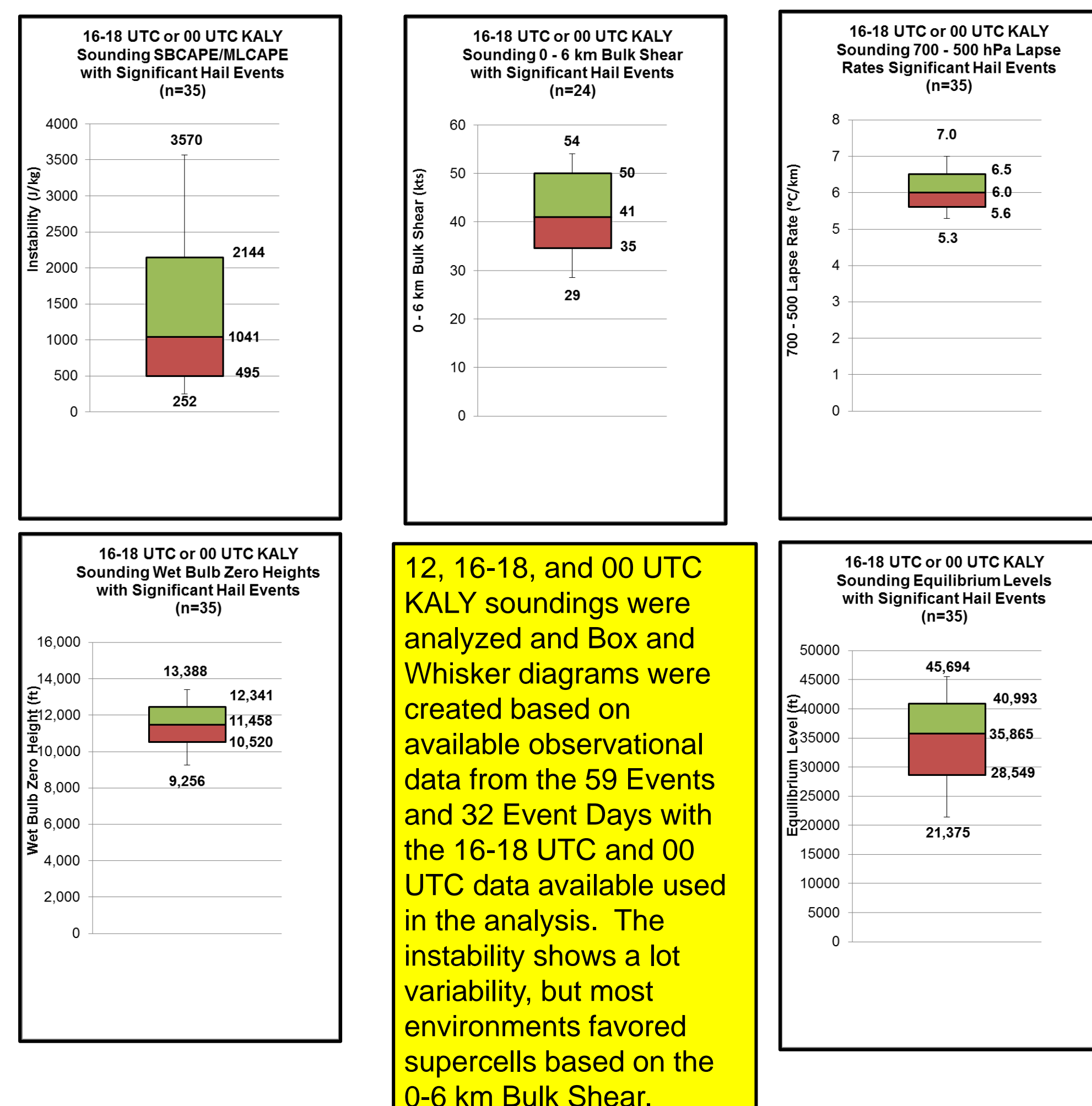
CSTAR Grant #: NA16NWS4680005

Background and Definition

- NCEP SPC significant severe thunderstorm definition:
- ✓ Wind gusts (measured or estimate) ≥ 65 knots (74.8 mph) OR
- ✓ Hail ≥ 2 inches (5.0 cm) in diameter OR
- ✓ EF2 tornado or greater

