# Gap-Filling Weather Radar & Winter Operations

Presenter- Apoorva Bajaj, Public Sector Weather Radar Programs

Flying in Complex Weather: Mountain and Winter Weather Operations

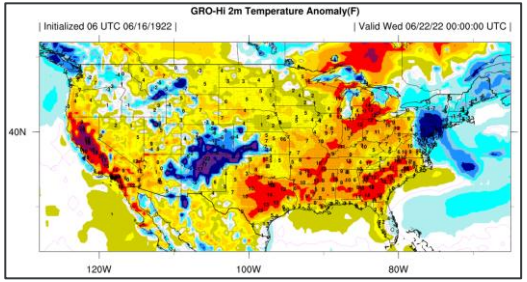
Friends & Partners in Aviation Weather Fall Meeting

October 9, 2025, Logan, Utah

# Climavision: Weather Intelligence & Analytics Of The Future

**Building a nationwide proprietary radar network…** → **… and a new AI Powered approach to NWP…** → **… to develop market leading analytics and forecasts**

- Filling low-level data voids in the US NEXRAD network
- Solid State, Dual Pol, X-band weather radars at 10X the resolution of S-band radars




**Leverage high-resolution observational data sets & AI** climate tech to fill blind spots in existing forecasts.

- 1.5 billion global observational datasets captured daily
- Rapidly assimilate new and novel third-party datasets

**Leading point-forecast** solutions with a top wind speed forecast and an asset-level database for **hyper-tailored views of renewable generation**

**New approach to Numerical Weather Prediction** that forecast the growth of major storm systems and big atmospheric changes with precision & speed.

**Powered by in-house and cloud-based super-computing capabilities**

**Climavision is building next-gen weather solutions to fill long-standing gaps and address the challenges of a changing climate**

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# Use of Weather Radar

## AVIATION

**Pilots & Dispatchers**

Flight planning

En route decisions

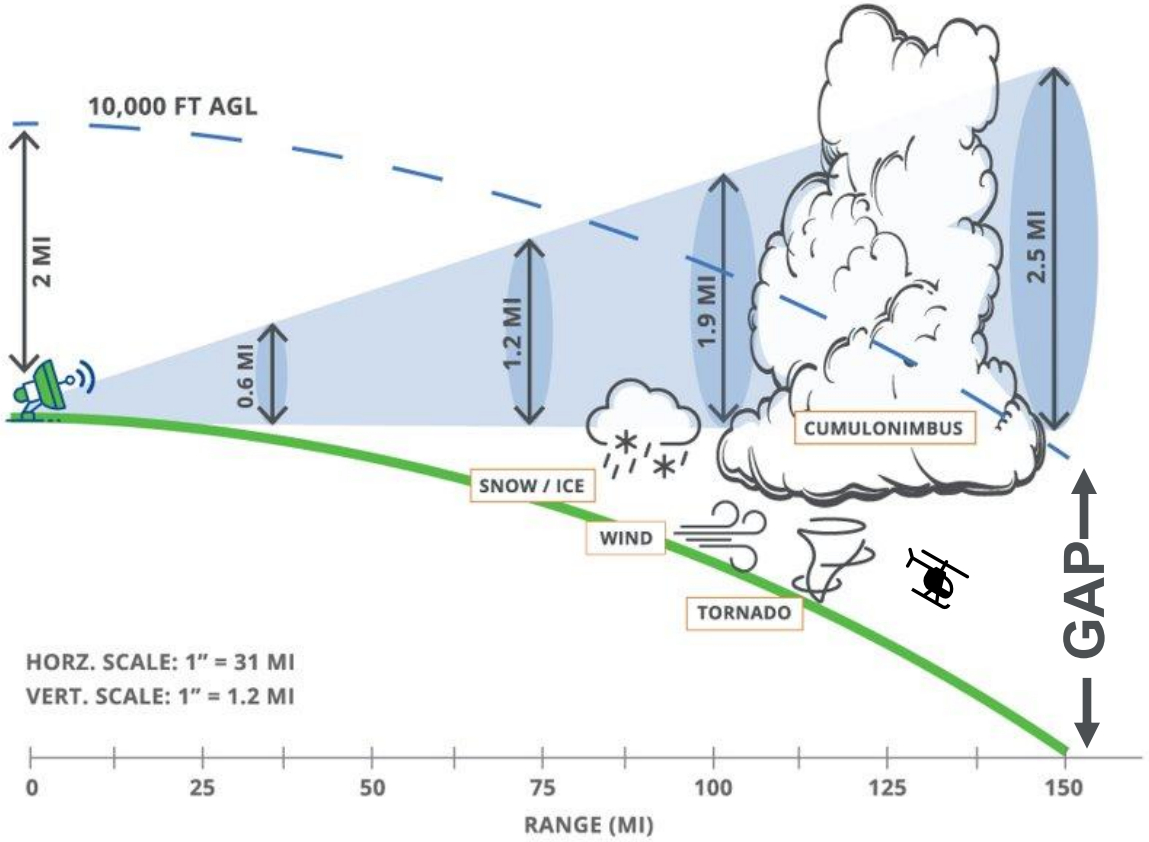
**Air Traffic Control**

Airspace guidance

**Airports**

Safety of personnel, fleet and infrastructure

Ramp and runway operations

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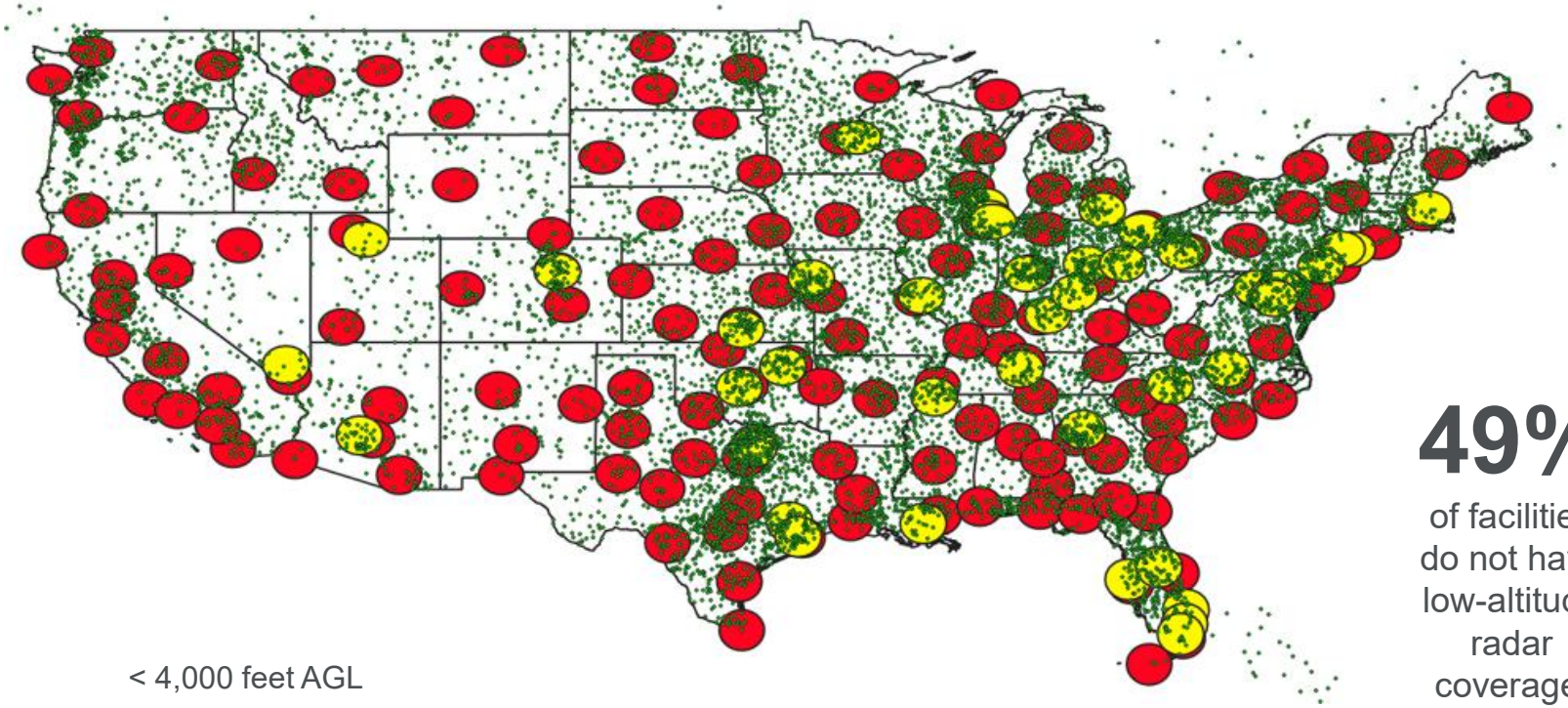
# Low-altitude Coverage for Aircraft Landing Facilities




