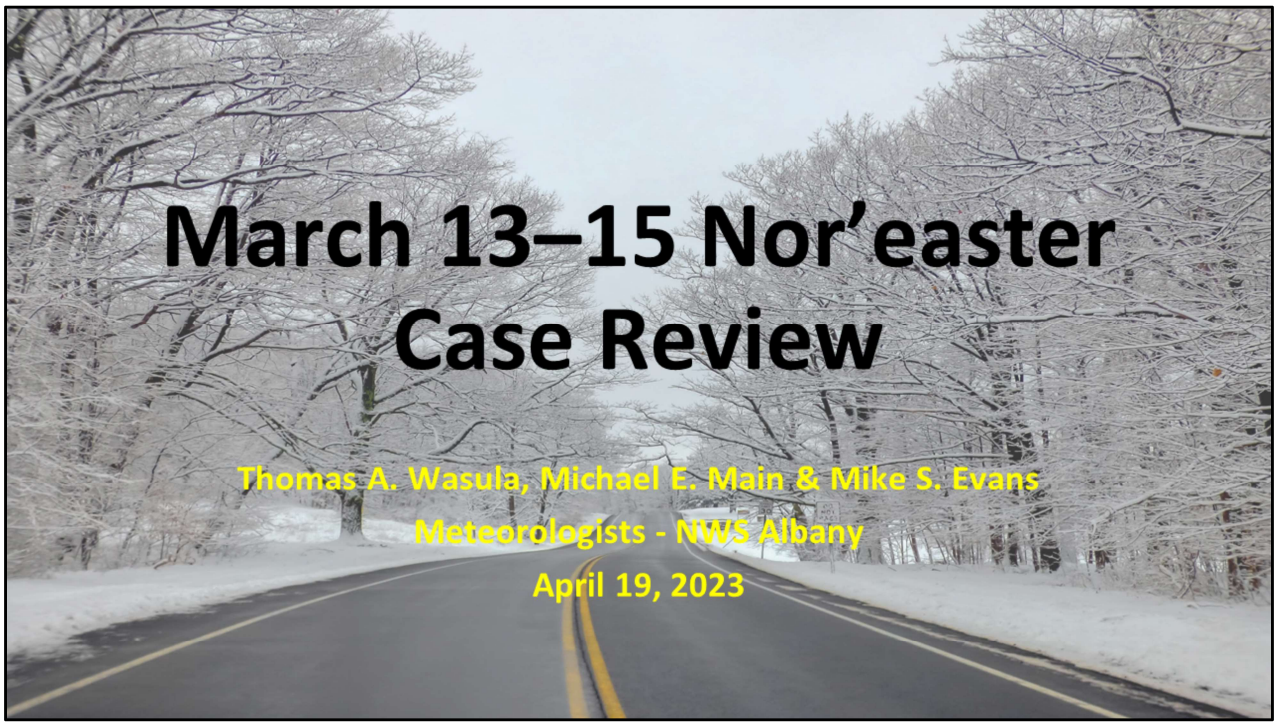
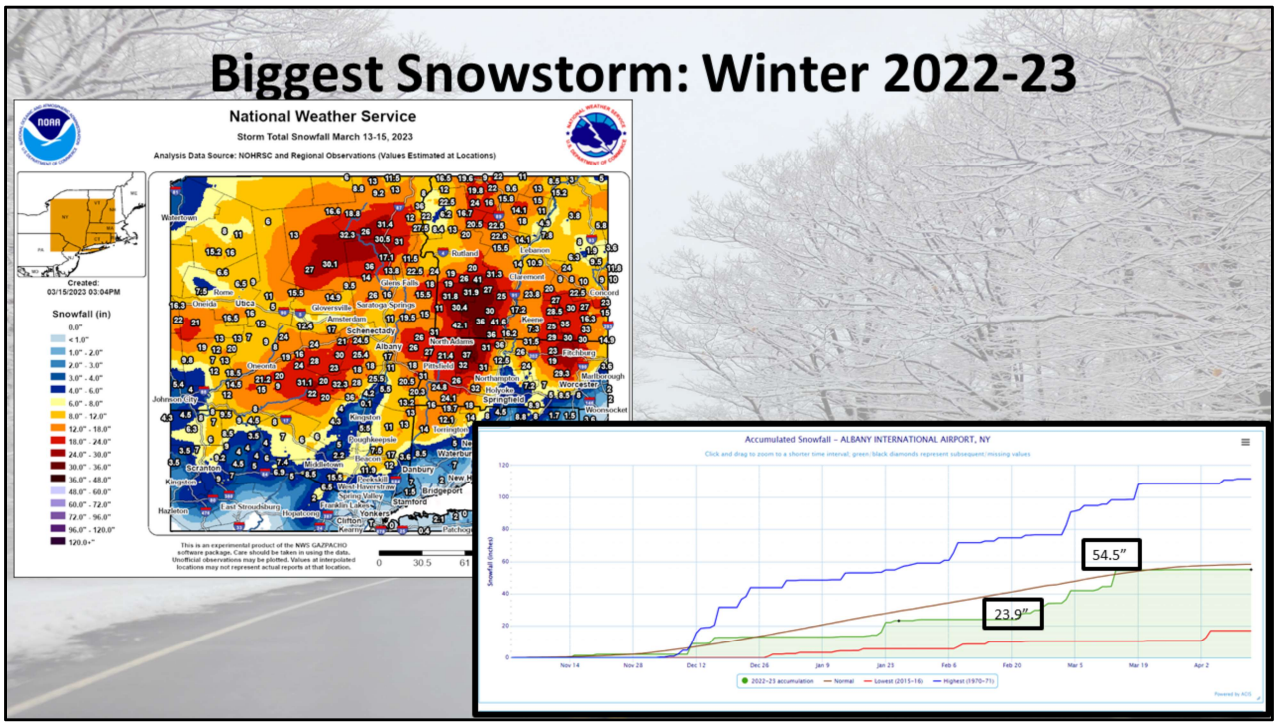
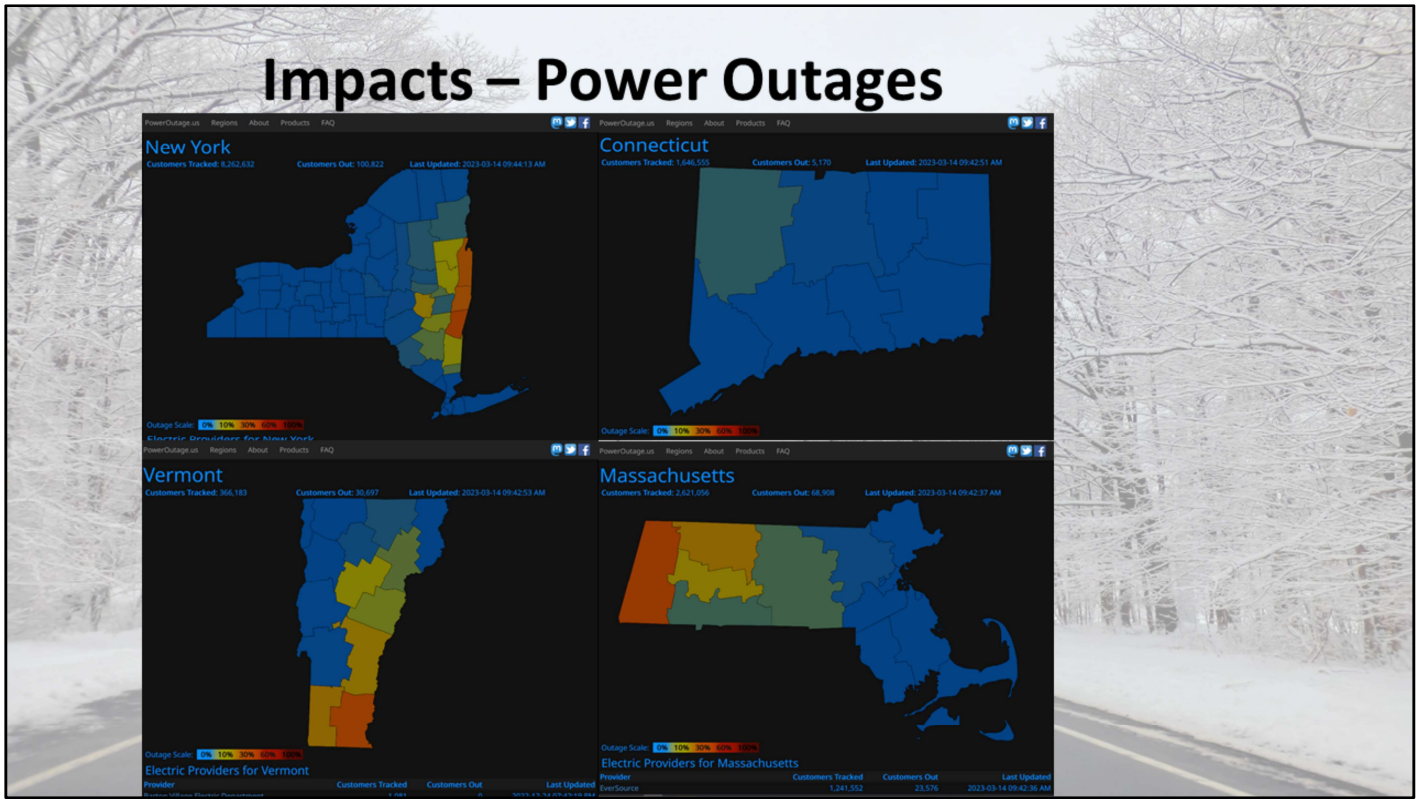