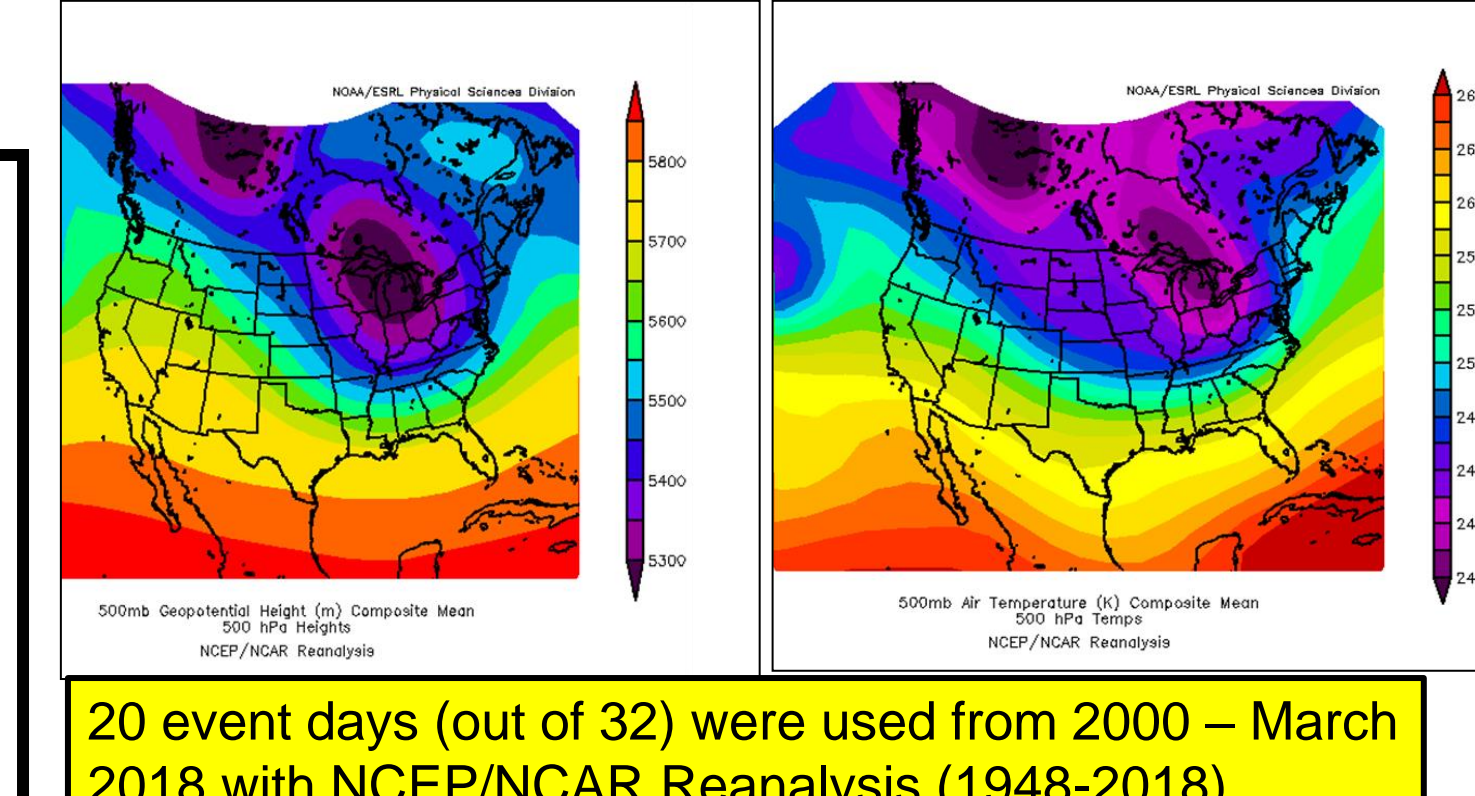


Observational KALY Sounding Analysis Box and Whisker Diagrams

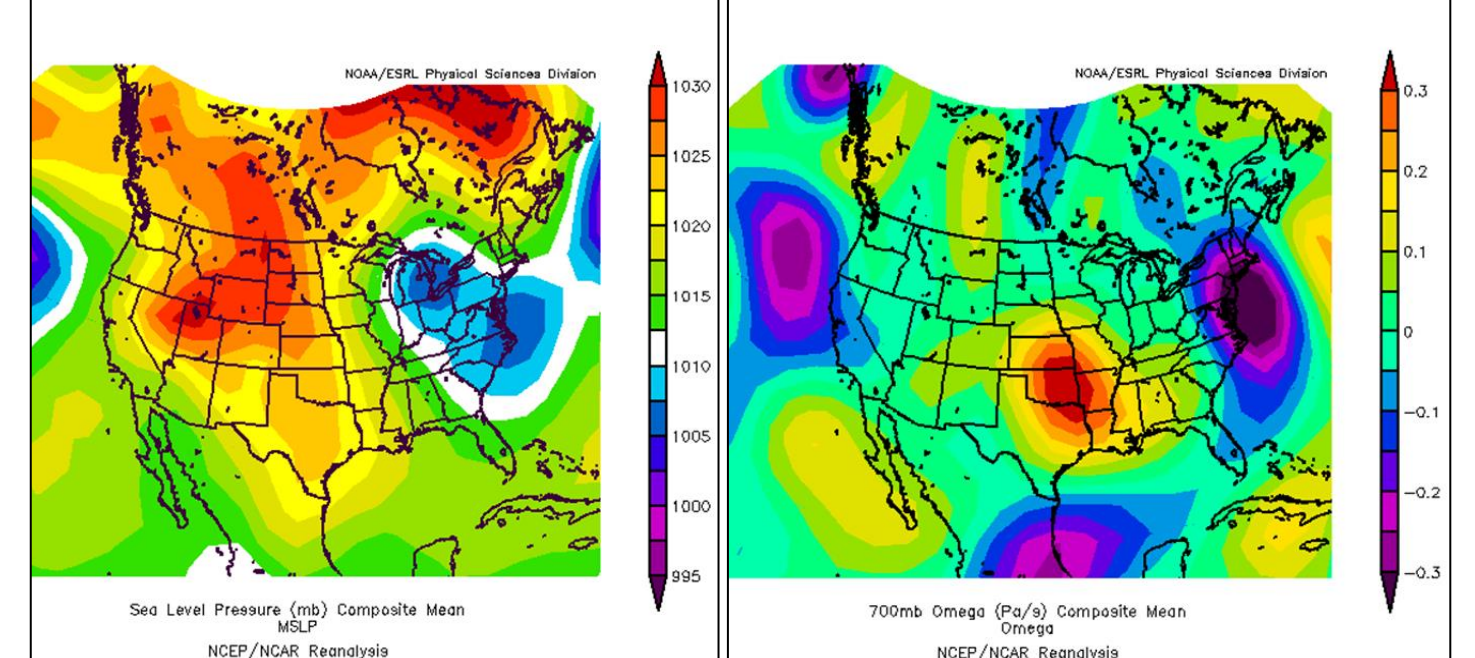


Composites

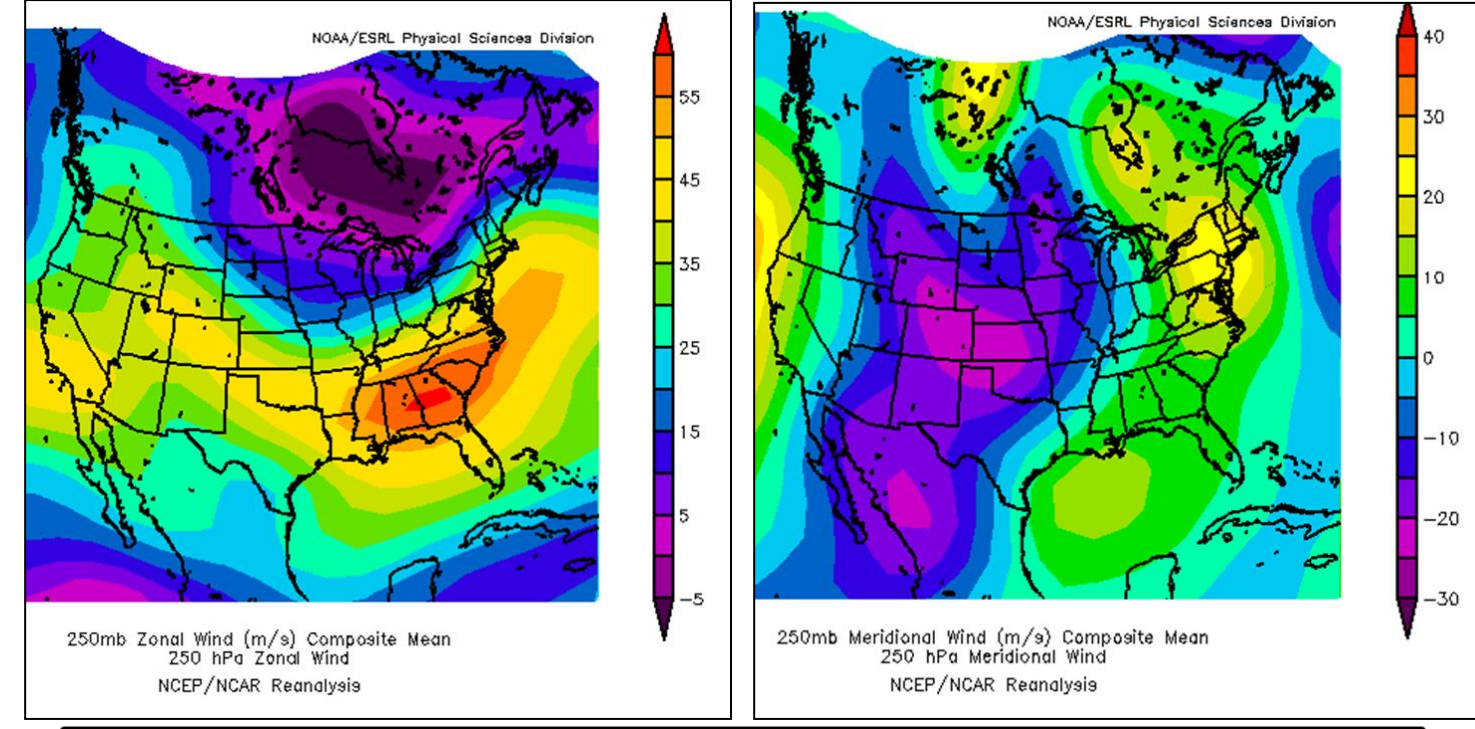
500 hPa Composite Mean Heights (m) & Temps (K) (n = 20)



MSLP (hPa) & 700 hPa Omega (Pa s⁻¹) Composite Means (n=20)



250 hPa Zonal (u) and Meridional (v) Composite Mean Winds (m s⁻¹) (n=20)