**49%**

of facilities do not have low-altitude radar coverage!

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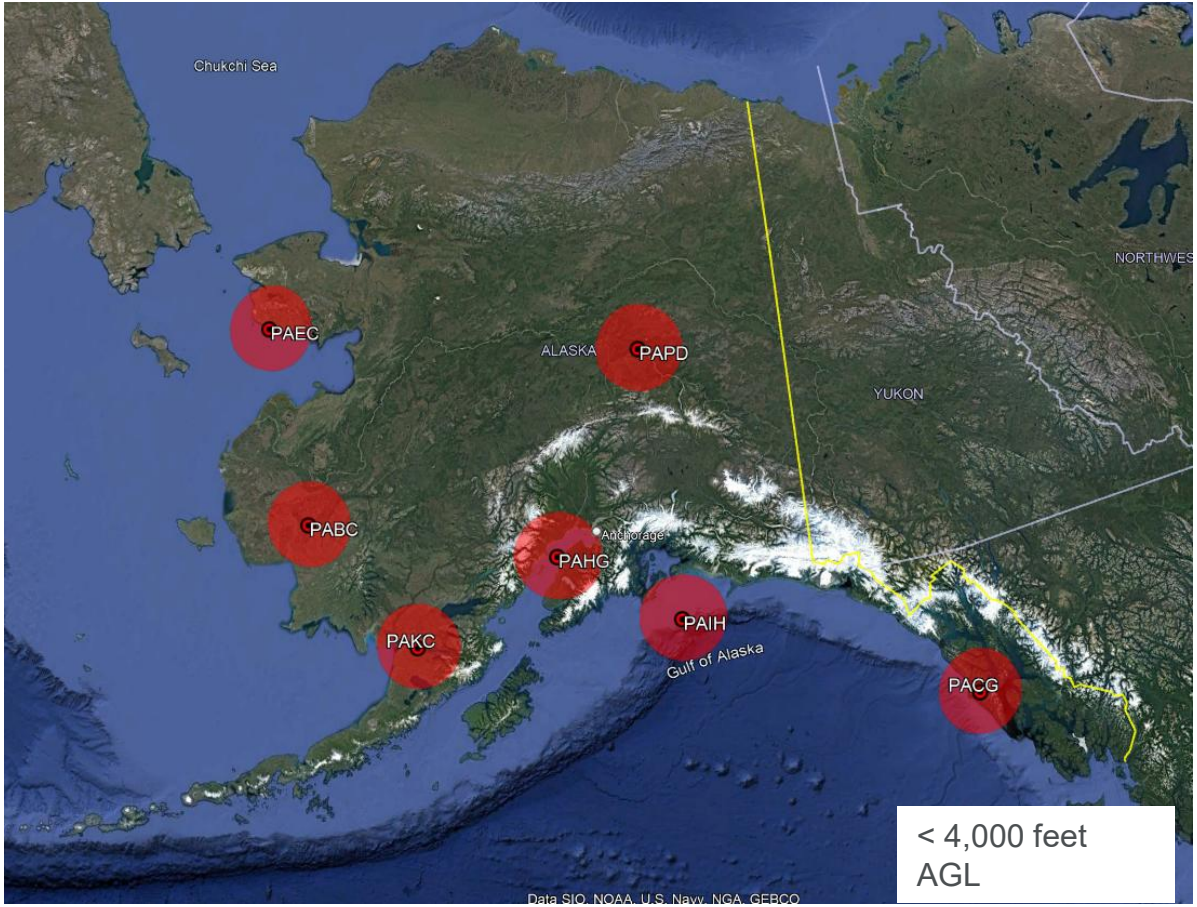


