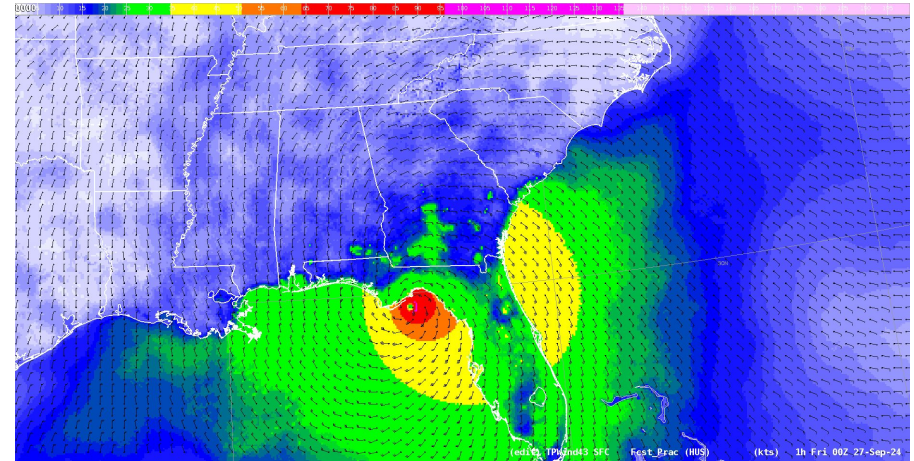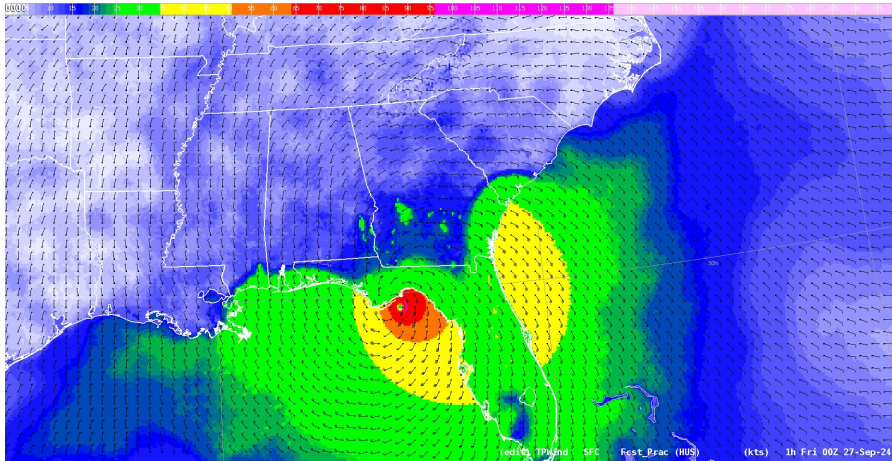# National Blend of Models (NBM) v4.3 Overview
16 December 2024

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NWS/OSTI/MDL Silver Spring, MD

Thanks to NBM v4.3 Developers

- Dave Rudack - Project Manager

- Geoff Wagner - Tropical Cyclone Wind Feature Matching Work

- Robby James - Maintaining/Running NBM v4.3 on WCOSS2

- Scott Scallion - Integrating SPC Products and Code Handoff to NCO

- Carly Buxton - Wet-Bulb Globe Temperature Work

- Daniel Cobb, Greg Leone - SLR Improvements to Snow product

- Adam Schnapp - Ceiling Change

- Dana Strom and Kevin McGrath - WSUP Viewer

- Brian Haynes - Evaluation and Web Page Support

Notable Changes in NBM v4.3

(1) Major improvements to the Tropical Cyclone Feature-Matched wind products. Instances of storms disappearing from the wind fields are removed, an adjustment based on the surface roughness length is used to create more realistic wind speeds over land, and wind direction is updated to be actually matched to the relevant feature.

(2) Additional probabilistic severe weather products from the Storm Prediction Center.