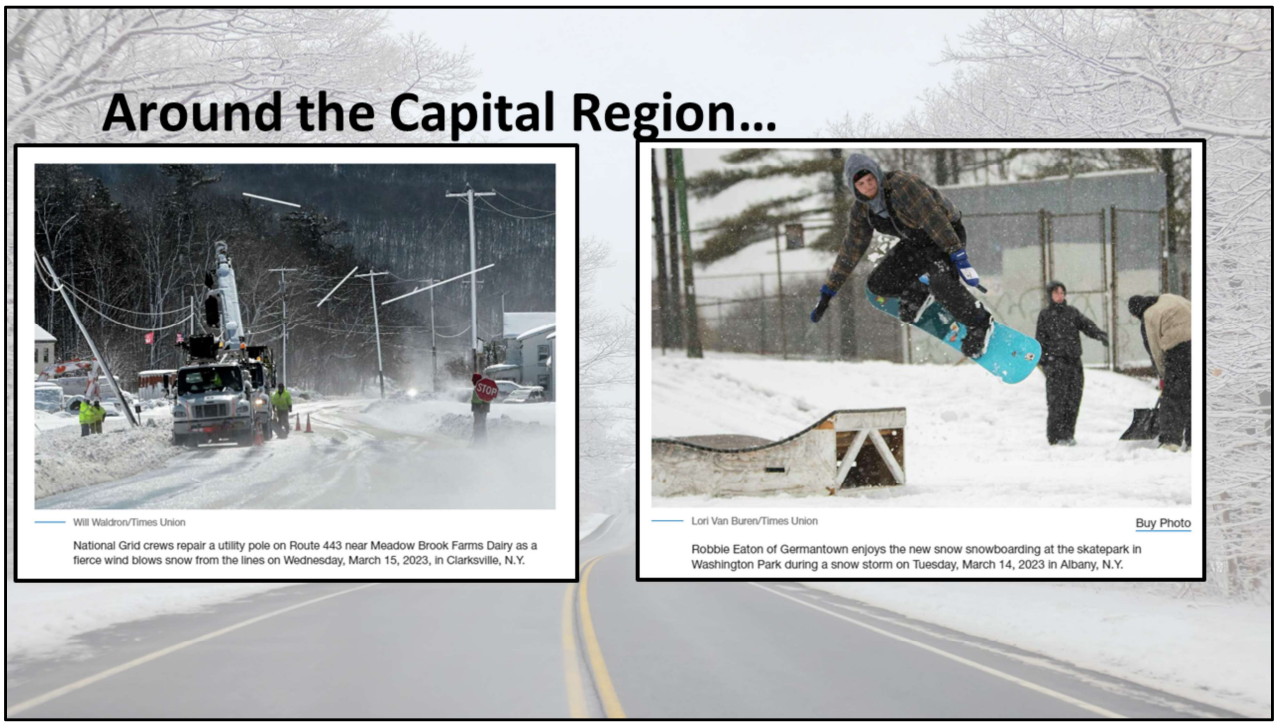
The largest snow event area-wide in the ALY forecast area across eastern NY and western New England in the Winter of 2022-23.



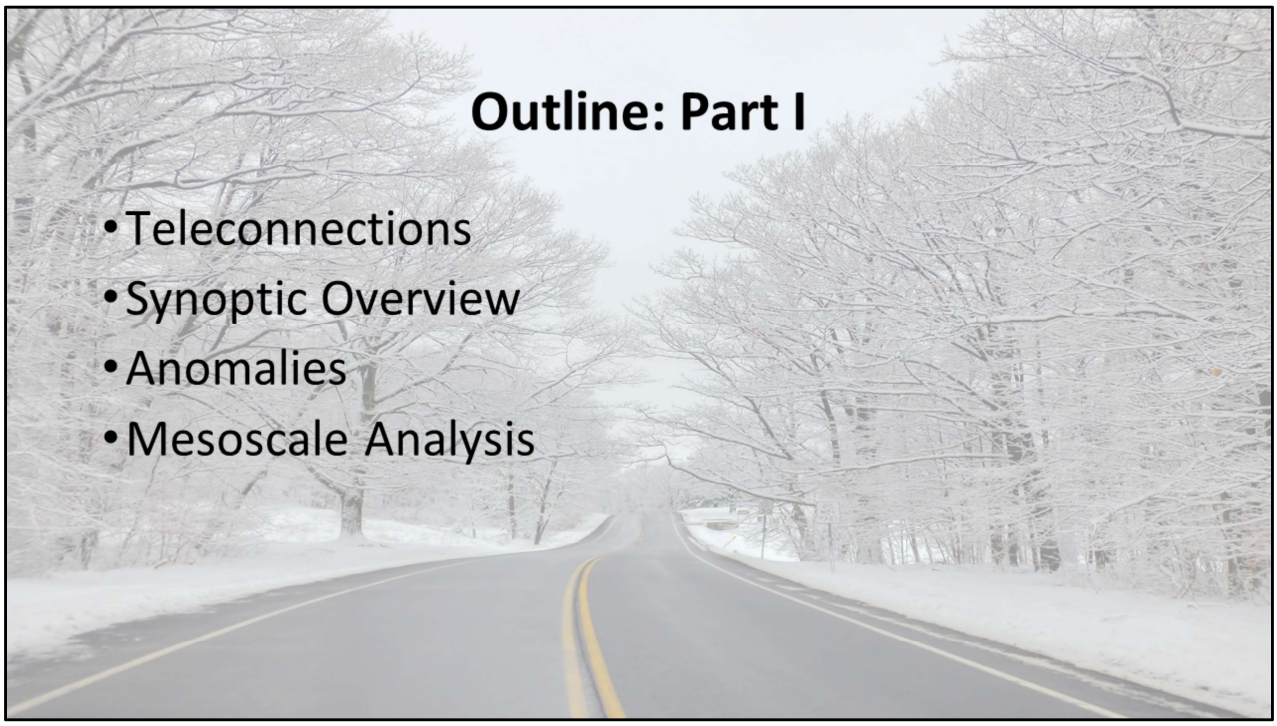
Snowfall amounts were extreme across the higher terrain of the southern Adirondacks, southern Greens, northern Berkshires, northern Taconics and eastern Catskills with 20-42” common. The valley areas generally had 10-20” with some isolated locations near the immediate river valleys having 0.1” to 6”. For example downsloping off the Helderbergs and Catskills yielded less than 2” for portions of eastern Ulster and eastern Greene Counties. Albany had 23.9” of snowfall on Feb 20th, but an active next 3+ weeks of storms and snow raised the total to 54.”5. The 13-14 March snowstorm produced 10.1” at the Albany International Airport.