Weather radar coverage below 4,000 feet in Alaska

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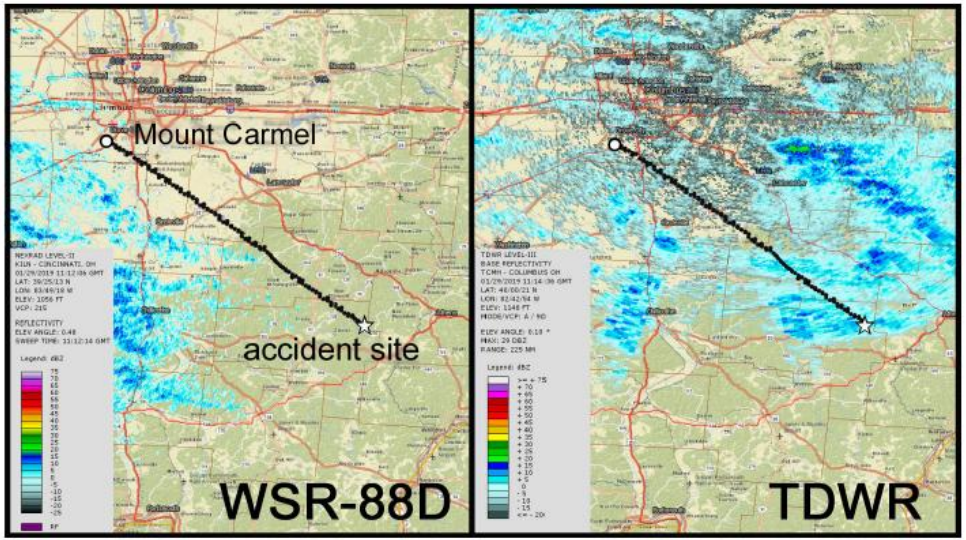
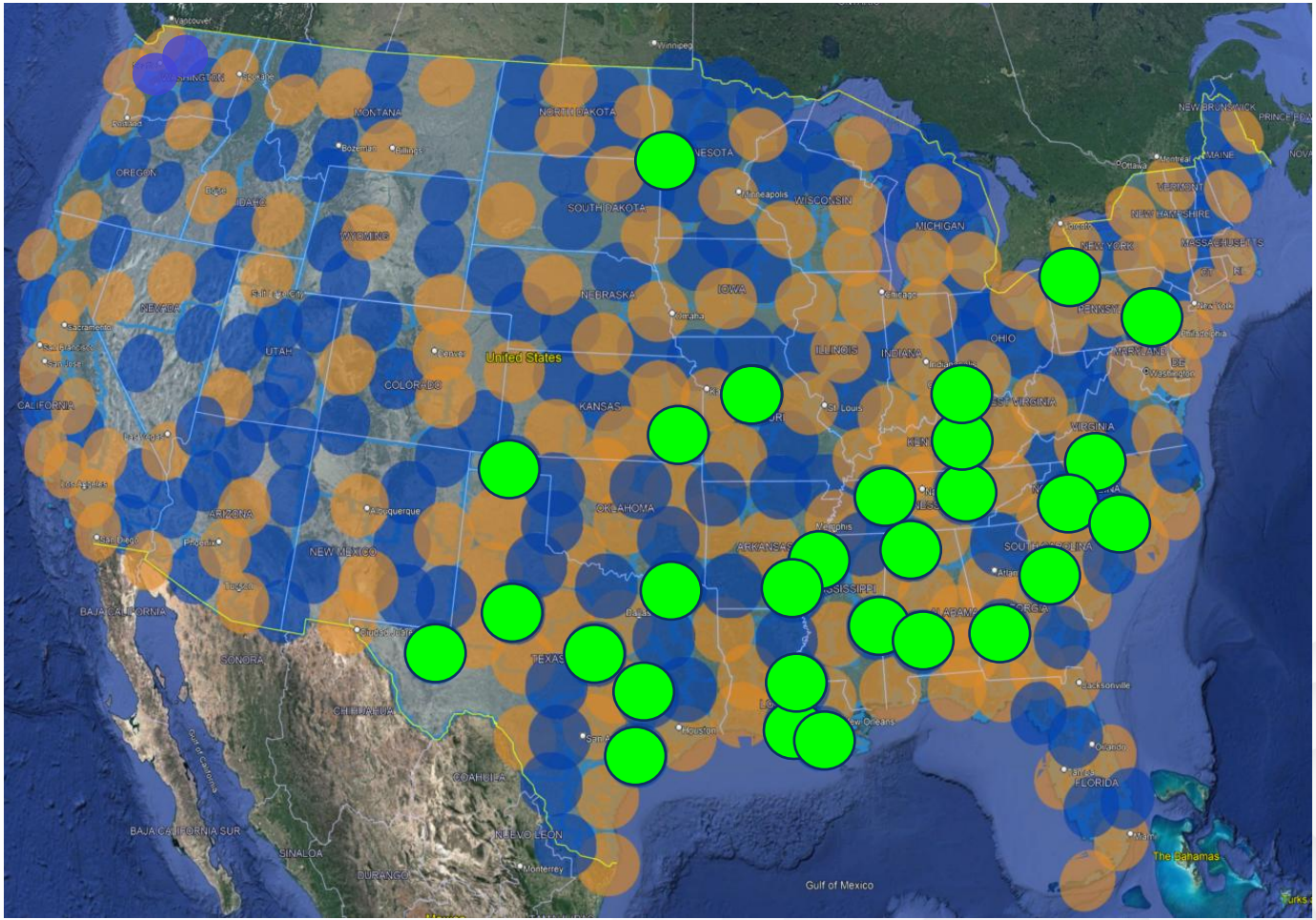
# Safety Implications for General Aviation

On Jan. 29, 2019, a Bell 407 helicopter air ambulance operated by Survival Flight crashed near Zaleski, Ohio, killing the pilot, Jennifer Topper, and flight nurses Bradley Haynes and Rachel Cunningham.




- Enroute weather radar not easily available to general aviation and air ambulance services
- EFB applications can have delayed radar imagery
- HEMS Weather Tool uses the MRMS product that does not include TDWRs

Image Source: Accident Report NTSB/AAR -20/01 Helicopter Air Ambulance Collision with Terrain, January 29, 2019




# Operational Fleet & Plan

As of October 1, 2025

- NEXRAD at 4,000ft AGL
- Planned Climavision site
- Operational (29)



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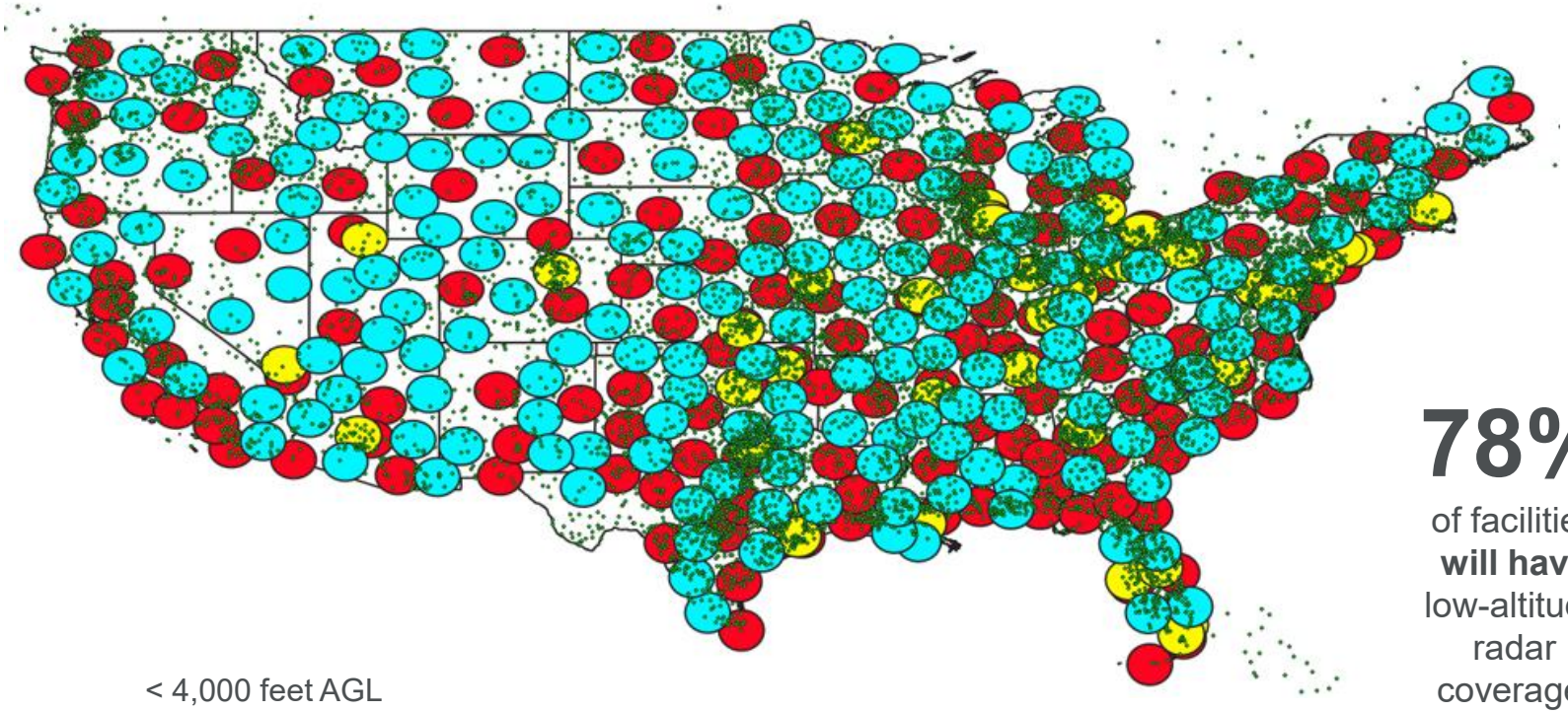
# Climavision Supplementary Radar Network



< 4,000 feet AGL

**78%**

of facilities **will have** low-altitude radar coverage!