(3) Modifications to the snowfall to reduce too much melting in marginal temperature environments.

(4) An updated wet-bulb globe temperature (WGBT) calculation to be consistent with NDFD.

(5) A less heavy-handed approach to building ceiling when LAMP has cloud base height and the blended values do not

(6) A consistency check to ensure that deterministic wind gust cannot exceed the deterministic wind speed (no examples shown in this slide deck).

Improvements to Tropical Cyclone Wind Feature Matching

- Update Matching Algorithm - Implement distance thresholds for matches, duplicate check, and improve feature identification for further speedup.
- Add Land/Water adjustment of Direct Model Output (DMO) wind speed when it's displaced to match WTCM center.
- Add U/V output for calculation of Feature Matched Wind Direction.

Tropical Wind Speed Improvement Example

- Toggle between slides 6 and 7
- On slide 6, note the strong winds, with an abrupt discontinuity, along the Georgia coast, as well as southeast South Carolina and extreme northeast Florida
- This is due to the feature matching shifting stronger winds, forecasted over water, inland when the forecasted TC feature is matched to the WTCM forecast
- On slide 7, this is significantly improved
- Similar improvement is seen in this example along the northern Gulf coast
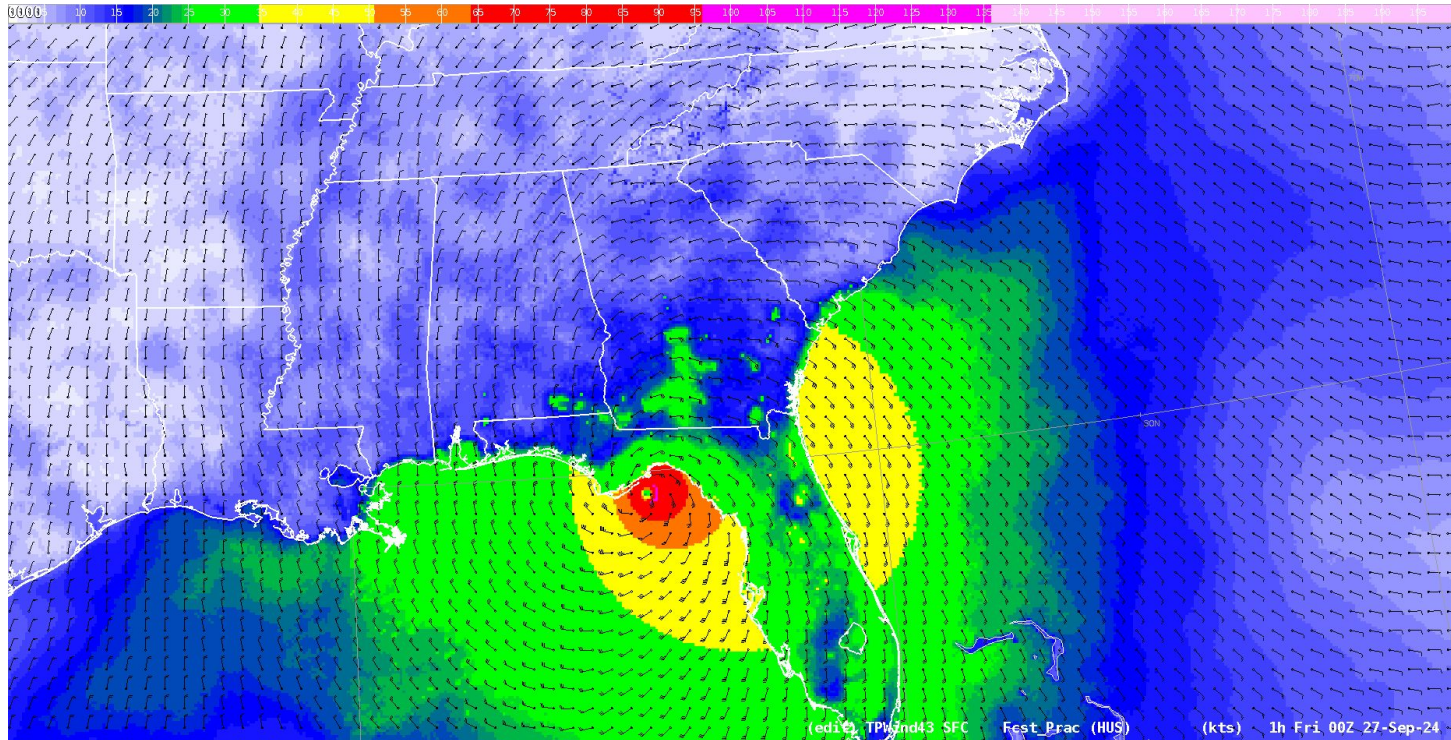- The land-water adjustment also reduces some speeds over the Florida peninsula