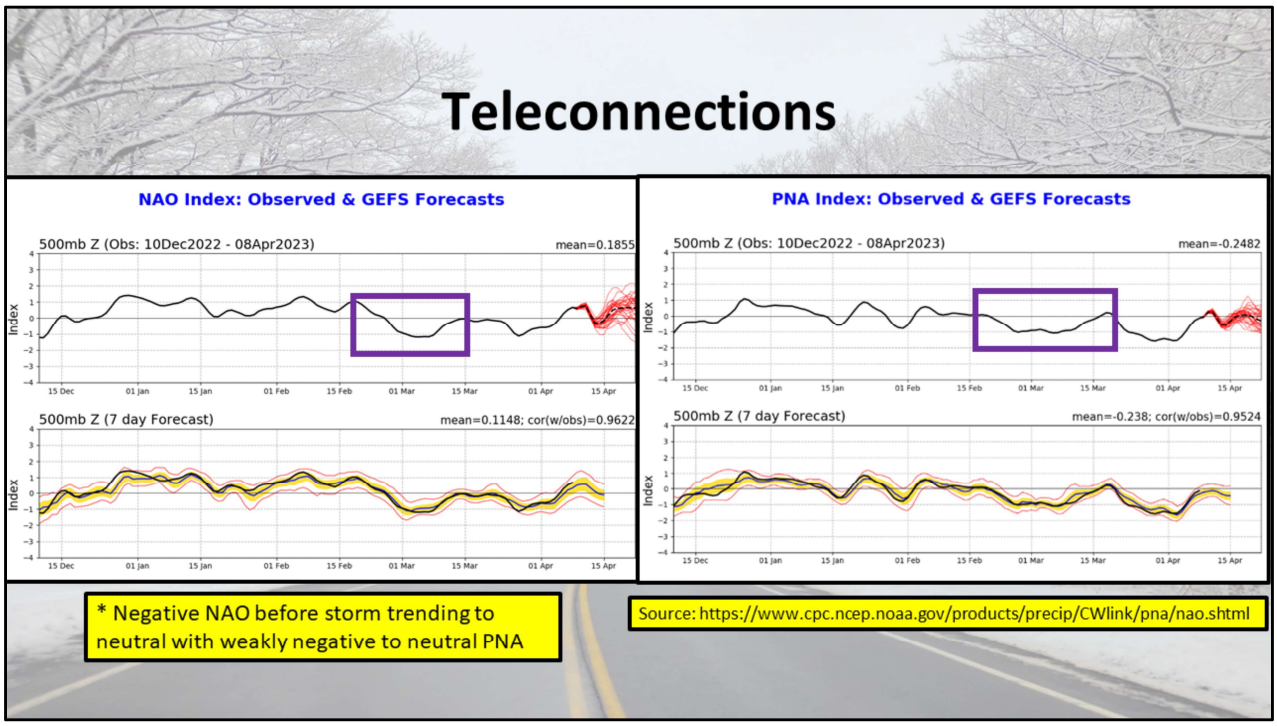
Power outages were common across eastern NY and west-central New England. The snow was a heavy, wet consistency. Snow to liquid ratios were generally 6-10:1. The power outages were most numerous across the eastern Capital District and Taconics in eastern NY and southern VT and the Berkshires of MA.



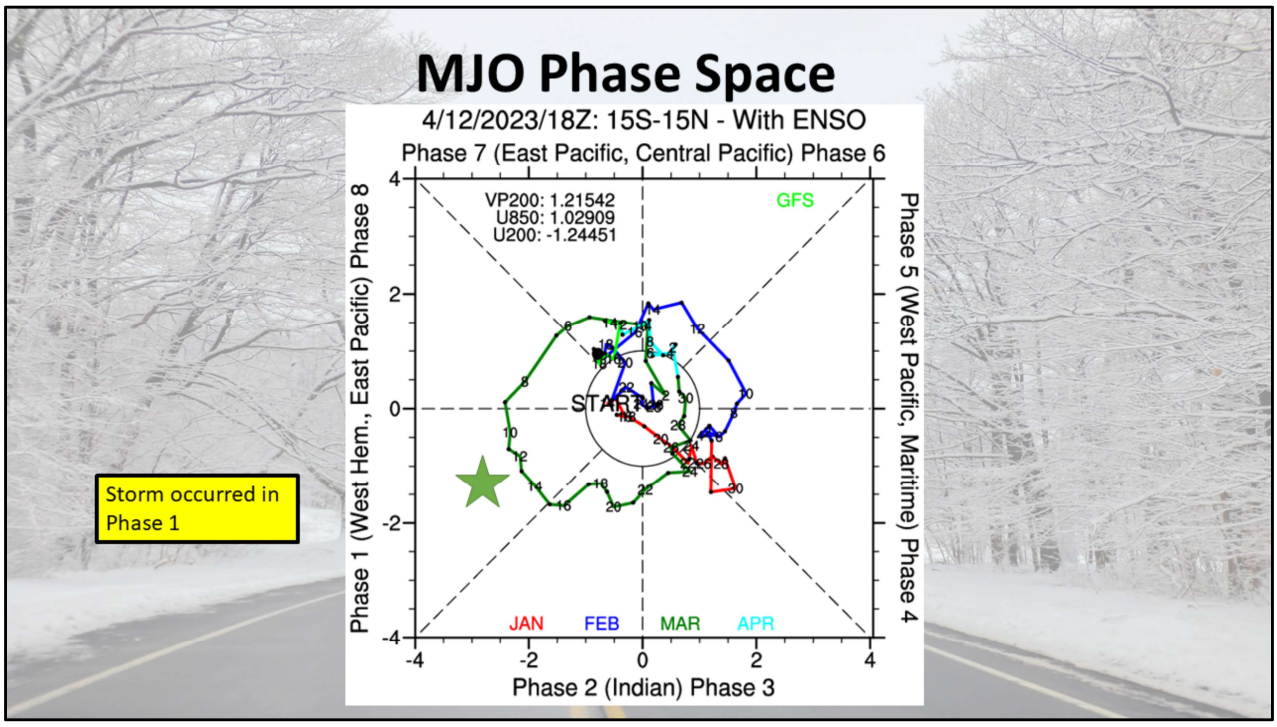
Some sites around the Capital Region with power lines near Clarksville, NY in western Albany (left photo). Some leisure fun in Albany, NY at Washington Park in the right photo.