**200+ radars over next 4 years!**

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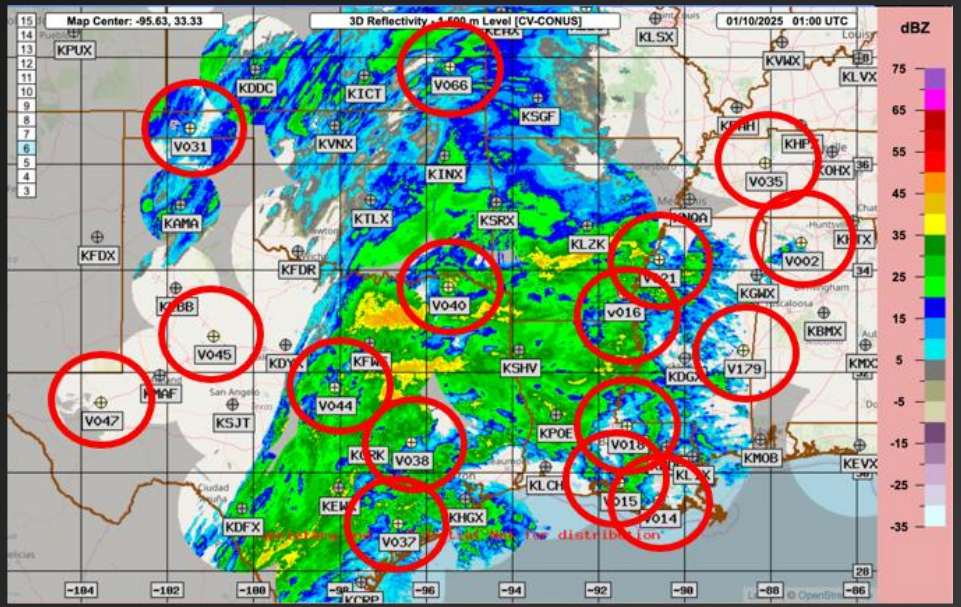
# Integrating with NWS




Climavision radars integrated into experimental MRMS configuration via CRADA activity.

- Data from 13 Climavision radars is a part of the NWS Commercial Data Buy Program and is available to select NWS Regional HQs and WFOs via GRAnalyst2
- CRADA with NSSL helped stand up and test dataflows for this activity
- NSSL and Climavision both continue to work with NWS SMEs at the ROC, Regional HQs, National Centers, etc. to share results from the CRADA

Image Courtesy: Race Clark, National Severe Storms Laboratory

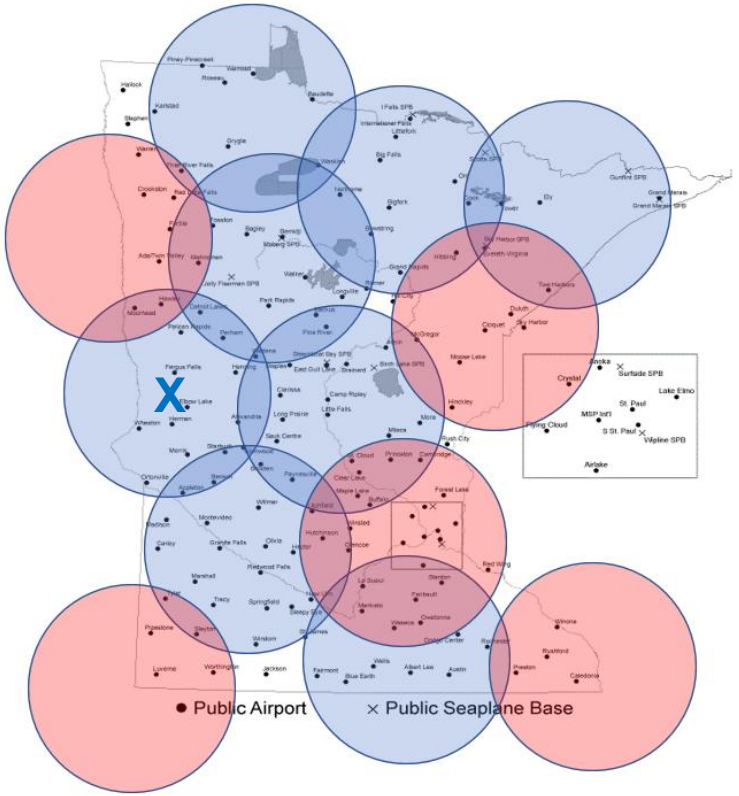
# Optimizing for Winter Weather Observations

- Focus on **low altitudes** – winter storms are shallow
- **Dual Polarization technology** – determine size and shape of hydrometeors
- Transmit at **shorter wavelength (X-band)**
  - **More sensitive to snow** than longer wavelengths (C-, S-band radars)
  - **More accuracy in snow rate measurements** - KDP three times higher at X-band than S-band
  - **Better ground clutter elimination** – cleaner imagery

# Radar in Central Minnesota

**Emergency managers hope new radar will fix coverage gaps in Minnesota**

The new radar was installed recently atop the water tower in the Grant County town of Wendell, Minnesota, by a private company called Climavision




Red = NEXRAD Blue = Climavision
(< 4,000 feet AGL coverage)