NBMv4.2 Tropical Wind Speed Example
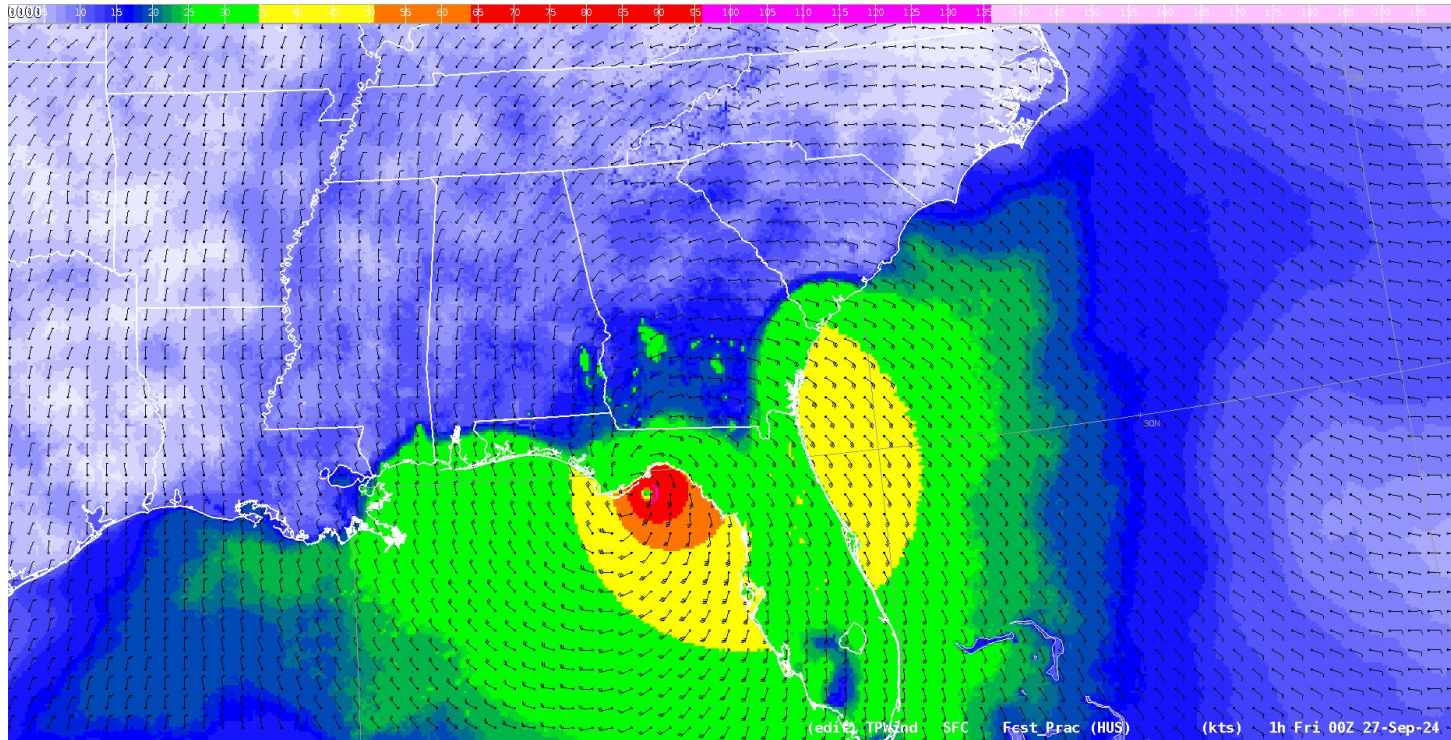