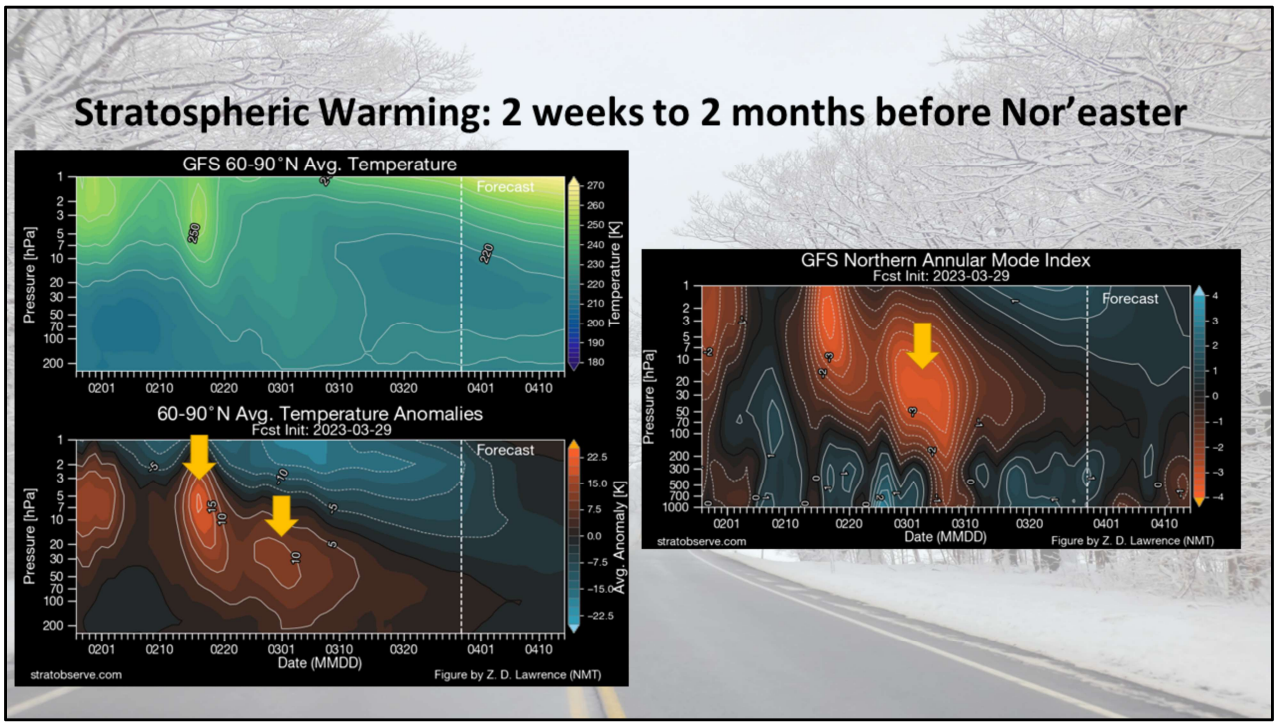
The topics covered will be mainly on the planetary or synoptic-scale with a brief overview on the mesoscale.



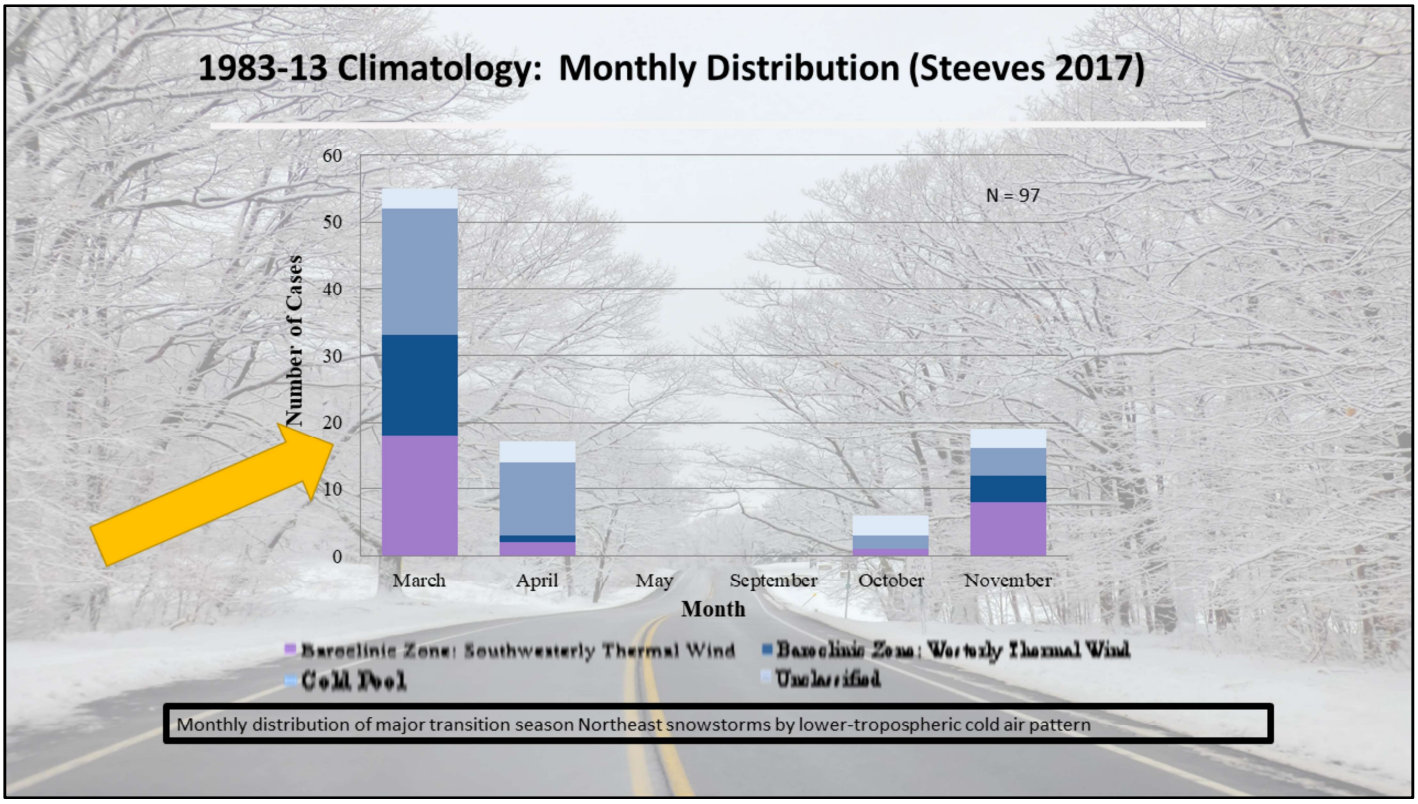
The NAO was negative leading up to the event, as it trended neutral which indicates troughines over the East Coast with blocking near Greenland. Some past research in CSTAR by Heather Archambault (2005) showed a trend to a neutral signal may lead to more storminess along the East Coast of North America. Interestingly, the PNA was negative with a trough over the West Coast of North America and (sometimes weak) ridging over the East Coast. This was a rare case.



The Madden-Julian Oscillation was in Phase 1. This diagram typically can correlate with frequent storms along the East Coast of North America when it is in Phase 7, 8 or 1.

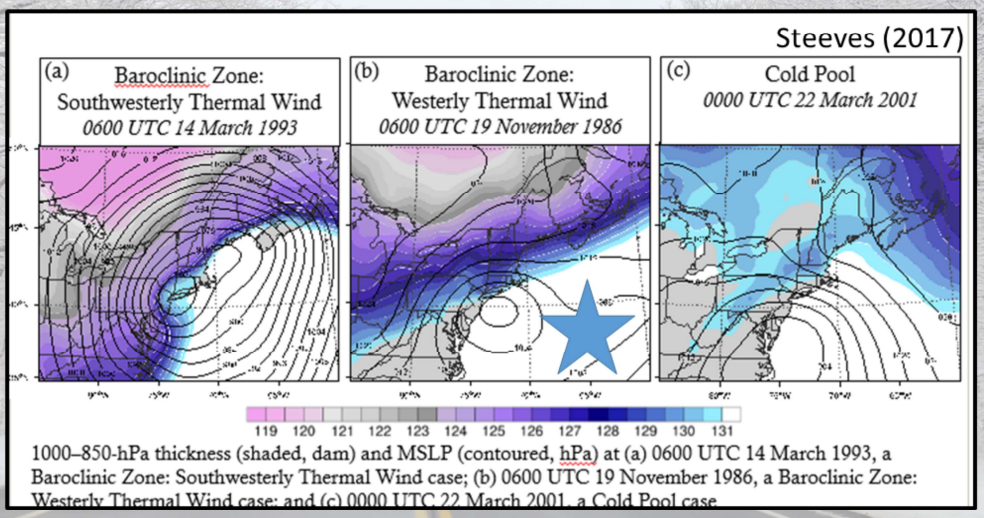


Stratospheric warming can indicate an uptick of a storm or frequent storms along the East Coast of North America 2 weeks to 2 months in advance. This event was hinted at looking at latitudinal Pressure (hPa) vs Temperature/Theta (K) diagrams between 60-90°N.