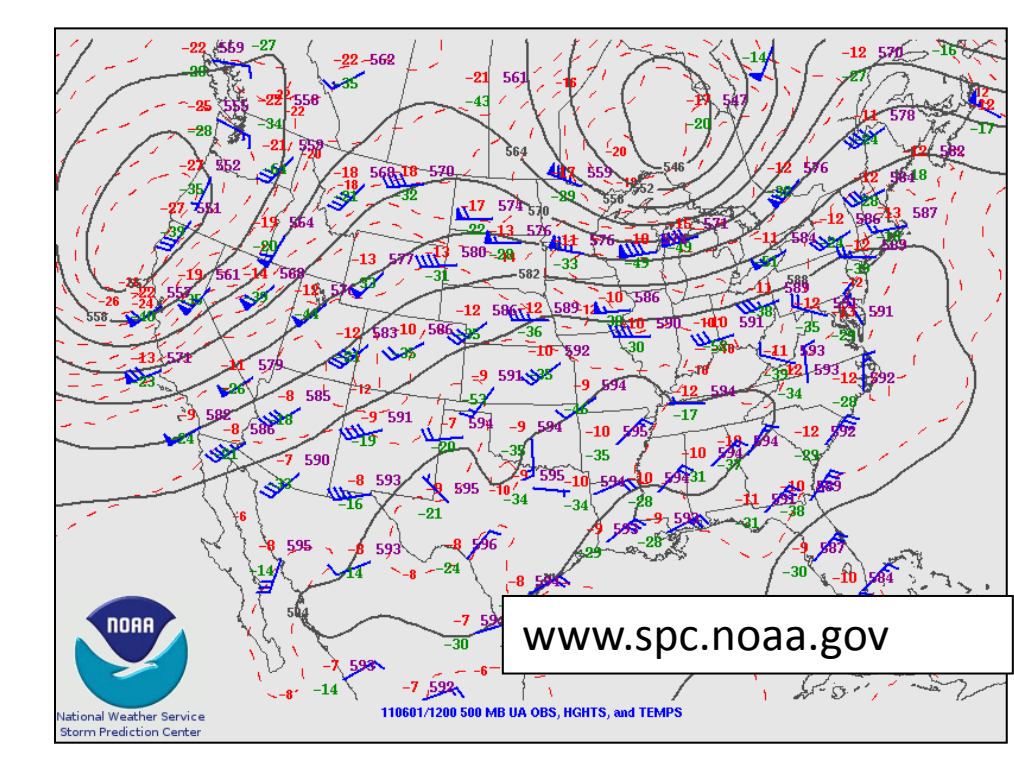


20 event days (out of 32) were used from 2000 – March 2018 with NCEP/NCAR Reanalysis (1948-2018)