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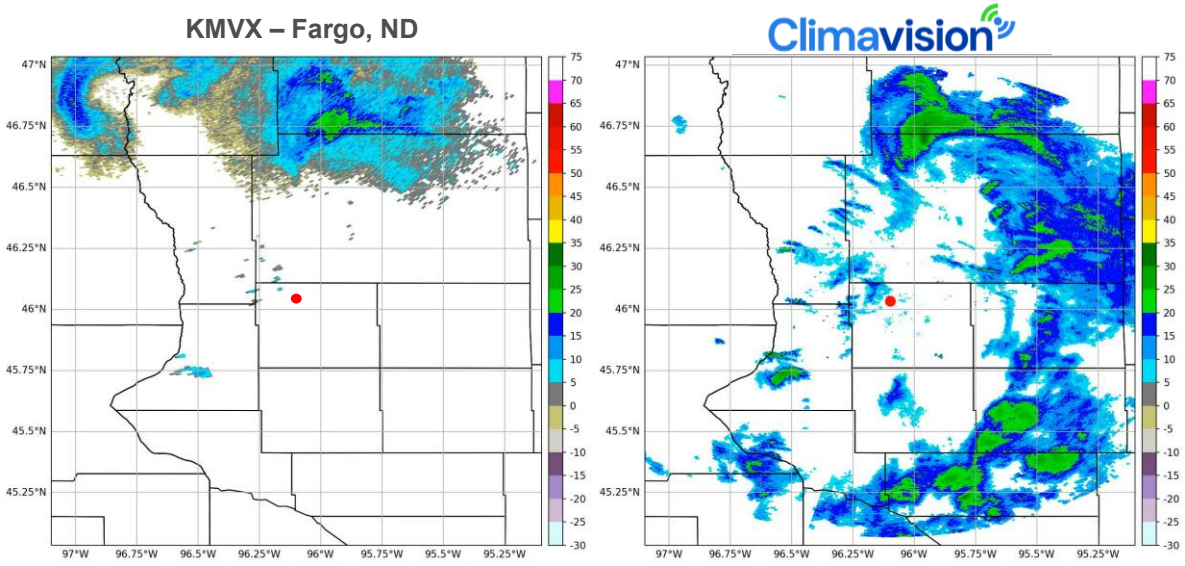
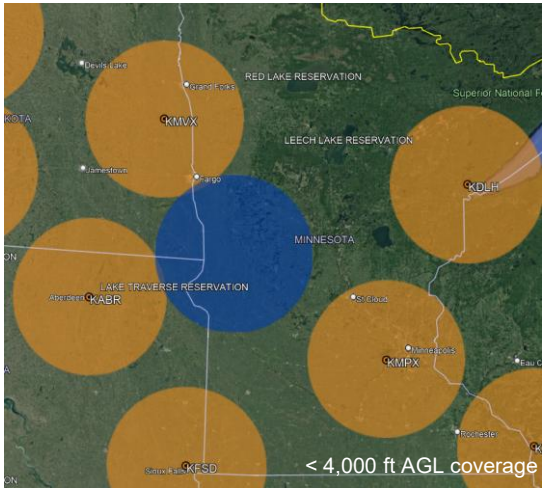
# Minnesota Case Study - I

October 31, 2023

On October 31st, one inch of snow fell near Climavision's first Minnesota radar installation in Grant County, per local weather station reports. As seen in the radar loop below, Climavision's radar detected snow for several hours, while the closest NEXRAD radars missed the majority of the snowfall event. It is important to note that low-level radar coverage in Minnesota is limited, making Climavision radar installations ever important.



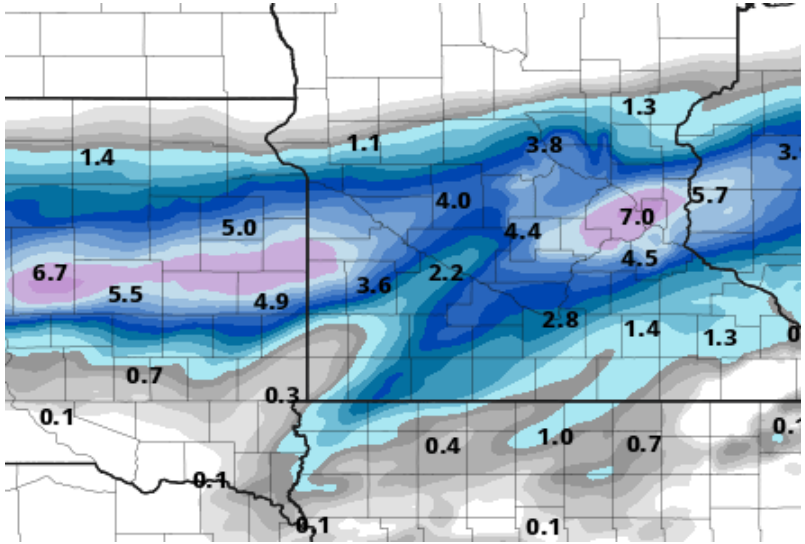




Climavision's radar (blue) in Wendell, MN sits in a prominent weather radar gap. The two closest NEXRAD radars (orange) sit over 100 miles away in North Dakota and South Dakota. The radar beams from KMVX and KABR sit at over 12,000 ft AGL over Wendell.

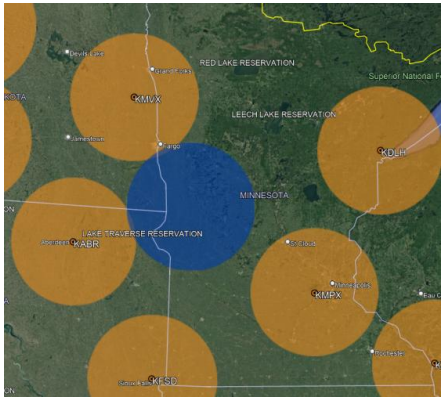
# Minnesota Case Study - II

February 14, 2024

On Valentines Day, snow was reported near Climavision's Wendell, MN radar site. The image below shows snowfall totals reported from a variety of locations. Nearby NEXRAD radars overshot the precipitation that made it to the ground, leading to underestimations in the expected precipitation, whereas Climavision's Wendell radar was able to detect heavier bands of snow.




Data: 48-Hour Snow Accumulation via PivotalWeather
Photos: twincities.com (top), nujournal.com (bottom)

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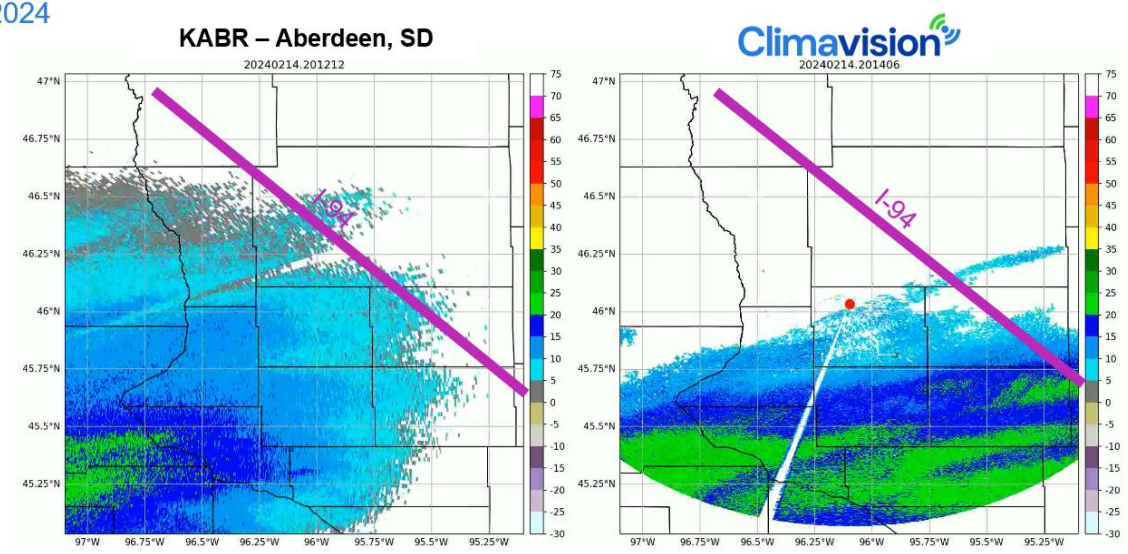
February 14, 2024



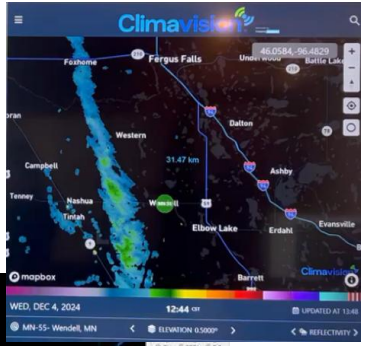

Climavision's radar imagery (right) showcases heavier bands of snow to the southeast of the Grant County radar location that KABR overshoots. With the supplemental low-level coverage, we are able to identify the heaviest bands of snow and better understand the precipitation that actually made it to the surface.