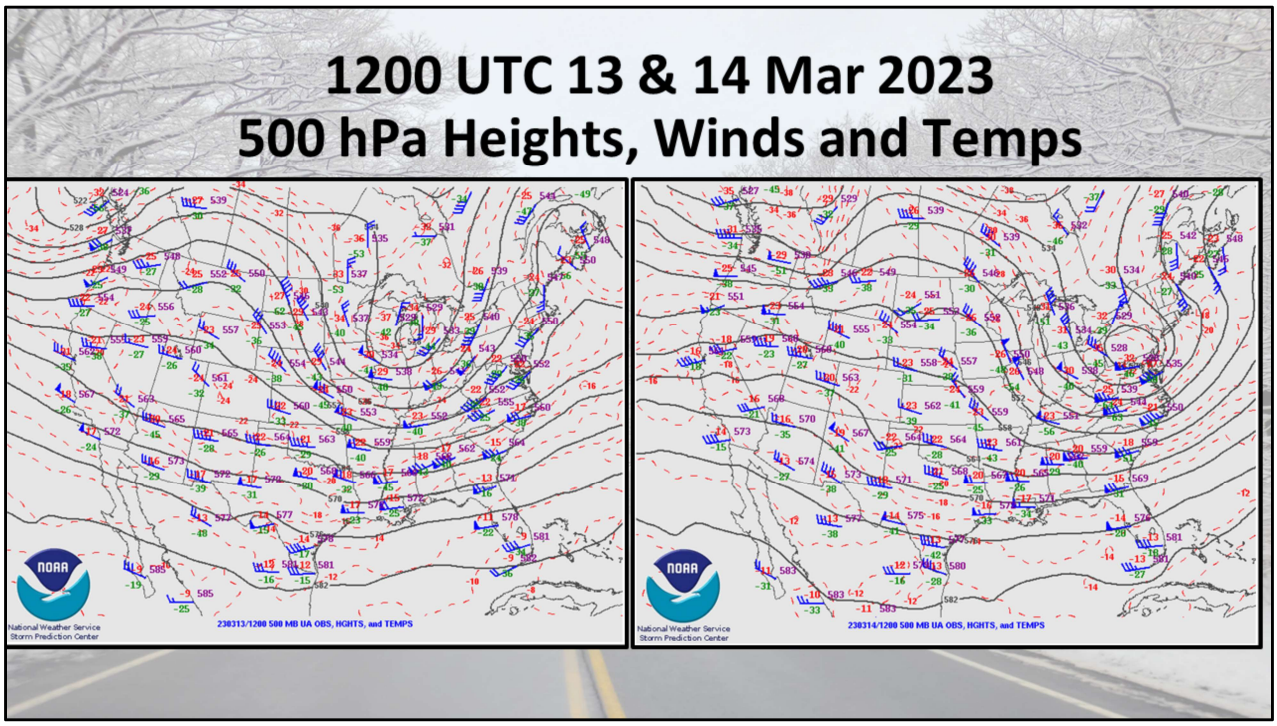


Past work in CSTAR by Rebecca Steeves (2017) examined transitional season storms (March-May and September to November) 1983-2013. She categorized the storms into the following: Baroclinic Zone: SW Thermal Wind, Baroclinic Zone: Westerly Thermal Wind, Cold Pool and Unclassified. March has the most storms which were dominated by the 3 major categories with slightly more in the Cold Pool (though several Baroclinic Southwest and West Thermal events occurred).

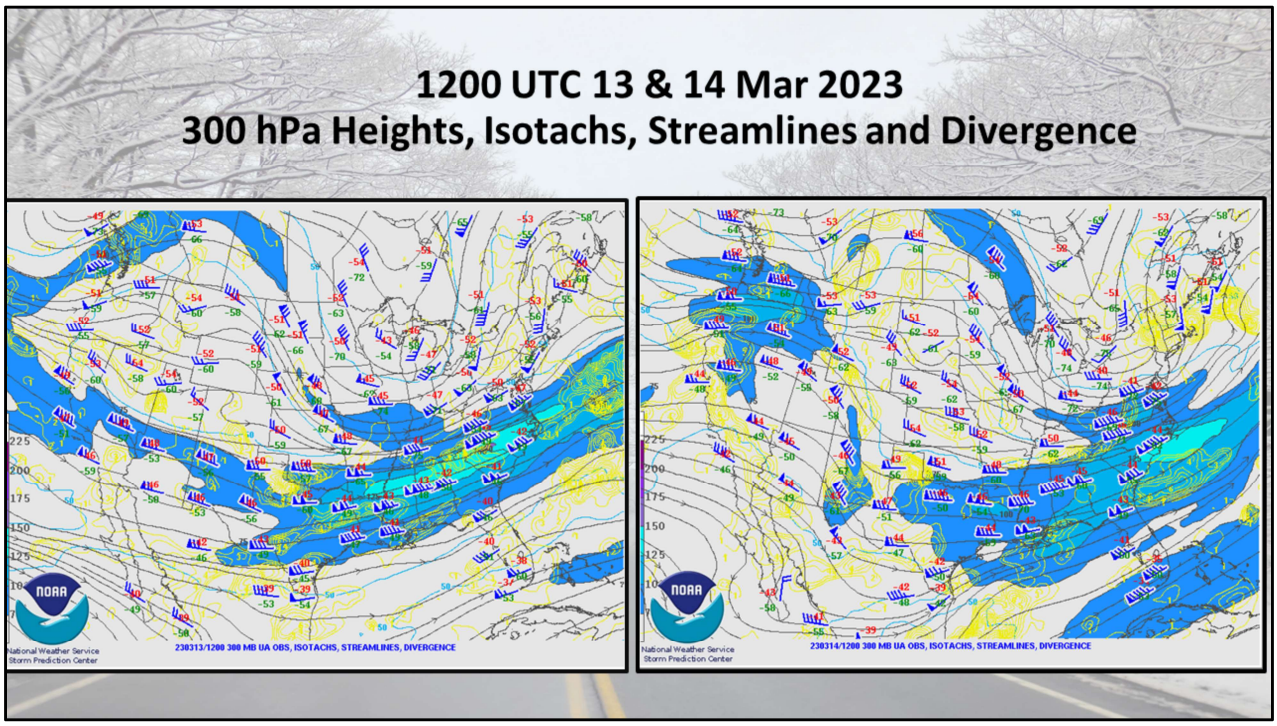
Transitional Season Storms: 3 Categories



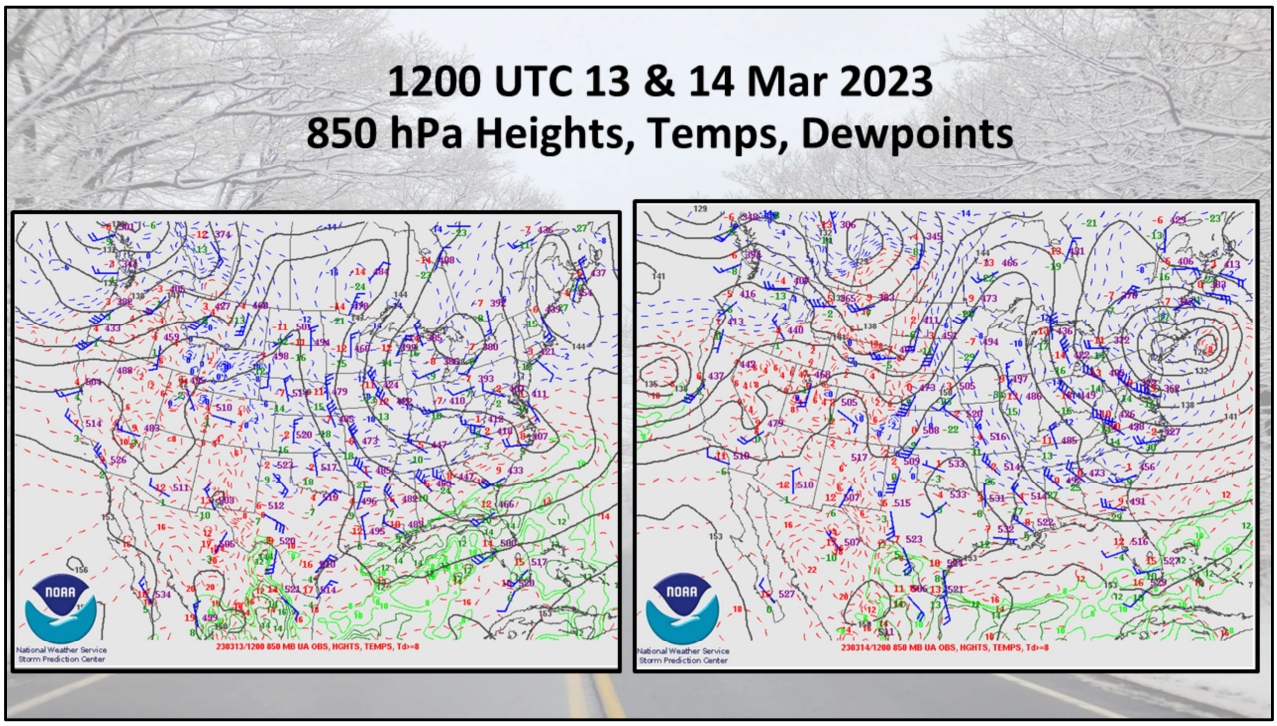
These are Conceptual Models for the Categories of Transitional Season storms. The March 13-15, 2023 case fit well into the Baroclinic Zone: Westerly Thermal Wind.