1 June 2011 Case

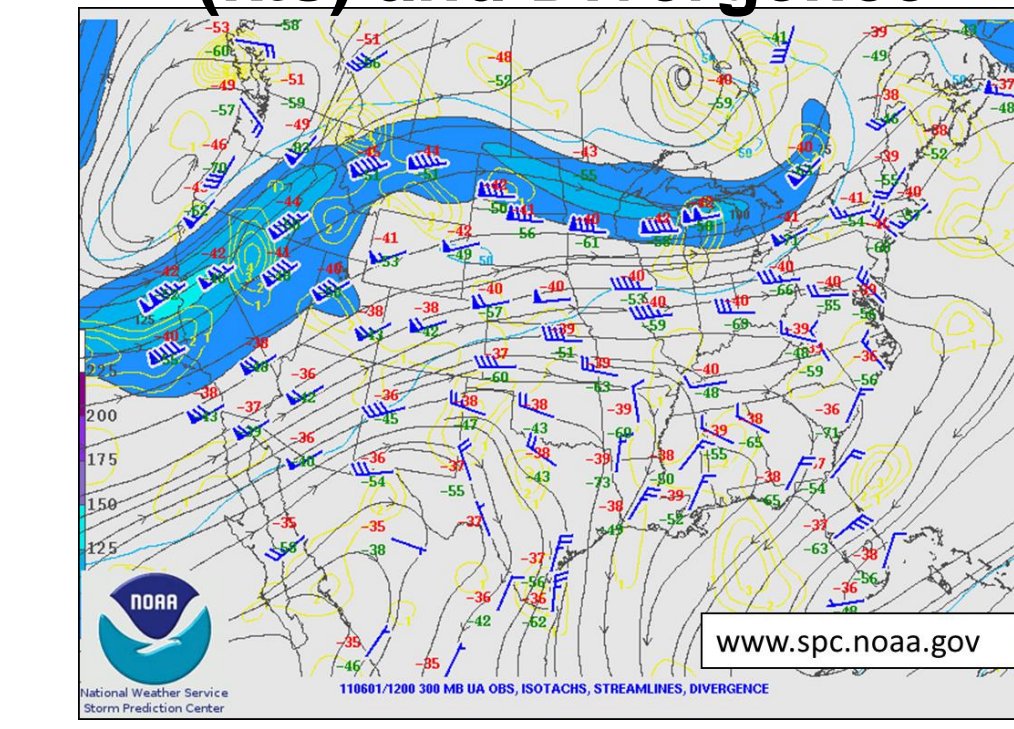
Synoptic Overview

1200 UTC 1 June 2011 500 hPa Heights (dam), Isotachs (kts), and Temps (°C)

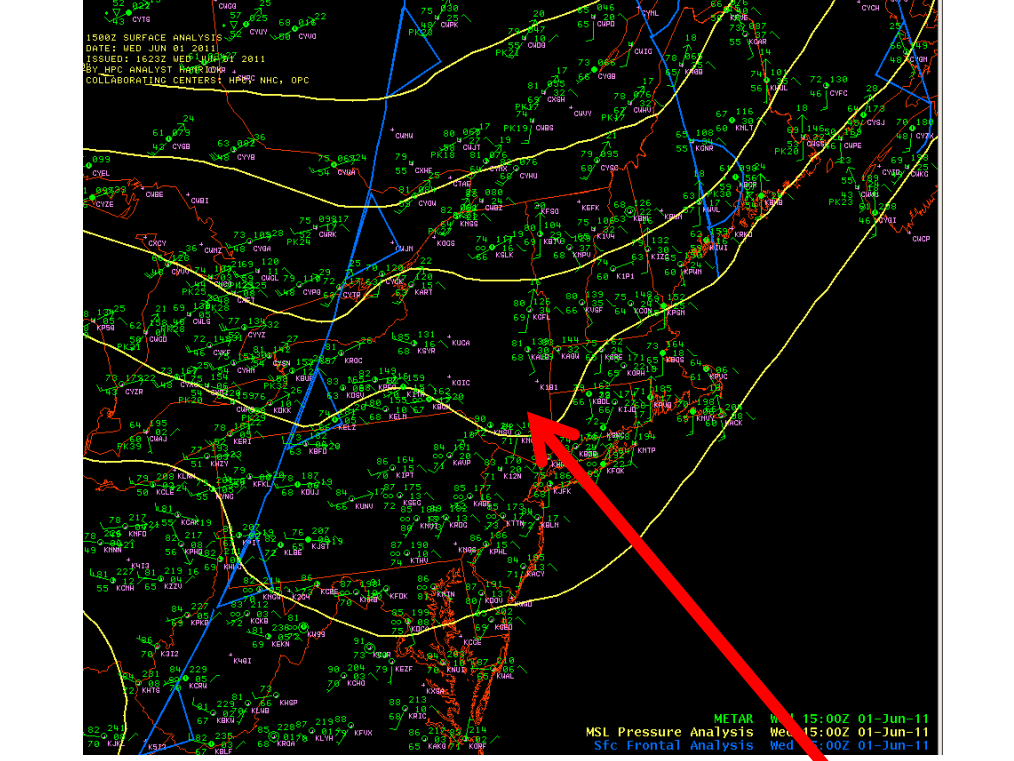


Presence of 500 hPa closed low upstream over south-central Quebec

300 hPa Streamlines, Isotachs (kts) and Divergence



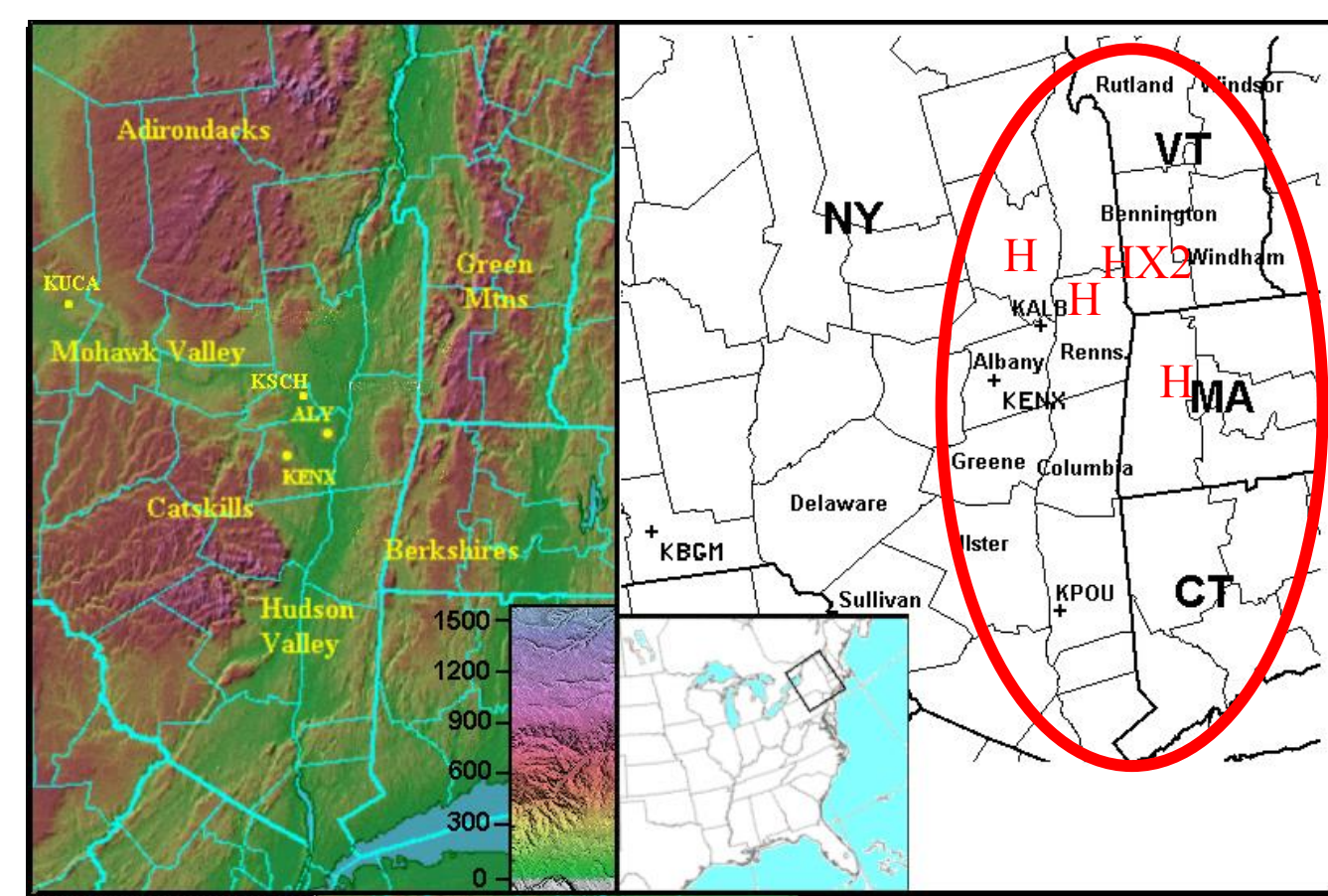
1500 UTC Surface Map



Developing prefrontal surface trough in the warm sector

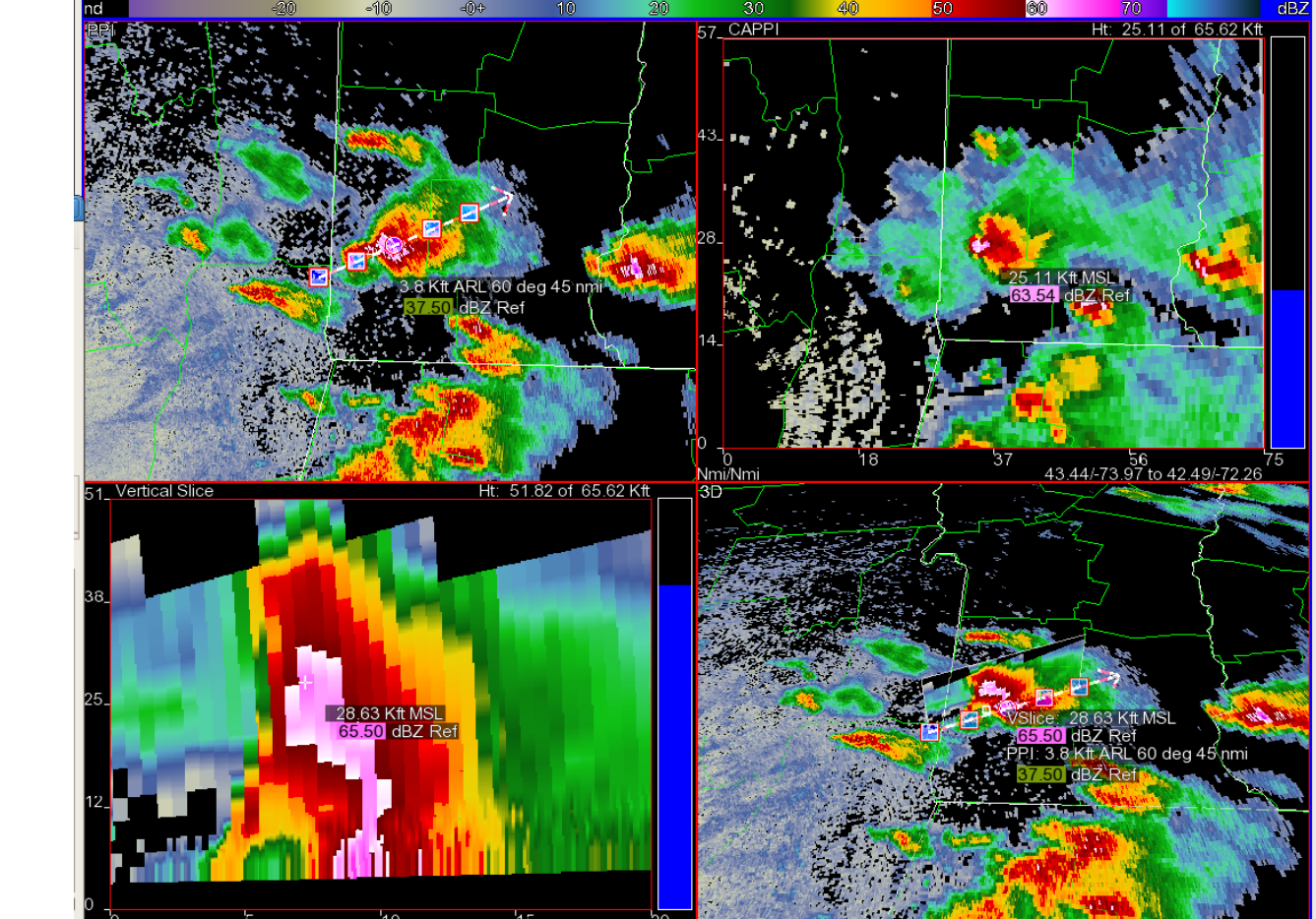
Storm-Scale Analysis

Albany Forecast Area



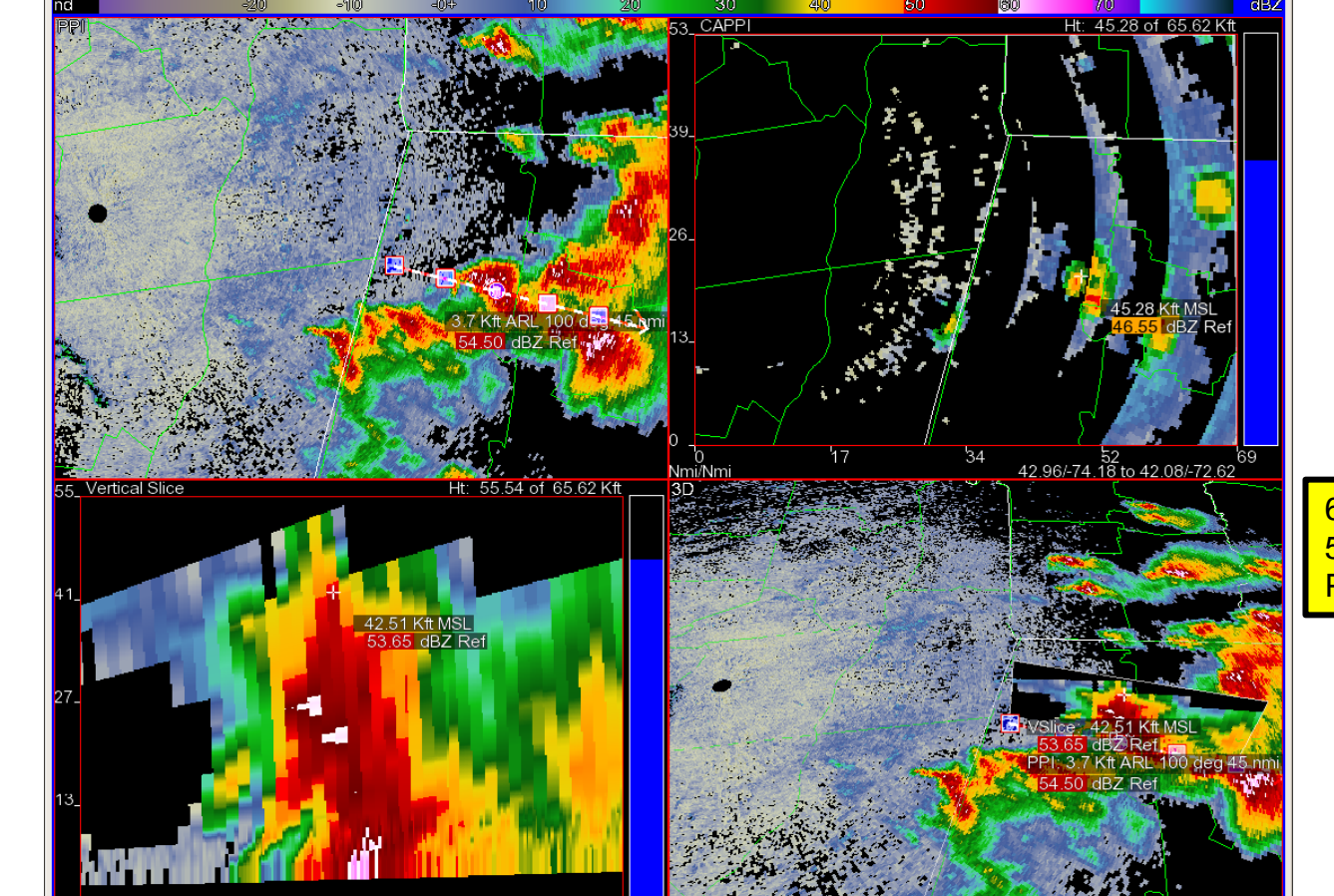
