



CASE STUDY | MARCH 2025

Horizon AI HIRES Outperforms HRRR During Severe Weather in the Chicago Region

Horizon AI HIRES Provided Earlier and More Accurate Insights

On March 19, 2025, a severe weather outbreak unfolded across the Chicago metro area and surrounding regions. Clusters of thunderstorms produced multiple gustnadoes, large hail, and two confirmed tornadoes, including an EF-1. As the storms rapidly evolved, forecasters needed timely, precise information to support critical decisions.

Climavision's Horizon AI HIRES model demonstrated superior performance over the widely used HRRR, offering earlier, more accurate guidance on storm timing, rotational potential, wind gusts, and hail risk. This case study illustrates how Horizon AI HIRES enhances confidence and operational preparedness in high-impact weather situations.

Climavision

Clusters of severe thunderstorms impacted the Chicago area

- The storm produced gustnadoes, two confirmed tornadoes (EF-unknown and EF-1), large hail, and damaging winds.

Horizon AI HIRES outperformed HRRR

- HIRES provided earlier and more accurate guidance on storm timing, rotation potential, wind gusts, and hail.

HIRES successfully identified supercell development

- The storm occurred south of Chicago, aligning with observed tornadoes and wind damage.

Hyperlocal, high-resolution forecasts

- The model gave forecasters enhanced confidence and insight for critical operational decisions.

Horizon AI HIRES Performance Highlights:

Climavision's Horizon AI HIRES model offered clear advantages over HRRR in multiple parameters:

Reflectivity

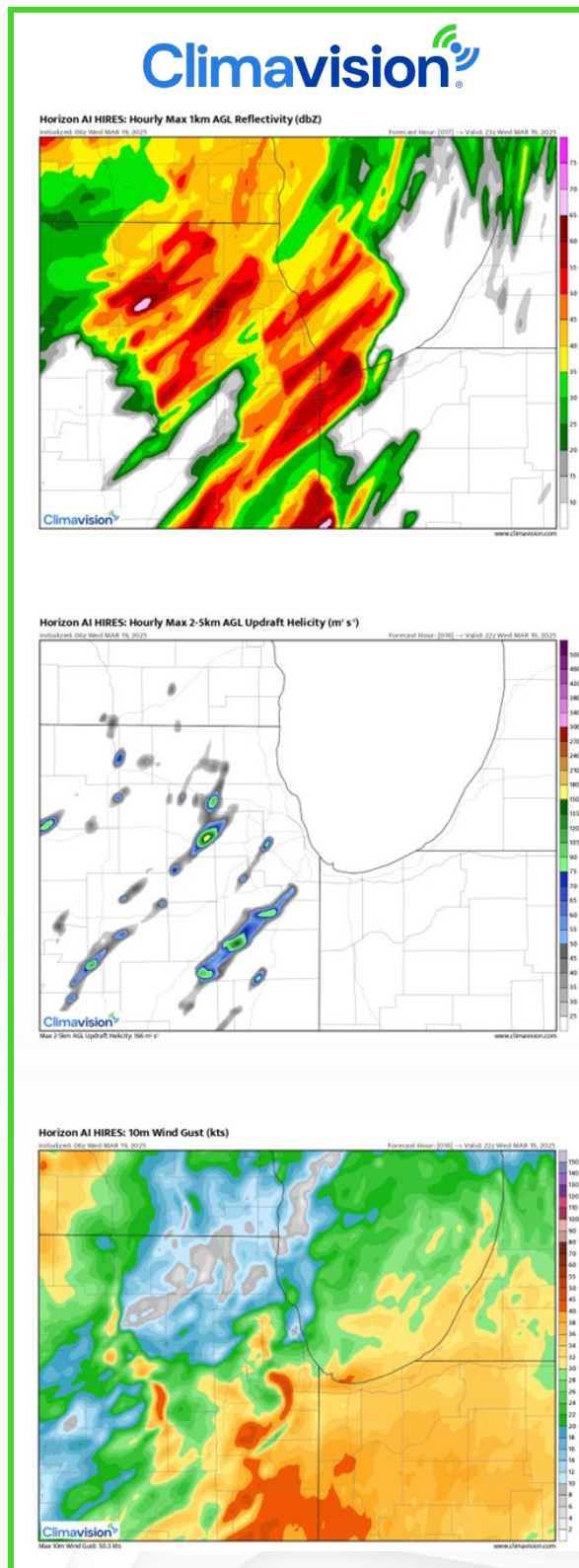
HIRES captured storm potential directly over Chicago around 22–23Z, closely aligning with observed timing. HRRR lagged behind and missed key activity in the metro area during this window.

