**The Heavy Mixed Precipitation and Localized Ice Storm on 3-4 February 2022 in Eastern New York Part I: Synoptic and Mesoscale Overview**

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A heavy mixed precipitation and localized ice storm occurred on 3-4 February 2022 across eastern New York (NY) and western New England in the National Weather Service (NWS) Albany New York County Warning Area. A prolonged and significant precipitation event occurred across eastern NY and western New England with one to two and a half inches of liquid equivalent. Rain quickly transitioned on 3 February 2022 to a variety of wintry precipitation types as an anafront moved southward across the region from late afternoon into the early evening. Heavy snow (8 – 16 inches) occurred north and west of the Capital Region over the Mohawk Valley, southern Adirondacks and the Lake George Area. Heavy accumulating sleet (up to and in excess of 2 inches), and lighter snow accumulation occurred in the Greater Capital Region. A localized yet significant ice storm occurred over portions of the Mid-Hudson Valley in eastern NY. The spatial distribution of ice accretion and associated significant societal impacts were modulated by the complex terrain and were extremely variable. Most of the freezing rain impacts were minor, except across portions of central and eastern Ulster County where heavy localized ice accretions (0.25- 0.50 inches of flat ice) caused 46,000 customers, or roughly half of the customers in the county, to lose power. Such a complex winter event presented numerous challenges to NWS forecasters as they communicated hazards and impacts to New Yorkand western New England federal, state and county partners.

The first part of this case study presentation will focus on a synoptic and mesoscale overview of the event with an additional focus on the observations. Analysis of radar data compared to observations and forecasts from the HRRR and HREF will be briefly shown. Anomalous low-level moisture advected into the region ahead of a positively tilted 500 hPa trough. Precipitable water anomalies were +2 to +4 standard deviations above normal based on the North American Ensemble Forecast System. The precipitation became heavy around 00 UTC on 4 February and continued until around 12 UTC on 4 February as the right entrance region of a 300 hPa 150-200 knot jet streak approached northern NY. The 850-700 hPa low and mid-level 2-D Petterssen frontogenesis strengthened significantly over eastern NY and western New England. Colder sub-freezing air would push southward across eastern NY overnight with snow, sleet and freezing rain becoming the predominant precipitation types as multiple waves moved along the cold front. The 00 UTC 4 February 2022 KALB sounding showed the evolution of precipitation types from rain/freezing rain with a shallow warm nose to a classic sleet sounding with a deep cold-air wedge in the lowest part of the boundary layer (surface to 3.3 kft) with a warm nose aloft at 12 UTC 4 February 2022. The NYS mesonet enhanced situational awareness as the event unfolded providing 5-minute temperature, precipitation rate and amounts, wind speeds, and hourly web cam images.