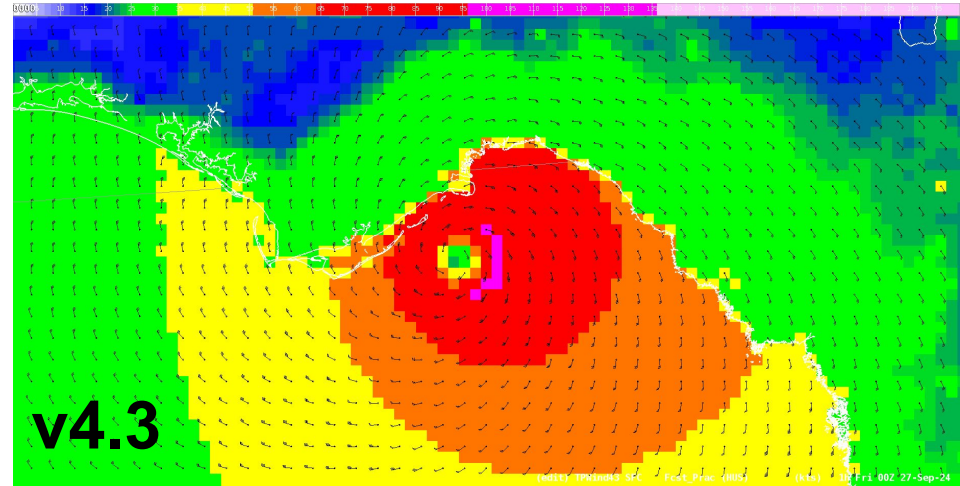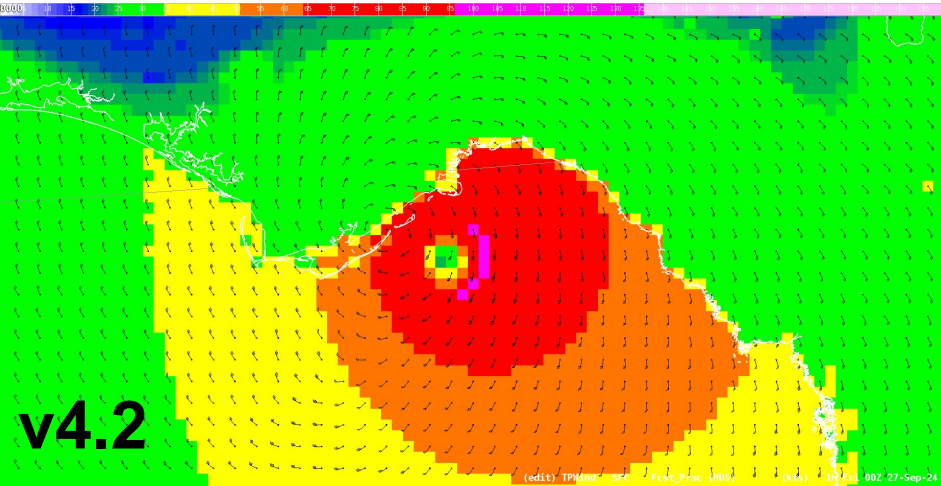