Updraft Helicity

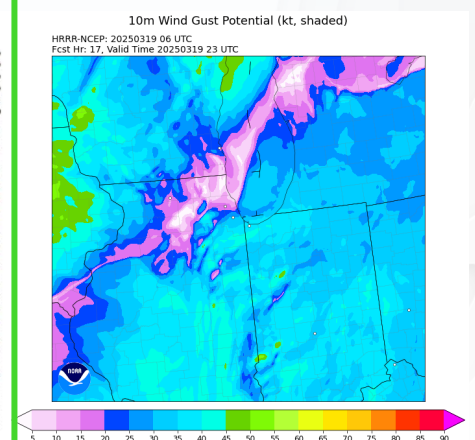
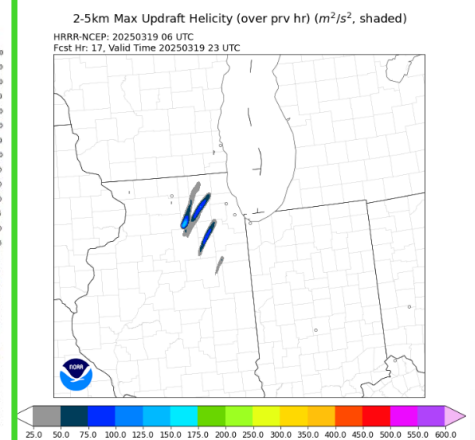
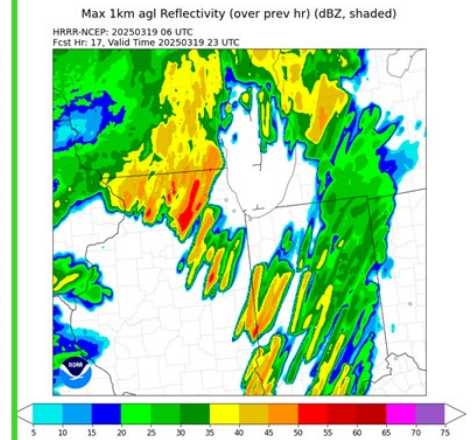
Used to assess supercell and tornado potential, HIRES revealed more widespread helicity south of Chicago—where tornadoes and wind damage were later confirmed. HRRR indicated some rotation, but less coverage and intensity.

Wind Gust Forecasts

HIRES more accurately forecasted strong winds near and south of Chicago, matching verified storm reports. HRRR under-predicted wind intensity in these areas.