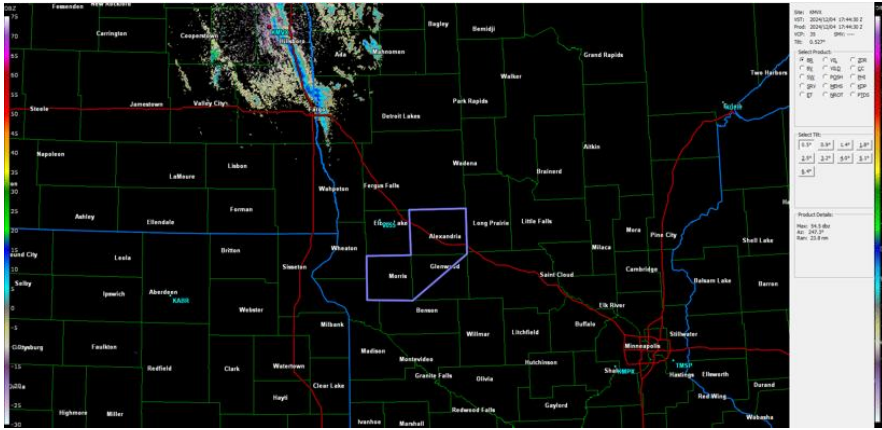
# Usage within the National Weather Service

Additional eyes on the skies

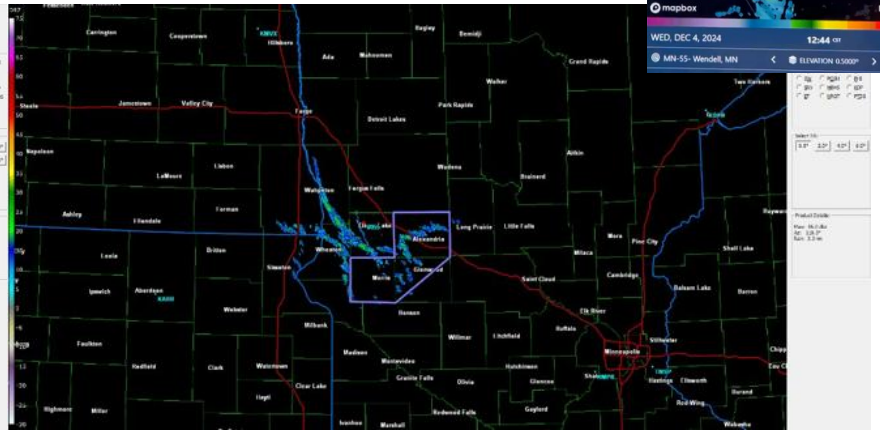
## Minnesota / North Dakota NWS Offices

*Had access to our radar in West Central Minnesota and issued their first ever **Snow Squall Warning** in December of 2024.*

KMVX – Mayville, ND



V055 – Wendell, MN

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# Lake Effect Snow – Erie Region

Beginning November 29, 2024

Just after Thanksgiving, on Friday, November 29, 2024, a winter storm moved across the US. As the system crossed the Great Lakes, it dumped dozens of inches of snow from Michigan and Ohio to western New York and the Erie region of Pennsylvania. Erie, PA set an all-time record with 22.6 inches of snow on Friday, and up to 42.5 inches by Sunday night. The event caused white out conditions and shut down major transportation corridors, such as I-90, on one of the busiest travel days of the year.

**Residents left dazed and homebound as lake-effect storm punishes Erie County with snow**

*Some areas of Erie County were on pace to record nearly 5 feet of snow since the lake-effect storm gripped the region the day after Thanksgiving.*

Ed Palattella and Nicholas Sorensen Erie Times-News

Published 2:36 p.m. ET Dec. 2, 2024

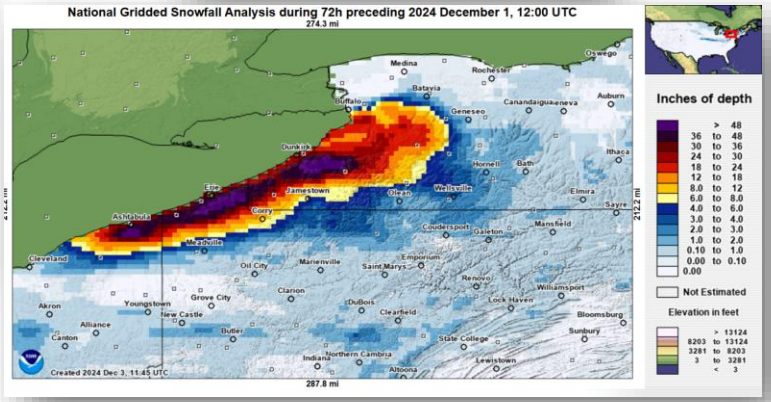
**Erie County Executive Davis, PennDOT urge residents to stay home amid lake-effect snowstorm**

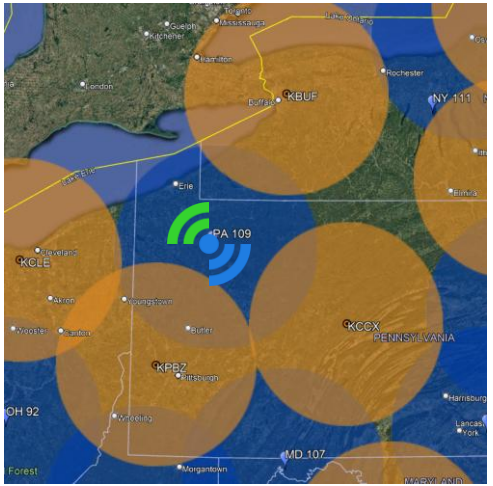
A.J. Rao
Erie Times-News

Published 2:18 p.m. ET Dec. 1, 2024 | Updated 5:49 p.m. ET Dec. 1, 2024

**Watch: Feet of lake-effect snow piles up along Great Lakes paralyzing travel, prompting states of emergency**

As of Monday morning, snowfall measurements reached 65.5 inches in Barnes Corners, New York, east of Lake Ontario. The town of Erie, Pennsylvania, set an all-time daily snowfall record at 22.6 inches Friday, with storm totals reaching 42.5 inches by Sunday night.




PA109 is located in Pleasantville, PA and provides gap-filling coverage for 60 miles in every direction. Orange circles represent NEXRAD systems out to 4,000ft above the ground. Blue circles represent radar "gaps" and planned or live supplemental Climavision radar sites – areas with diminished coverage beyond the low-level visibility of NEXRAD systems. The nearest NEXRAD radar to Erie is KBUF around ~90 miles away.