Helene Case - 20240925_0700 Cycle - Version 4.2

NBMv4.3 Tropical Wind Speed Example

Helene Case - 20240925_0700 Cycle - Version 4.3

Tropical Wind Direction Example

- Note the circulation in v4.2, displaced to the northwest of the eye
- The wind barb circulation in v4.3 is aligned with the eye

Snowfall Changes

- A Cobb method for melting snowfall was added to NBMv4.2; it allows snow to accumulate in environments with marginal temperatures but good snowfall rates
- There were examples last winter, however, of snowfall being erroneously reduced when forecasted temperatures were warmer than observed
- A Cobb update allows for the possibility that the forecasted temperature is too warm and is less aggressive with melting
- This change was made in ForecastBuilder (FB) towards the end of last winter; this update makes the NBM consistent with FB

Snowfall Example
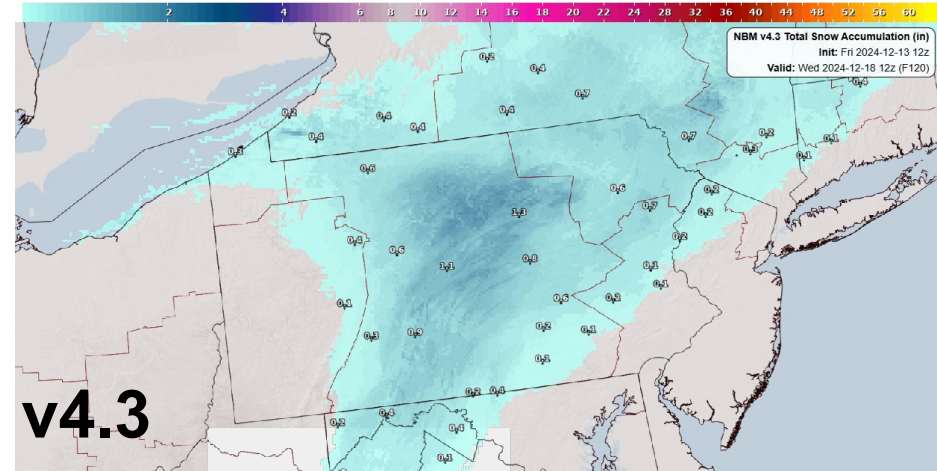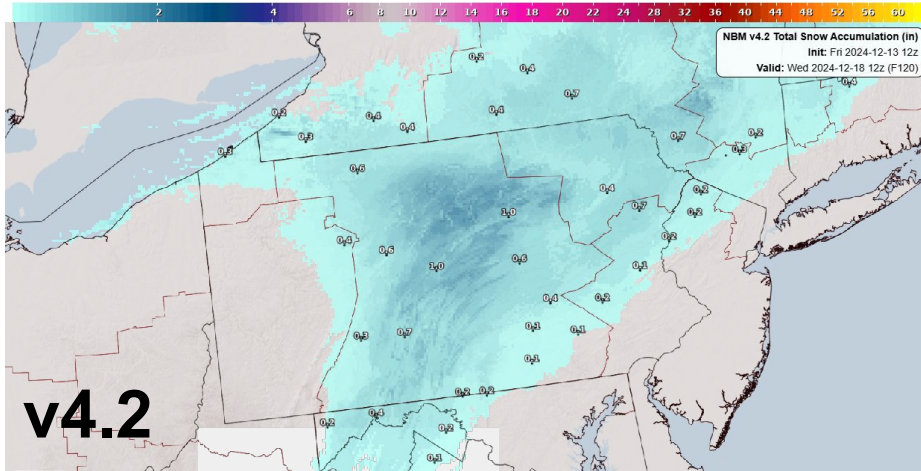
- Amounts are slightly increased over central PA

SPC Probabilistic Severe Weather Guidance

- NBM currently outputs SPC probabilities for each severe weather hazard (wind, hail, tornades) for Day 1, covering 4 and 24-hour periods
- They are generated from SREF and HREF output and are generated for the 03, 06, 15, and 18Z cycles