5 baseball size hail reports occurred on this date, which are annotated on the CWA map

1858 UTC FSI: Shaftsbury, VT 2.75-3.25" Diameter Hailstones



Upper left: Planned Position Indicator (PPI), Upper Right: Constant Altitude (CAPPI), Lower Left: -20°C height: 22.8 kft AGL (50 dBZ to 45 kft AGL, 55 dBZ to 43 kft AGL, 60 dBZ to 33 kft AGL, and 65 dBZ to 29 kft AGL, Lower Right: 3-D Flier

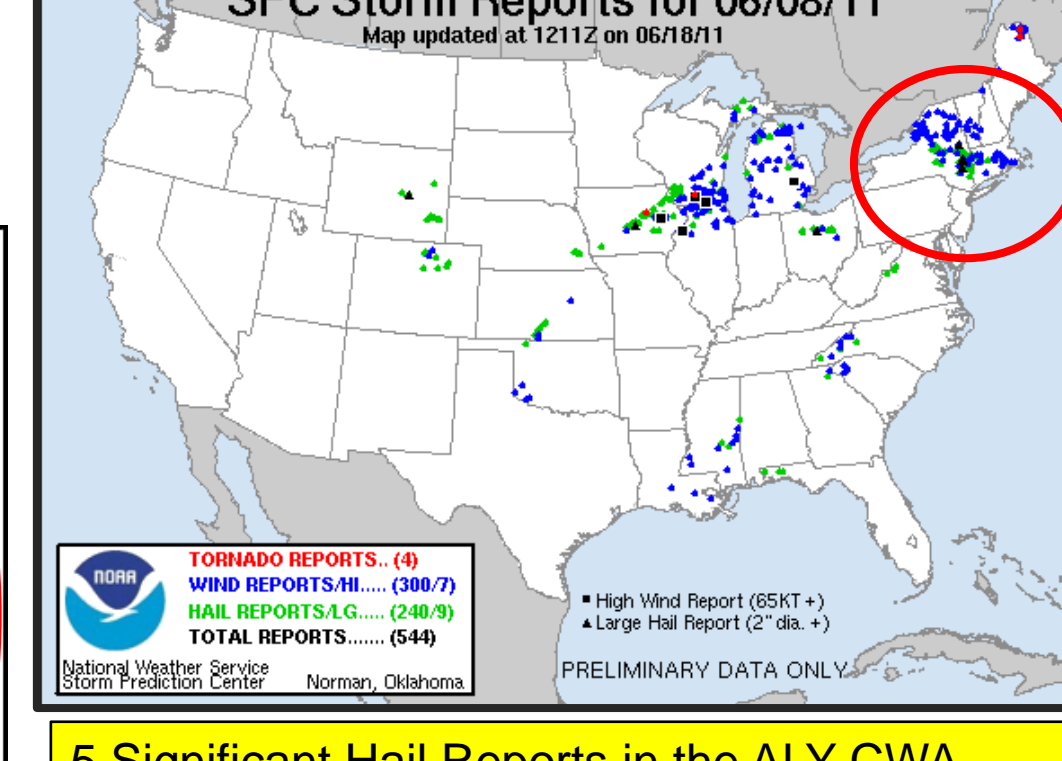
1930 UTC FSI: Windsor, MA 4" Diameter Hailstones



Upper left: PPI, Upper Right: CAPPI, Lower Left: -20°C height: 22.8 kft AGL (50 dBZ to 45 kft AGL, 55 dBZ to 42 kft AGL, 60 dBZ to 28 kft AGL, Lower Right: 3-D Flier