NEWS

**Highways in Pennsylvania closed due to lake effect snow**

by: Brett Balicki, Sarah DeLisio, Hanna Erdmann
Posted: Nov 30, 2024 / 08:54 AM EST
Updated: Nov 30, 2024 / 08:54 AM EST

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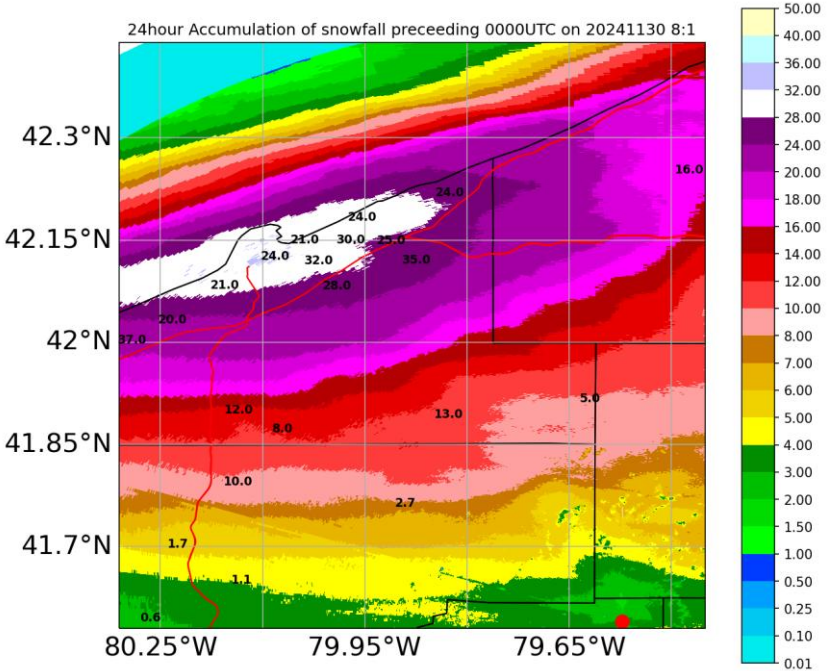
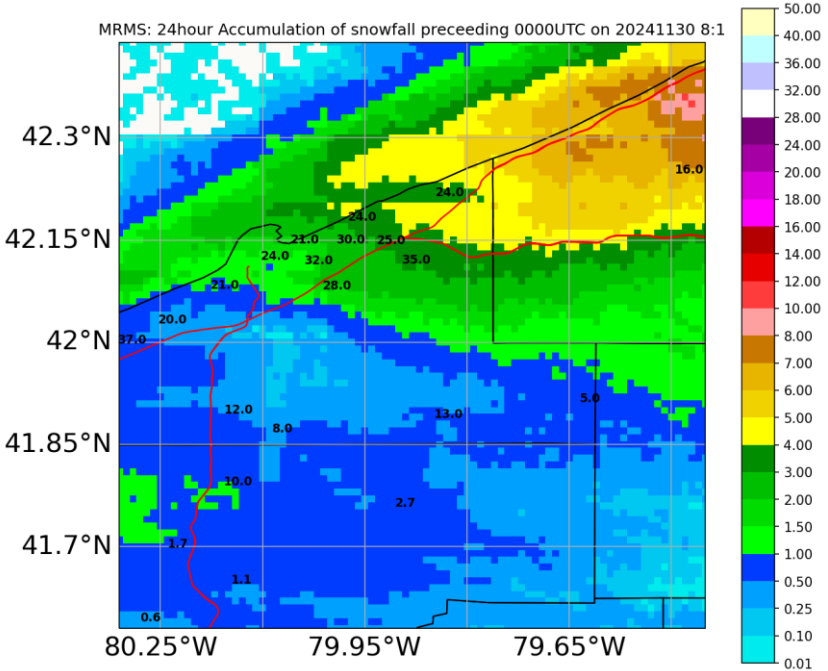
# 24 hour Snow Accumulation from 0000 UTC – 2359 UTC on 11/29/2024. SWE is 8 inches of snow for every 1 inch of precip. (Units: Inches)

## v109 Snow Accumulation




## MRMS Snow Accumulation (Radar Only)

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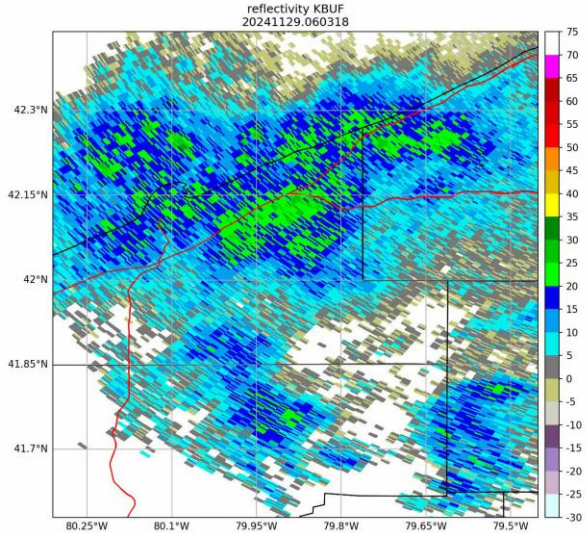
# Lake Effect Snow – Erie Region

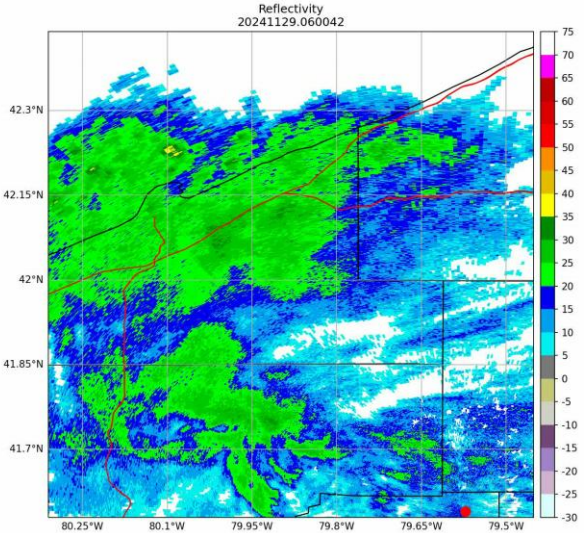
Beginning November 29, 2024

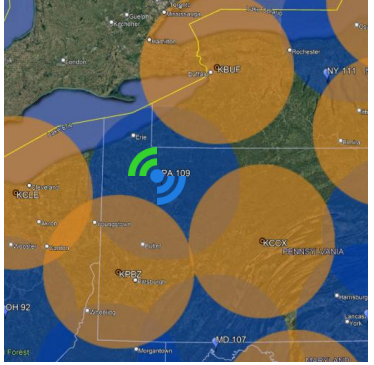
Climavision recently installed a supplemental radar in Pleasantville, PA to fill a low-level gap in observations in the Erie region. When compared to nearby National Weather Service radars (NEXRADs), the supplemental system captured heavier snowfall in certain areas. The high-resolution data captured on the supplemental system showed more clarity around impacted areas.