HRRR



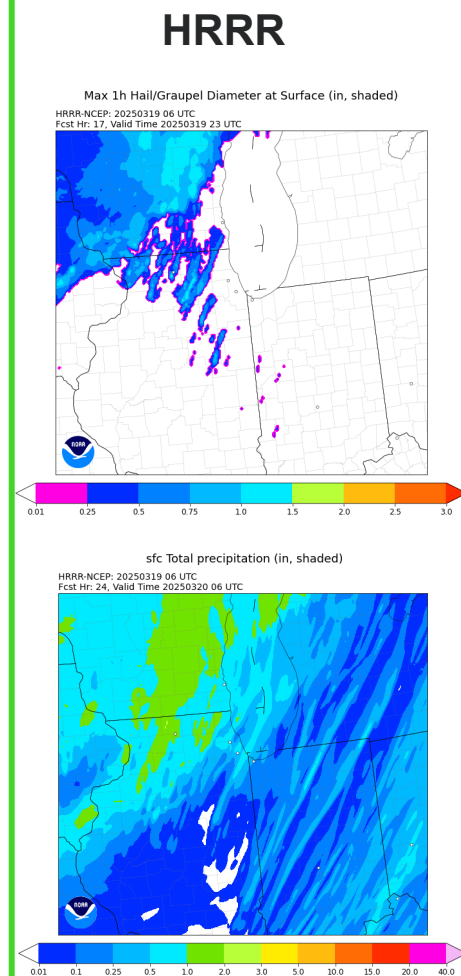
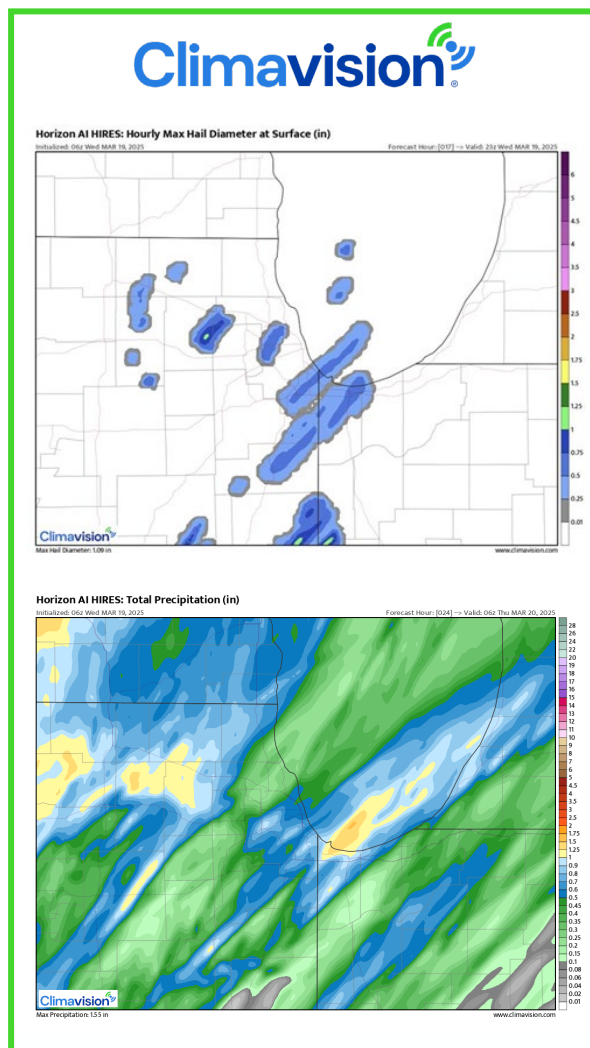
Horizon AI HIREs Performance Highlights Cont.

Max Hail Diameter

HIREs identified the risk for hail exceeding 1" south of Chicago—matching two hail reports in the affected area. HRRR provided less targeted insight.

Total Precipitation

Both models placed the heaviest precipitation correctly, though HIREs maintained high-resolution fidelity in localized accumulation patterns.



Why HIREs Performed Better:

Horizon AI HIREs delivers hyperlocal storm insights through a combination of enhanced physics, high-resolution output, and smarter data integration:

- **Resolution:** 2km CONUS model with optional 0.67km subdomains for ultra-local insights.
- **Physics:** Advanced schemes like the E- ϵ boundary layer and modified Tiedtke cumulus parameterization improve vertical mixing and cloud forecasting.
- **Data Inputs:** Combines HRRR initial conditions with radar, satellite, and sensor data.
- **Customization:** Models are tailored to specific geographies and operational needs.

Operational Impact for Users

Utilities, emergency managers, and broadcasters could have gained valuable operational advantages, including:

- **Informed Market Decisions:** Energy traders could anticipate demand spikes and generation disruptions tied to storm impacts, enabling better hedging and trading strategies.
- **Optimized Resource Deployment:** Utilities could better position crews and resources before damage occurred.
- **Enhanced On-Air Communication:** Broadcasters could deliver more precise forecasts, improving public trust and safety.
- **Improved Preparedness:** Earlier awareness of rotating storms and strong winds allowed for faster response planning.

When Stakes are High and Minutes Matter

The March 19, 2025 outbreak highlights the critical importance of high-resolution, storm-scale forecasting in today's volatile weather environment. Horizon AI HIREs provided earlier and more accurate predictions across multiple severe weather indicators, outperforming traditional models and validating against observed events.

When the stakes are high and minutes matter, HIREs empowers forecasters with the insight and confidence they need to protect people, assets, and operations.



About Climavision

Climavision is a well funded, Louisville-based startup, rebuilding climate technology from the ground up and combining terrestrial sensors with space-based observations. Our team of renowned meteorologists, leading scientists, and passionate weather enthusiasts are changing weather forecasting as we know it by uncovering the clearest, most accurate picture of weather intelligence. Our offerings put next-generation climate technology to work to fundamentally change weather forecasting.

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