- Changes in v4.3
    - The individual hazard probabilities now cover Day 2
    - The GEFS replaces the SREF as the lower-resolution contributor
    - The products are also available for 00 and 12Z
    - A combined hazard probability is available for each day covering the Days 3-8 period (available for the 06/18Z cycles)

Example of SPC's Days 3-7 Combined Severe Probability
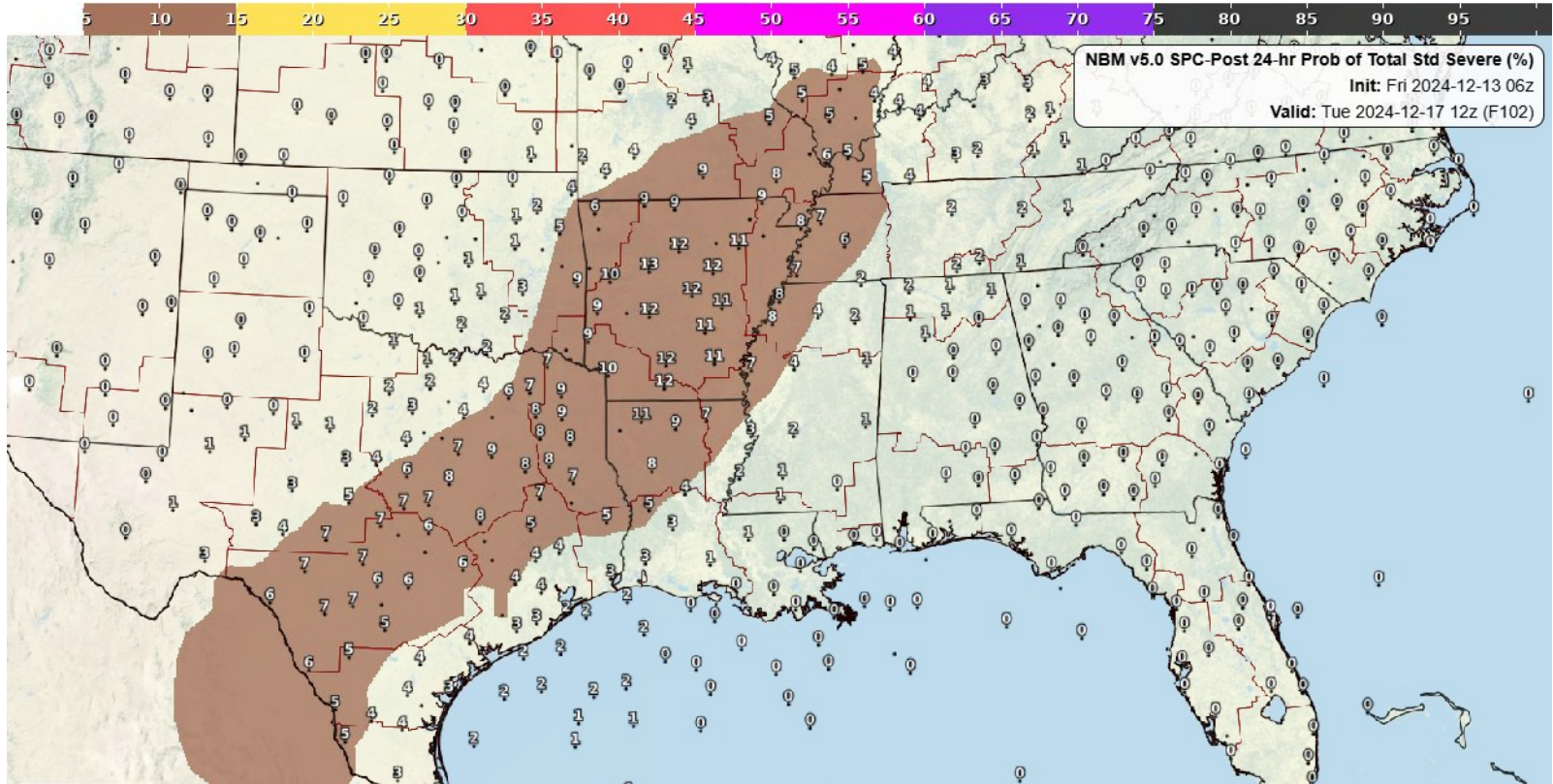
Cloud Ceiling Consistency Check