**KBUF – Buffalo, NY NEXRAD**




**Climavision – Pleasantville, PA**

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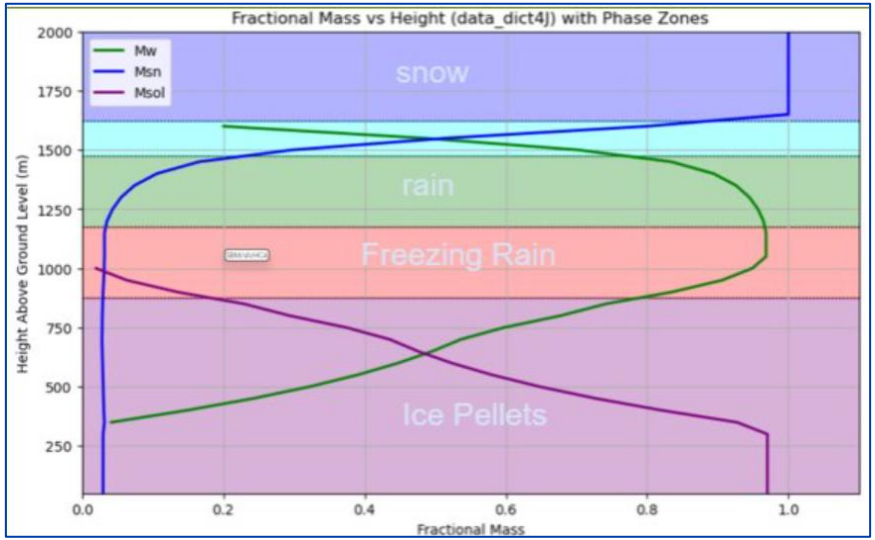
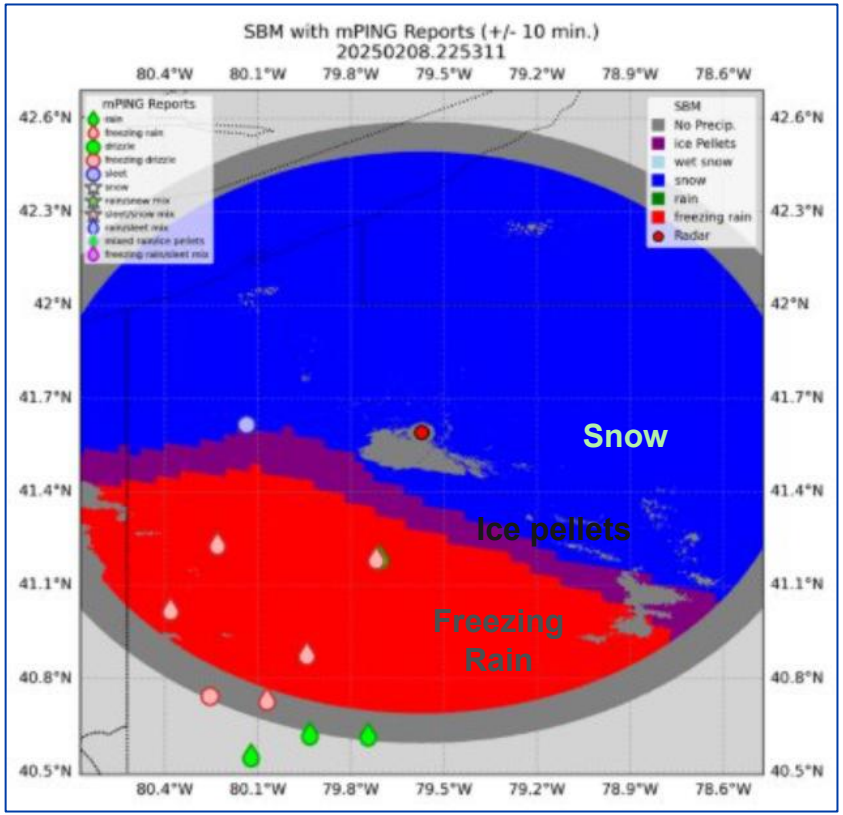
# Winter Weather – Hydrometeor Classification using Weather Radar

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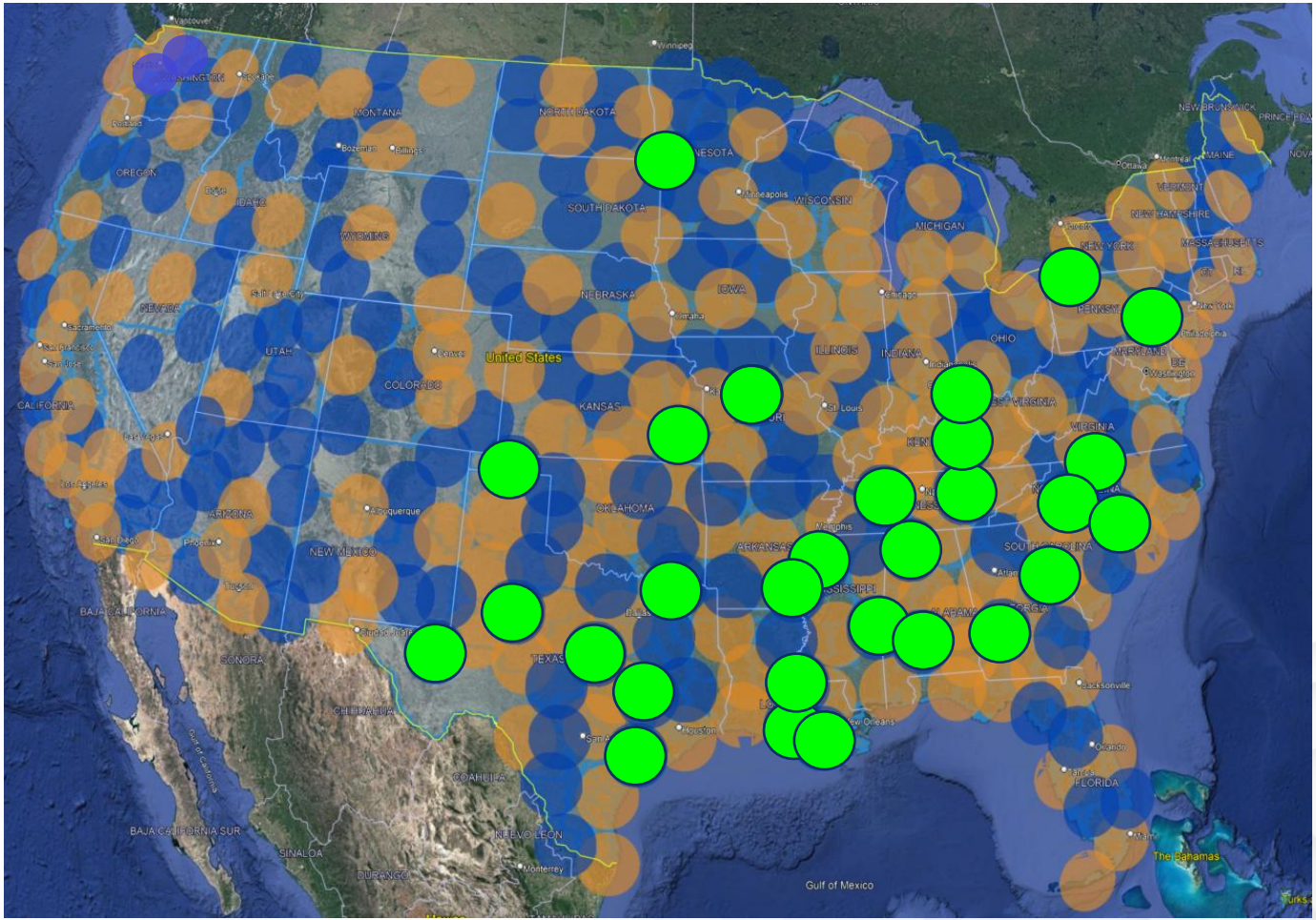


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As of October 1, 2025

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**Let’s fill the weather radar gaps!**



Climavision