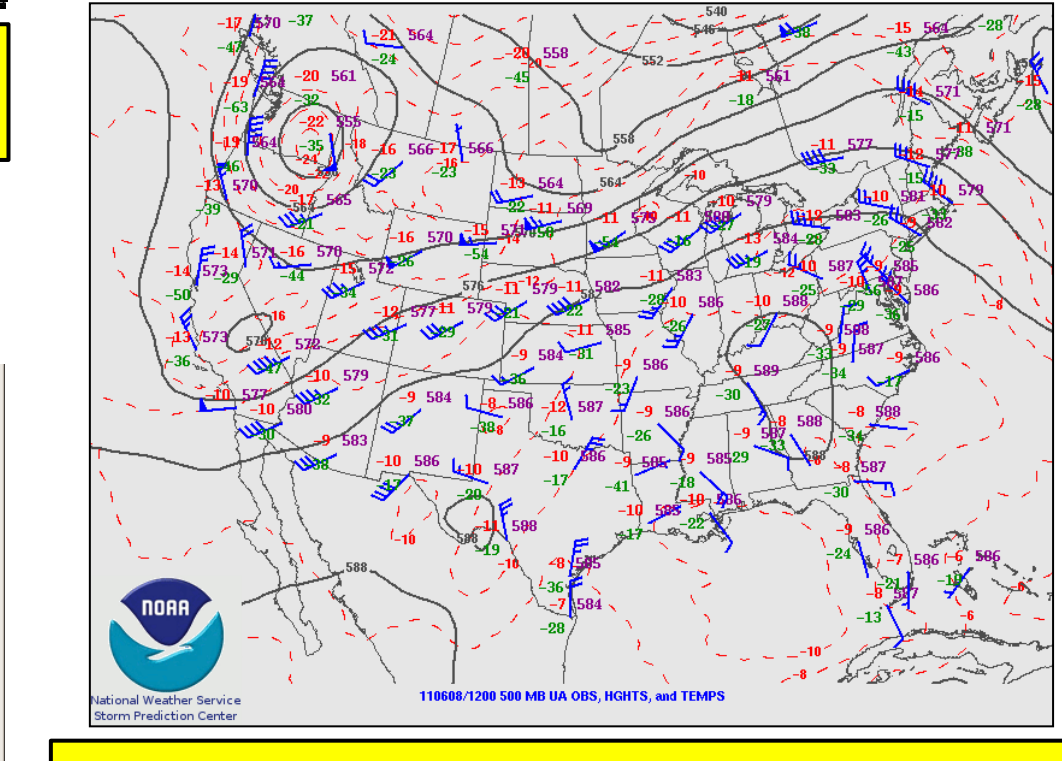
8-9 June 2011 Case

Case Review



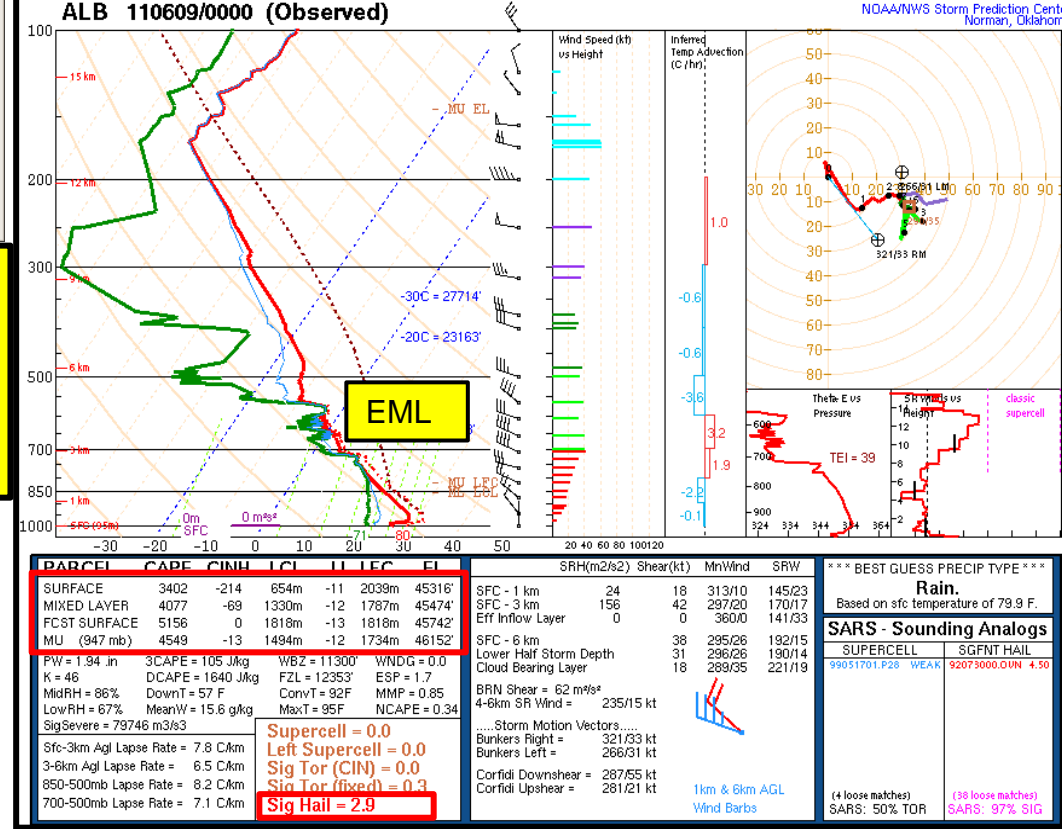
5 Significant Hail Reports in the ALY CWA

1200 UTC 8 June 2011 500 hPa Heights (dam), Isotachs (kts), & Temps (°C)

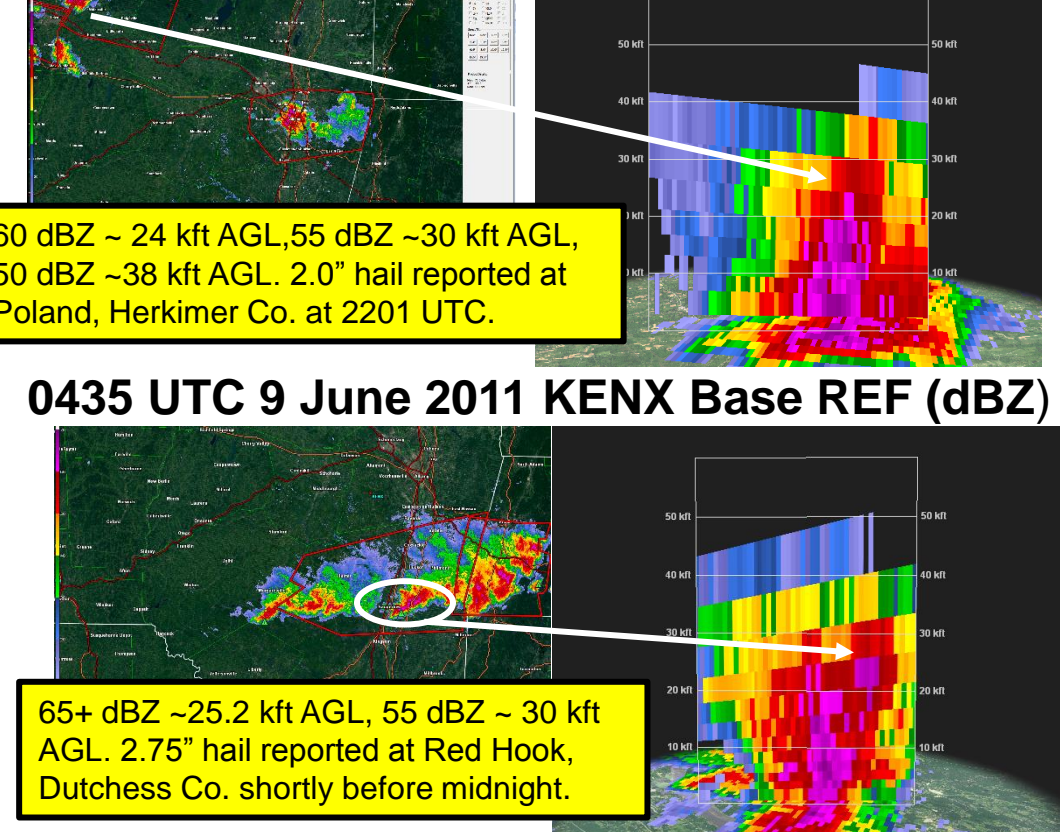


500 hPa short-wave trough is approaching Upper Midwest with ridging over Northeast