- NBM Cloud Ceiling over CONUS is the GLMP product through forecast hour 36 and then a mix of NAM and GFS MOS through forecast hour 84
- A check, however, is performed against the sky cover field, and if that value is greater than 57% at a point with no GLMP ceiling, the cloud base height field is used to build a ceiling at that point
- Based on feedback, we do not want to introduce low ceilings at a point where the GLMP product shows no ceiling
- A check is therefore added in v4.3 to not allow an introduced ceiling value to be lower than 13,000 feet
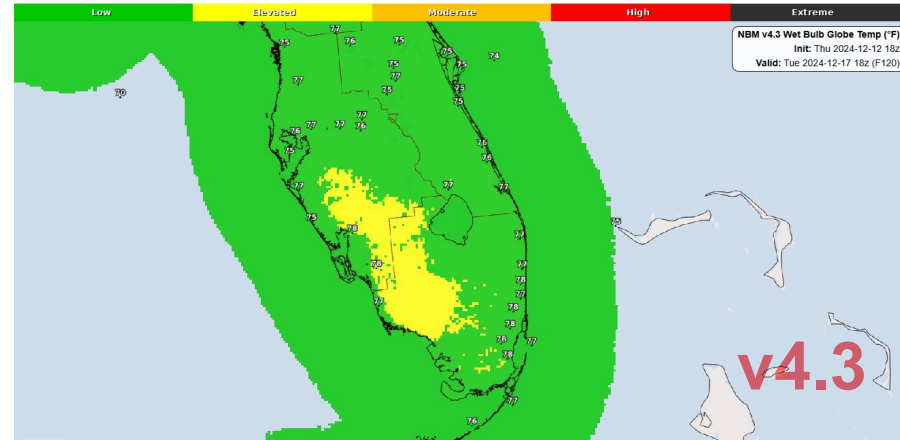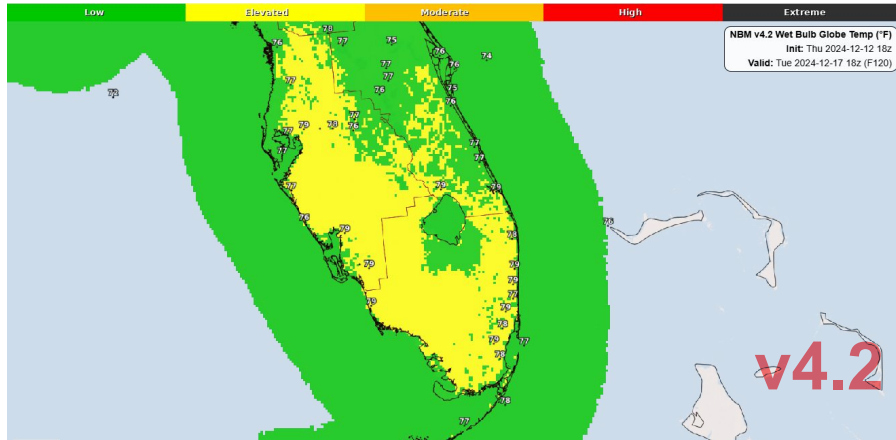
Ceiling Check Example
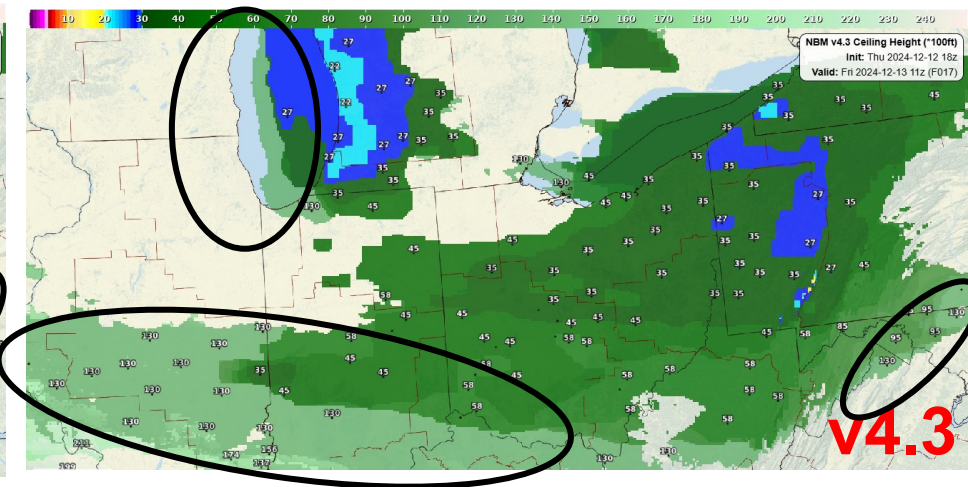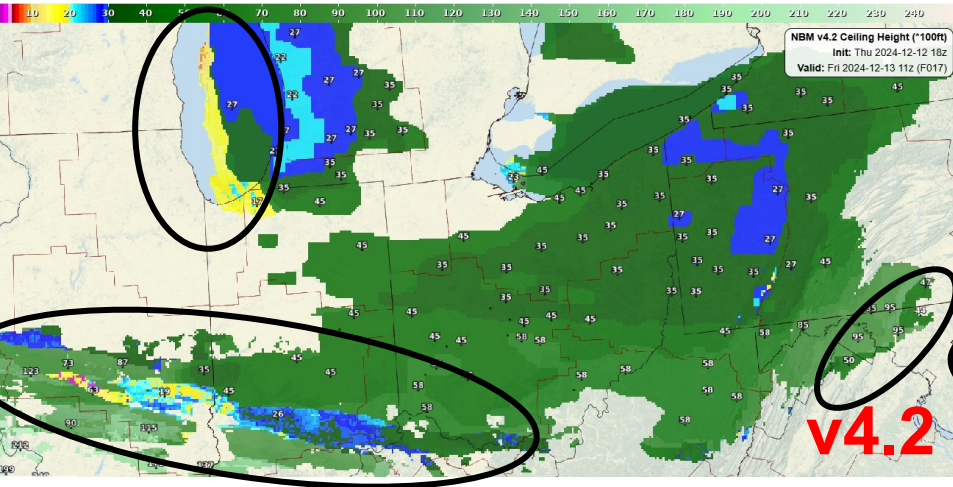
Wet-Bulb Globe Temperature Example

More v4.3 Graphics

- [TC Cases](#)

- [WSUP Viewer](#) (NOAA only)

- [Quick Viewer Graphics Site](#)

What's Next?   NBMv5.0 in Spring 2026

- Extension of (most) hourly products from 36 to 48 hours
- Addition of quantile-mapped instantaneous wind/gust and other products to OCONUS
- Usage of quantile mapping to generate probabilistic fire weather elements, including joint probs
- Generation quantile-mapped probabilistic wave products
- Addition of probability matched mean products for QPF and snowfall
- Addition of Precipitable Water and Probabilistic Apparent Temperature
- Continued work on Improving Winds
- Usage of long-tme archive of URMA data for bias correction
- Usage of a single reanalysis source for QPF and other QPF improvements
- Make QPF and snowfall more consistent, including the addition of Canadian model data to the winter suite
- Usage of higher resolution ECMWF data
- Elimination of usage of SREF in preparation for likely retirement in next 1-3 years
- Potential removal of low skill and unreliable inputs
- Calibrated 24, 48, and 72h snow exceedances
- Make deterministic and probabilistic output more consistent, especially for QPF

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