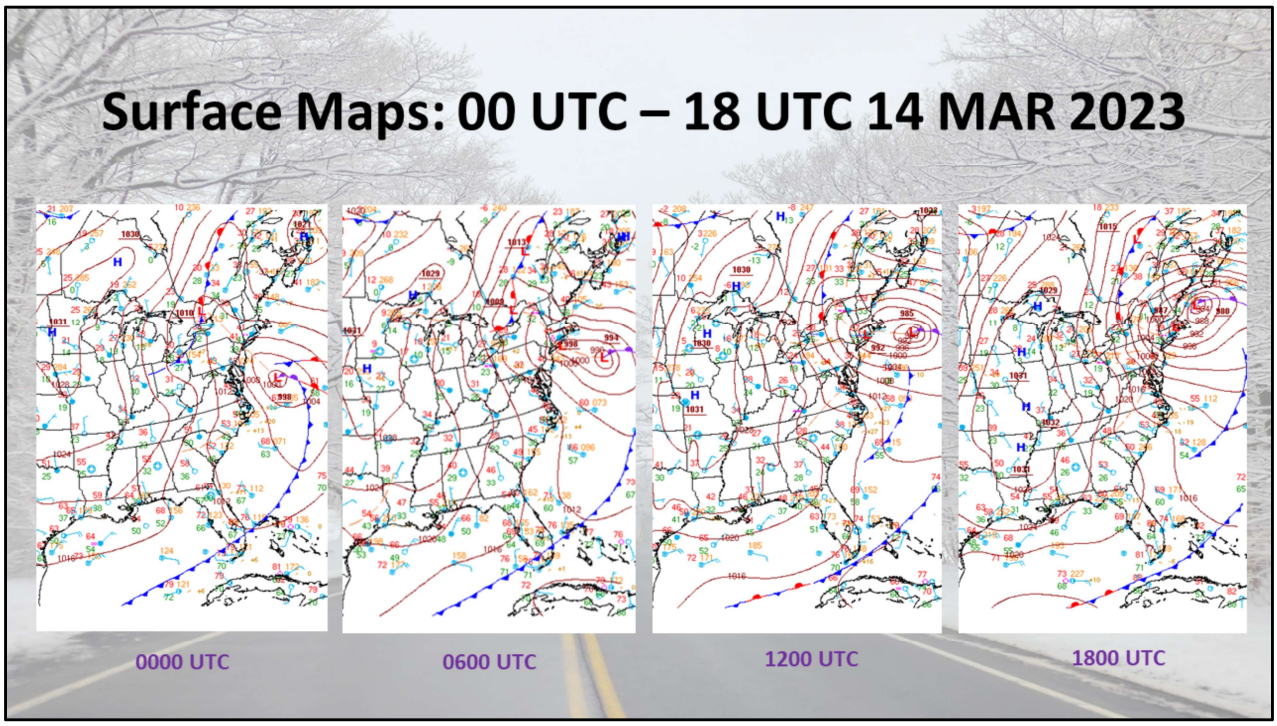
A very strong 500 hPa trough was moving across the Great Lakes Region at 1200 UTC 13 March 2023 with a ridge moving downstream of New England and New Brunswick. 24 hours later the 500 hPa low closed off over PA and the trough became negatively tilted at 1200 UTC 14 March 2023 over the Northeast.



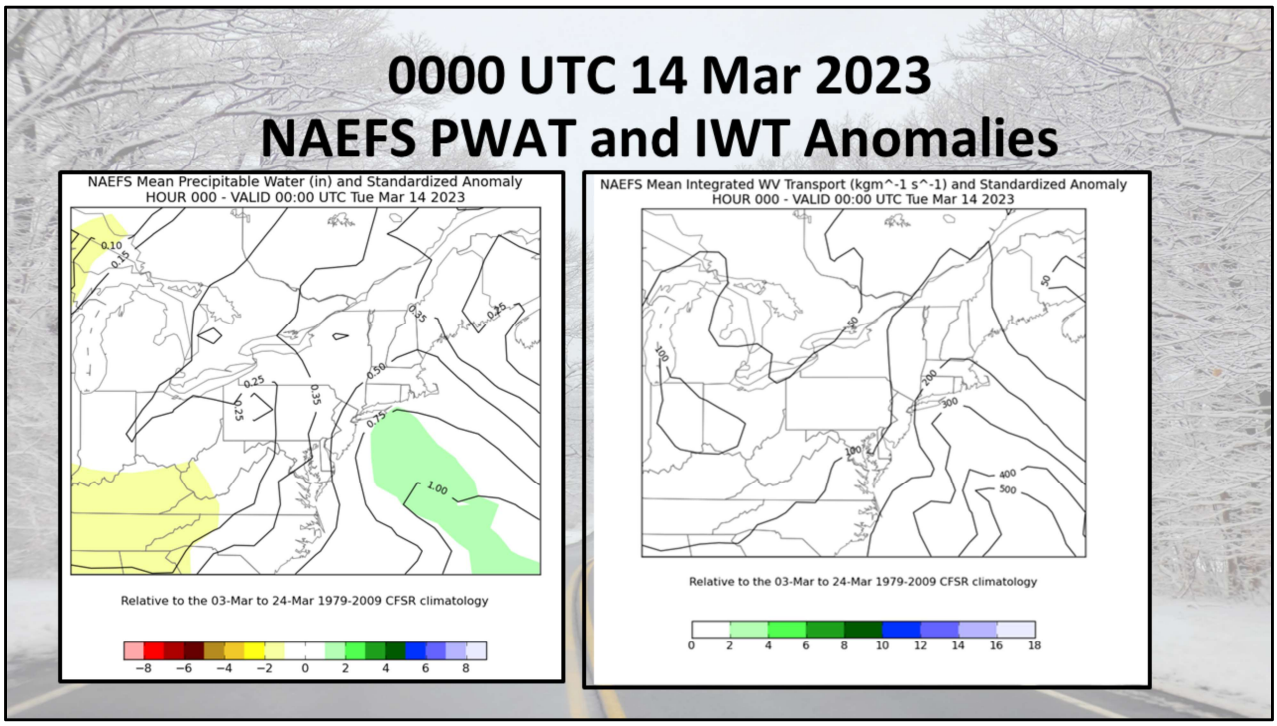
At 300 hPa the upper level jet was 100-150 knots over the sunbelt with a jet streak of 125-150 knots over the Southeast the Carolinas. A plume of divergence was over the Northeast, and the ALY forecast area was north of the poleward cyclonic exit region of the jet streak. The jet streak would move off the East Coast and would continue to provide upper level dynamical support for the coastal low 1200 UTC 14 March 2023. The 300 hPa divergence was significant over upstate NY and New England at this time.