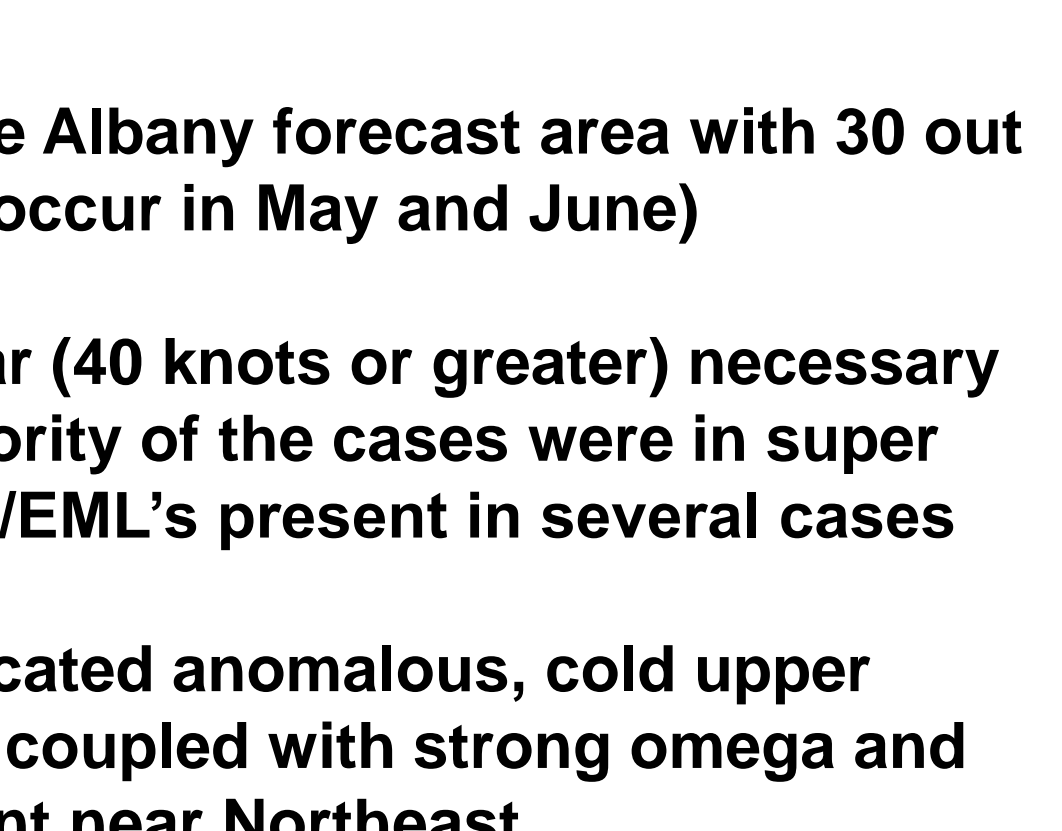
00 UTC 9 June 2011 KALY Sounding



2150 UTC 8 June 2011 KENX Base Ref (dBZ)

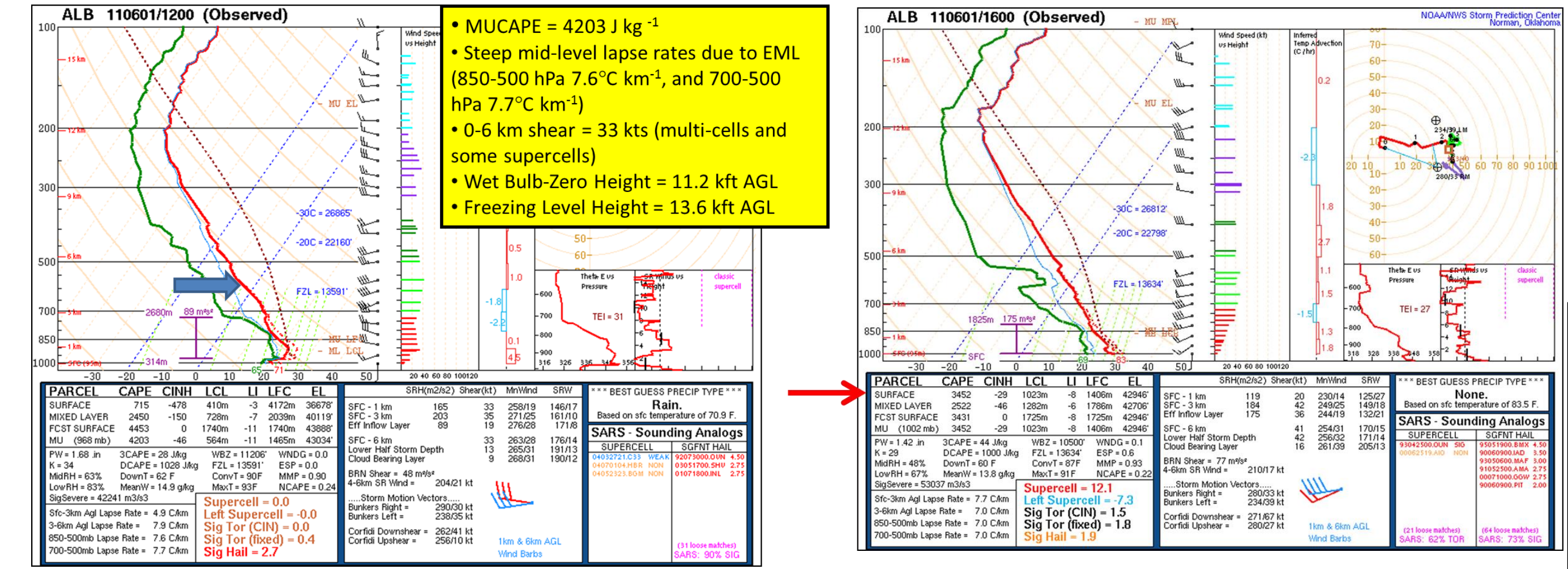


0435 UTC 9 June 2011 KENX Base REF (dBZ)

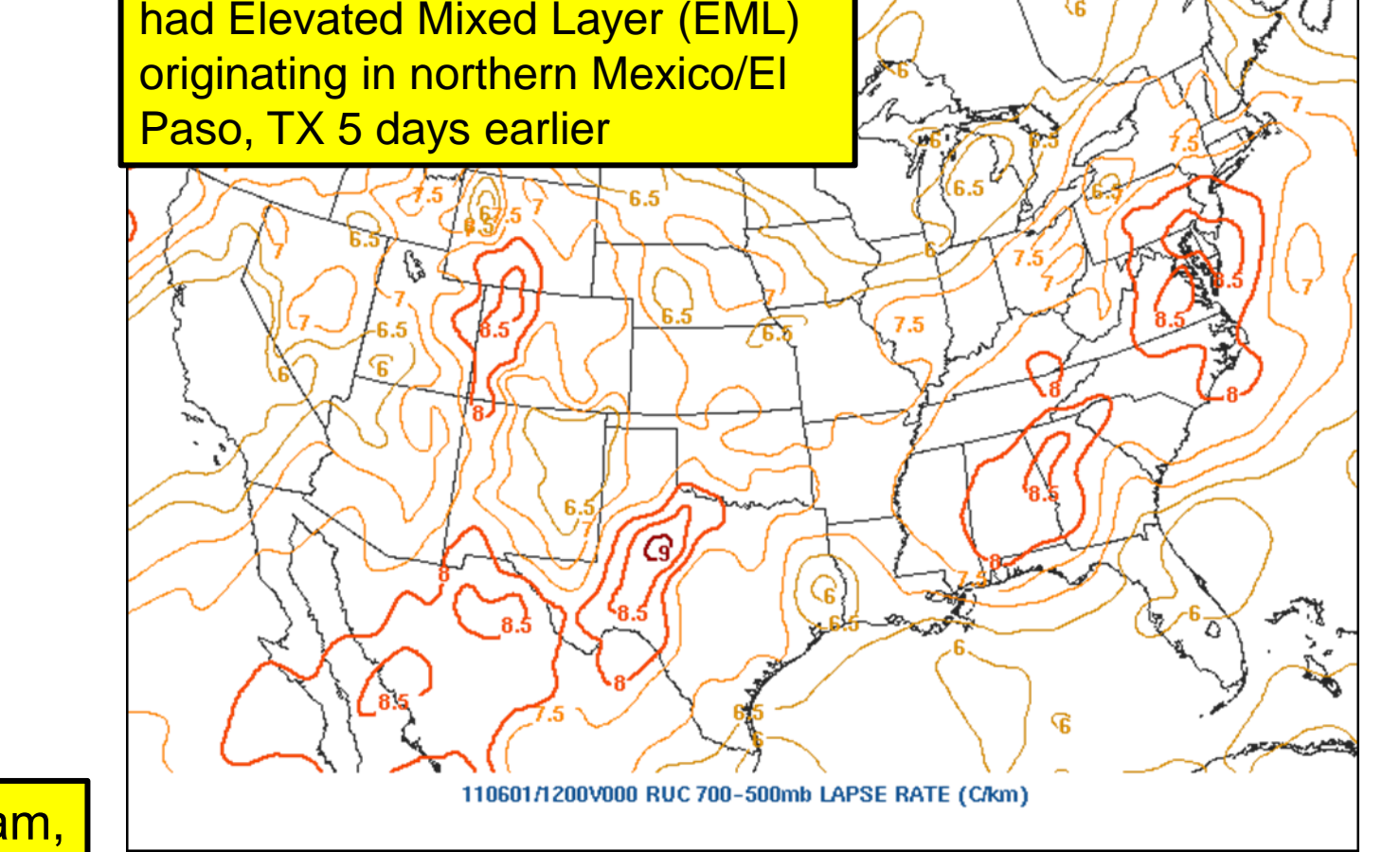


65+ dBZ -25.2 kft AGL, 55 dBZ - 30 kft AGL, 2.75" hail reported at Red Horse, Dutchess Co. shortly before midnight.

Mesoscale & Sounding Analysis

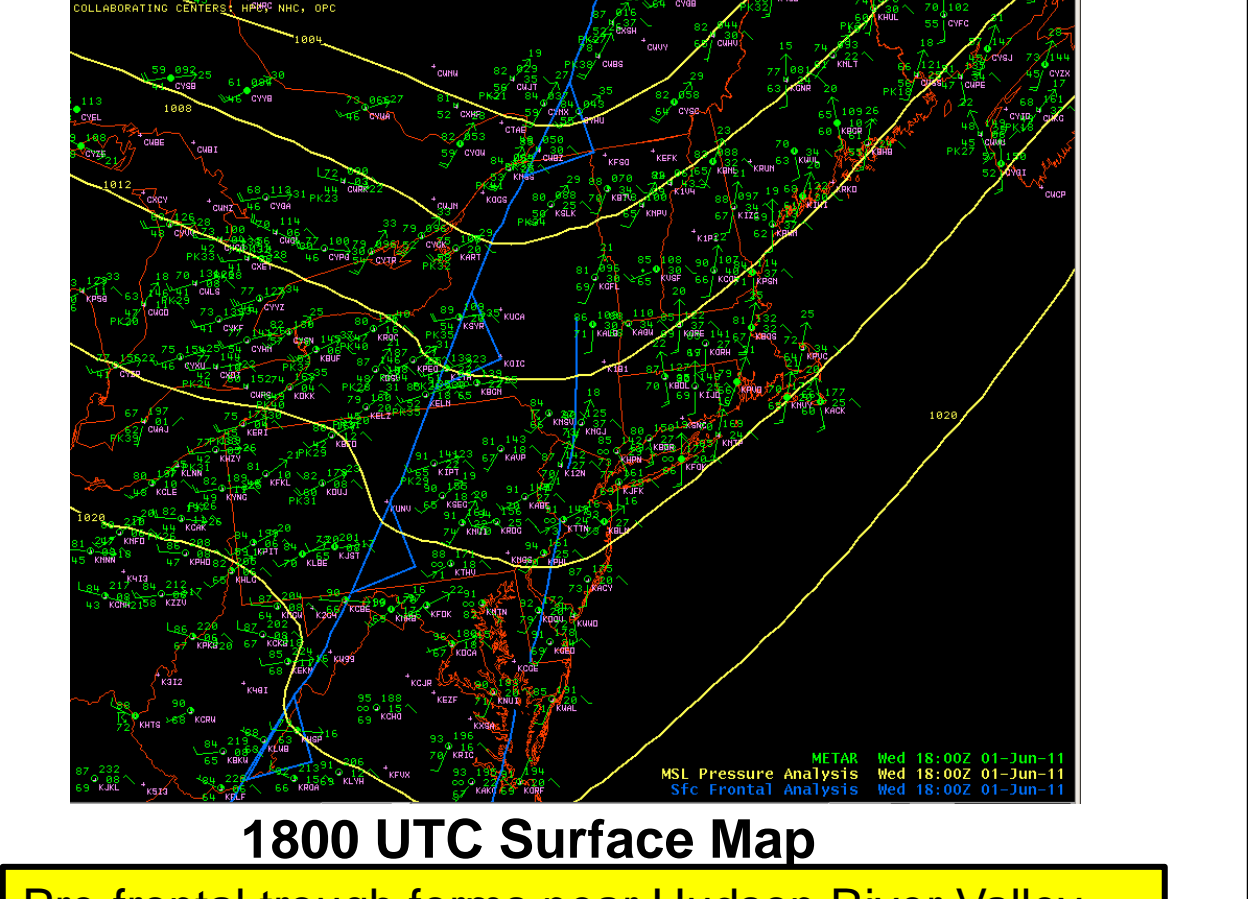


1200 UTC 1 June 2011 ALY Sounding



1200 UTC 1 June 2011 RUC/RAP 700-500 hPa Lapse Rates (°C/km)

1600 UTC 1 June 2011 ALY Sounding



1800 UTC Surface Map

- Summary**
- Significant hail events are on the increase in the Albany forecast area with 30 out of 59 events (51%) occurring this decade (68% occur in May and June)
 - Moderate to abundant instability and deep shear (40 knots or greater) necessary for supercells to support hail monsters, as majority of the cases were in super cells environments. Steep mid-level lapse rates/EML's present in several cases
 - Composites of 20 out of 32 hail event days indicated anomalous, cold upper trough over Great Lakes Region into Northeast coupled with strong omega and anomalous 250 hPa meridional (v) jet component near Northeast.
 - Intense/extreme updrafts due to thick CAPE allowed 50/55/60/65 dBZ reflectivity cores to reach incredible heights for mammoth hail stones with both cases (11 significant hail events with 2 cases shown)
 - Epic 3 events with 125+ large hail reports in forecast area in the first 9 days of June 2011 (13 significant hail events), as WFO ALY thrived issuing 67 warnings, verifying 55 (POD: 0.96, FAR: 0.18, CSI: 0.80, and Average Lead Time: 31.7 minutes)
 - Expansion of significant hail study to include all of NY and New England planned