BAIRS II: The Second Buffalo Area Icing and Radar Study

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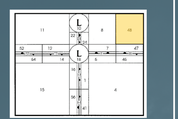
Introduction

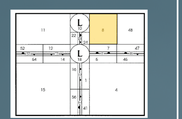
Five in situ icing missions were performed during January–March 2017. The purpose of the missions was to verify the presence of supercooled liquid water (SLW), attendant riming, and ice-phase hydrometeors in support of further development of the FAA's NEXRAD Icing Hazard Levels (IHL) algorithm and validation of the NEXRAD Hydrometeor Classification Algorithm (HCA). Initial analysis of the data is underway. An overview of the five missions is detailed here.

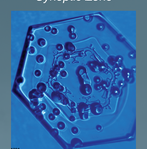
Mission #1: 10 January 2017


Synoptic Zone

- Continental air ingestion
- Needle episodes with SLW
- Encounters with +ZDR BB (positive differential reflectivity "bright band")
- Droplet episodes in CPI (imager) data
- Scattered areas of pre-frontal precipitation
- In situ area north and well east of warm front (surface low moves through Western Great Lakes)

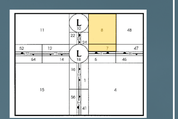
Mission #2: 24 January 2017

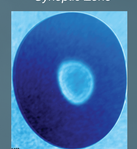

Synoptic Zone



- Maritime air ingestion
- SLW large drops: Drizzle and freezing rain
- Spiral through multiple 0°C crossings
- Aerial coverage of mixed phase precipitation becomes extensive with time in Central NY
- Large occluded, slow moving east coast storm with deep strong easterly inflow from surface to mid-levels

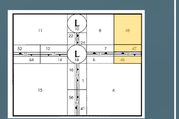
Mission #3: 7 February 2017


Synoptic Zone



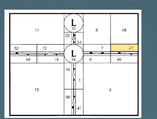
- Shortest probing duration among the five missions (3 hours)
- Spiral and porpoising focus within and several thousand feet above melting layer in search for wet snow
- Widespread pre-warm frontal precipitation probed

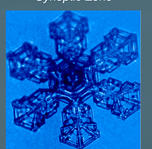
Mission #4: 24 March 2017


Synoptic Zone

- Probed widespread precipitation that developed ahead of warm front and associated with large scale lifting from very distant closed low over Central Plains
- Four spirals performed within stronger reflectivity cores
- Probed areas within and above the melting layer with graupel occasionally observed

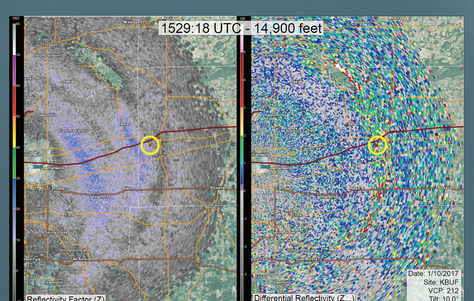
Mission #5: 25 March 2017


Synoptic Zone



- Previous day's warm front now a cold front stalling over Southern New York
- Long porpoising transects performed where HCA predominately showed "Dry Snow"
- Observed long stretches void of SLW
- Occasional in situ graupel observations noted within heavier precipitation cores
- Weak +ZDR BB sampled late in the mission

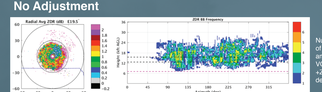
Probing the Positive Differential Reflectivity Bright Band



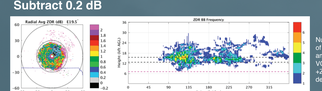
The positive ZDR "bright band" (+ZDR BB) is typically co-located at altitudes associated with temperatures between -10° to -15°C that in water-saturated mixed phase conditions correspond to dendritic growth in mixed phase conditions. Understanding how this dual pol radar feature relates to a possible icing hazard is key.

ZDR Bias Affects +ZDR BB Detections

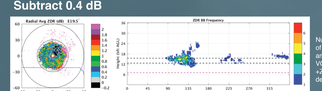
No Adjustment



Subtract 0.2 dB



Subtract 0.4 dB

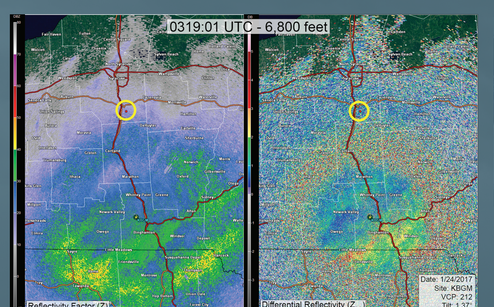


Radar Reflectivity Comparison Tool


3-Method ZDR Bias Estimate

Proper calibration of dual pol fields such as differential reflectivity (ZDR) is paramount for optimal performance of automated detection algorithms.

Refreezing Zones Beneath Melting Layer Explored



Especially with higher altitude melting layers, a refreeze icing hazard zone could be present beneath.

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