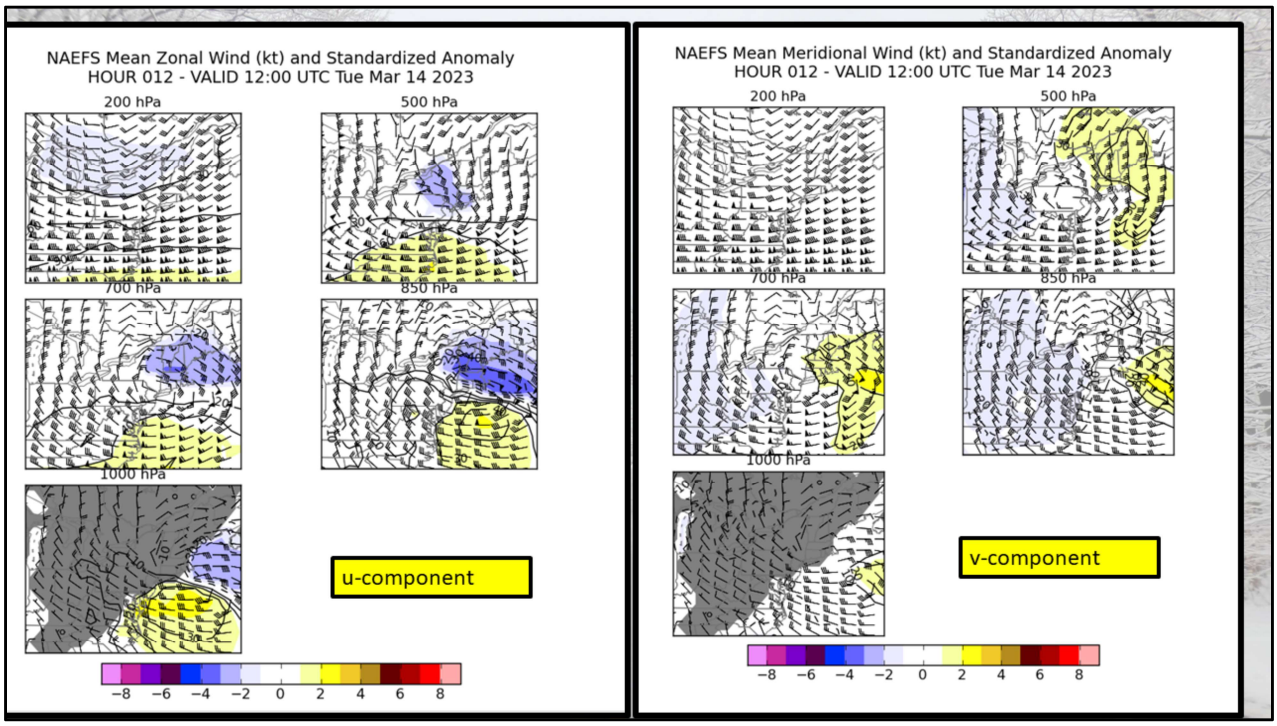
A closed circulation at 850 hPa was moving across the eastern Great Lakes Region into western NY at 1200 UTC 13 March 2023. A separate circulation was near the NC/VA coast. The west/northwest low-level jet would increase over upper Mid Atlantic Coast by 1200 UTC 14 March 2023 with a stretched closed circulation extending from southern NY to southeast of Cape Cod 24 hours later. The low-level deformation and frontogenesis was increasing by 1200 UTC 14 March 2023 with some very heavy banded snowfall in the ALY forecast area.



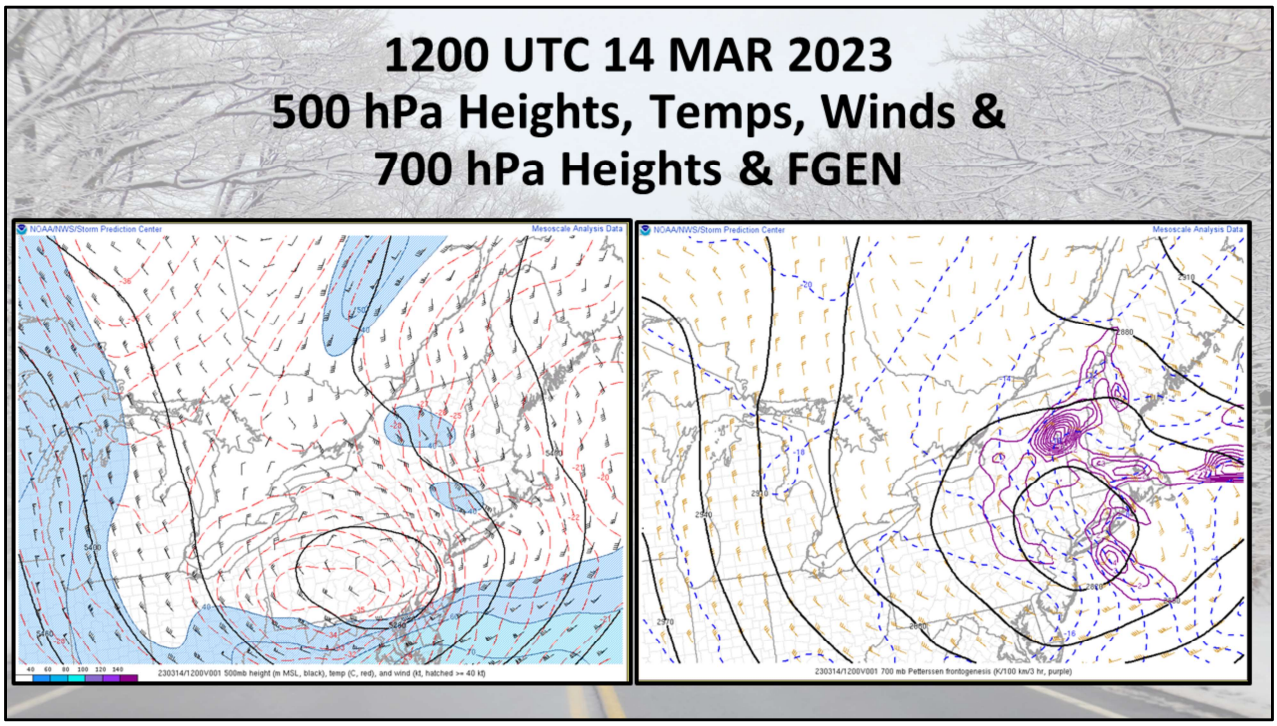
The Miller Type B system would transition to a stretch coastal low near eastern Long Island and southern New England by 1200 UTC 14 March 2023. The storm was not quite a bomb as it fell short deepening from 998 hPa at 0000 UTC 14 March 2023 to 980 hPa near the Gulf of Maine at 1800 UTC 14 March 2023. Nonetheless, it was a very intense and slow moving storm that tapped plenty of Gulf and Atlantic moisture.



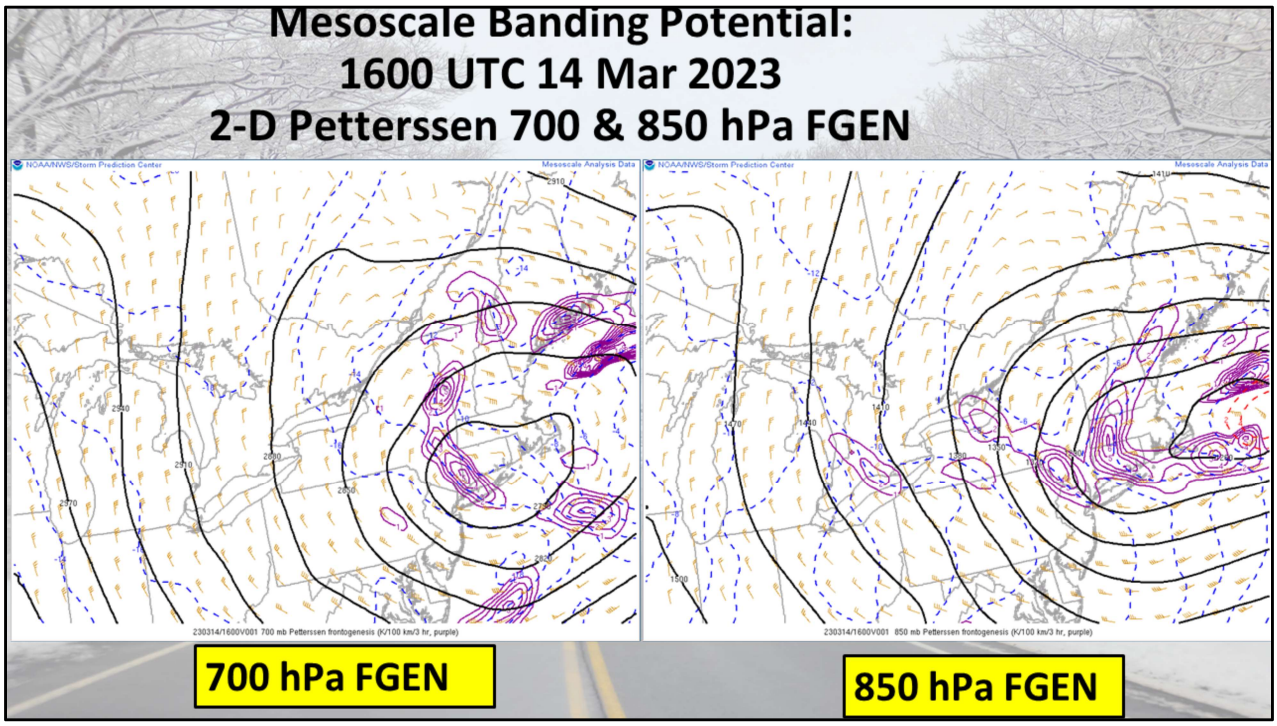
The 0000 UTC 14 March 2023 NAEFS PWAT anomalies were about a standard deviation above normal with IWT values of 100-200 kg/m/s which were also less than 2 standard deviations above normal. However, the slower movement of the storm and banded precipitation with local wind effects enhanced the snowfall.



The NAEFS low-level wind anomalies were evident at 1200 UTC 14 March 2023 with -u component wind anomalies (easterlies) at 850 hPa -2 to -4 standard deviations greater than normal. The 850/700 hPa +v-component anomalies were also +1 to +2 standard deviations above normal (southerlies)).



At 1200 UTC 14 March 2023 the 500 hPa low closed off over central and eastern Pa south/southwest of the forecast in a favorable location for persistent and heavy precipitation as the low-level circulation would get captured and the 700 hPa 2-D FGEN would increase overnight over eastern NY and western New England.



By 1600 UTC 14 March 2023, the 700 hPa and 850 hPa 2-D Petterssen frontogenesis will enhance over eastern NY and western New England with a heavy snowband that would push westward in the deformation zone of the cyclone.

CSTAR I (Novak et al. 2004): Mesoscale Snowband Flow Charts &Conceptual Models

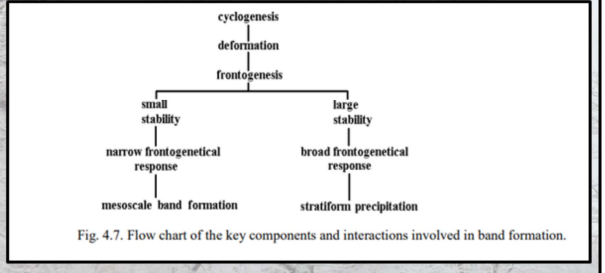


Fig. 4.7. Flow chart of the key components and interactions involved in band formation.

Frequently cited in NWS Area Forecast Discussions, refereed literature & used in the warning decision making

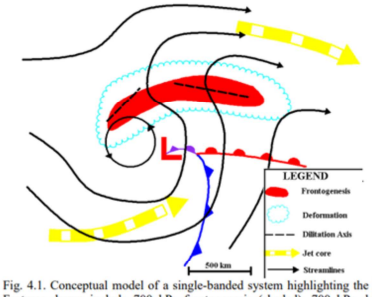
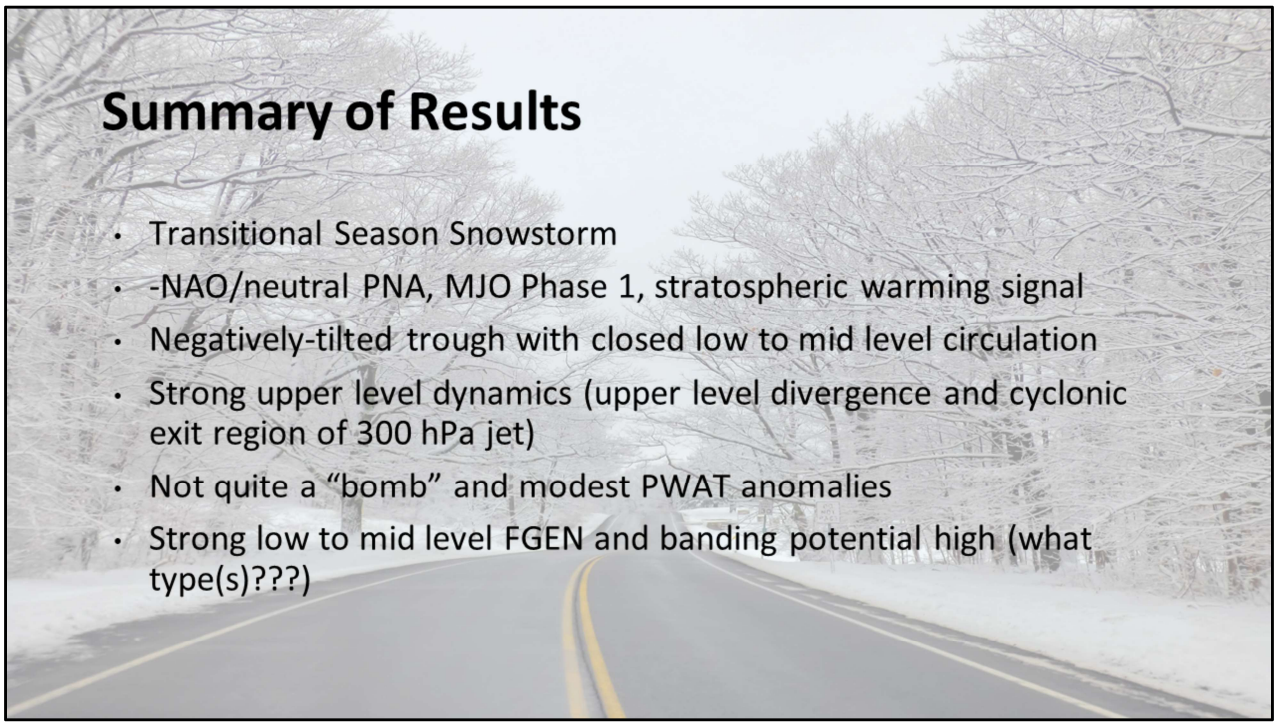


Fig. 4.1. Conceptual model of a single-banded system highlighting the key parameters. Features drawn include 700 hPa frontogenesis (shaded), 700 hPa deformation zone (encompassed by scalloped line) and associated primary dilatation axes (dashed line), 700 hPa streamlines (black lines), and 300 hPa jet cores (wide dashed arrows).

This is a flow chart (left) of previous published work by Dave Novak et al. (2004) from CSTAR I on forecasting and identifying mesoscale heavy snow bands. The snow band potential was highlighted in AFD's and used in the Warning Decision Making. A translating band becoming quasi-stationary was anticipated. The conceptual model (right) was also utilized in the forecast decision and headlines (i.e Winter Storms Warnings, etc).



The results from Part I of the presentation are shown above. This transitional season snowstorm was the most impactful in the 2022-23 winter season for the WFO ALY forecast area.