The Impact of Using NWS Warnings to Verify Warn-On Forecasts of Severe Weather Events

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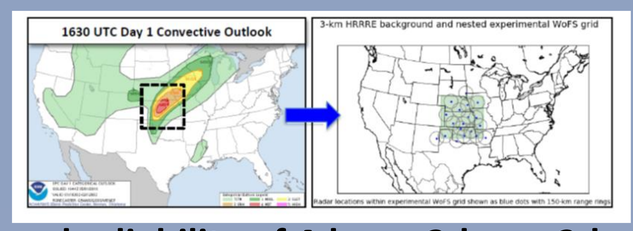
Abstract

The following project was initiated to verify several forms of observational datasets with Warn-On-Forecast (WoFS) ensemble forecasts during high-impact weather events. Observations include local storm reports and National Weather Service warnings, while the forecast data from the National Severe Storm Lab's WoFS uses updraft helicity. The reliability and skill of the forecasts were assessed after applying 24 daily cases from May 2019 in hourly intervals of 1900Z-0200Z. Results depicted high reliability, and generally low skill for updraft helicity at the 90th percentile greater than its specified threshold (120). Overall, NWS warnings yield to higher reliability and skill values when compared to LSRs, but only when the threshold was set to the value of 120, suggesting higher thresholds equate to increased forecast accuracy. Future work will dive deeper into this by setting other forecast variables to this higher threshold value.

Methods

Verification data

LSRs and NWS severe thunderstorm and tornado warning polygons are gridded to daily WoFS domain

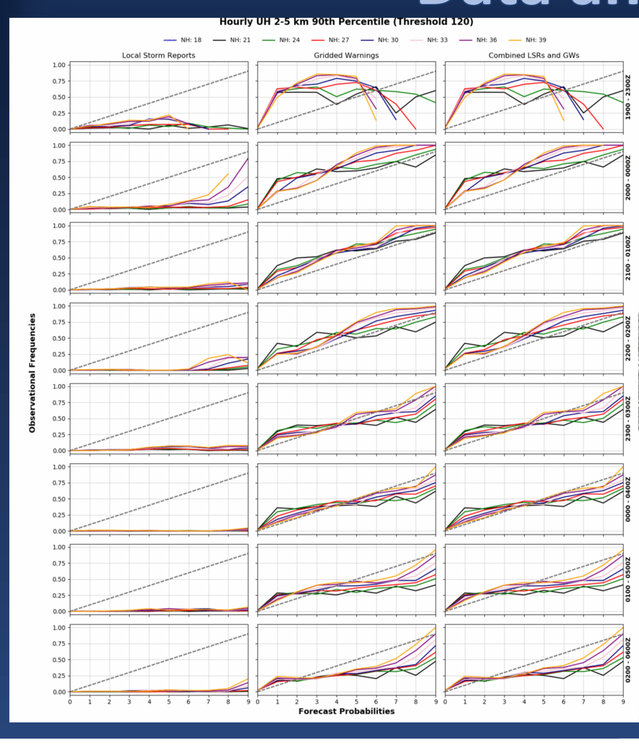


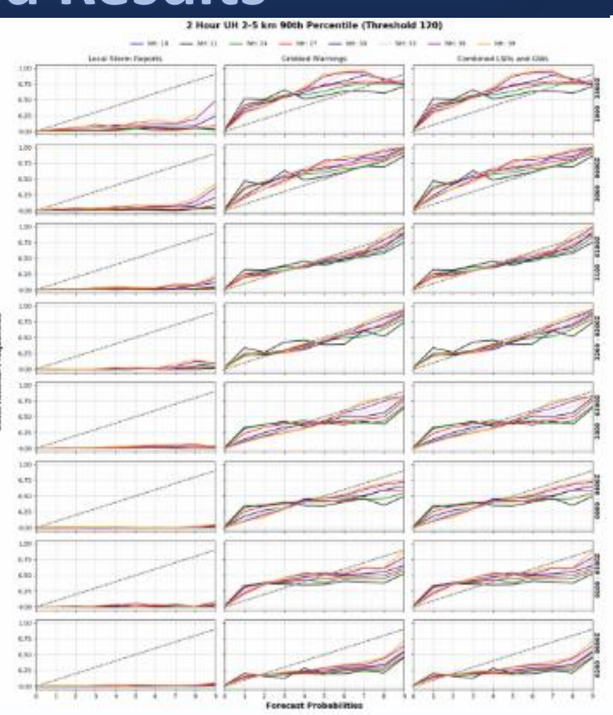
Assess skill and reliability of 4-hour, 3-hour, 2-hour, and 1-hour forecasts: 2-5 km UH (90th percentile greater than specified threshold)

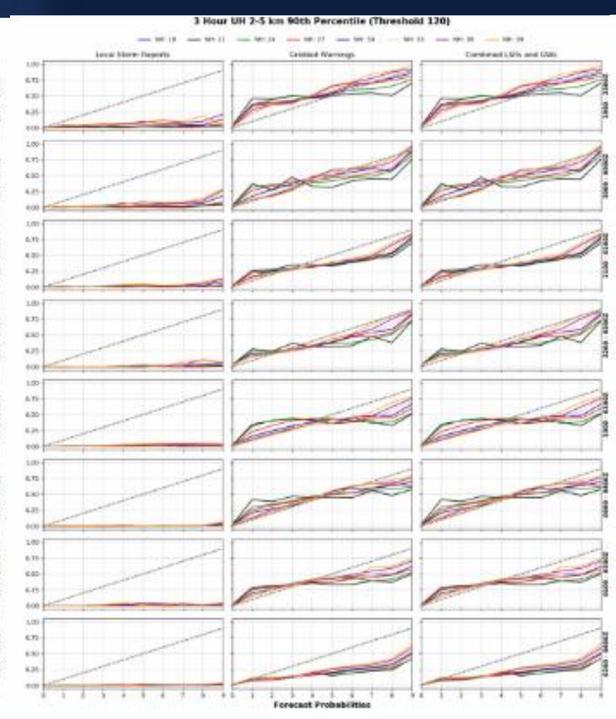
- **Reliability diagram**
- **Fractions skill score**

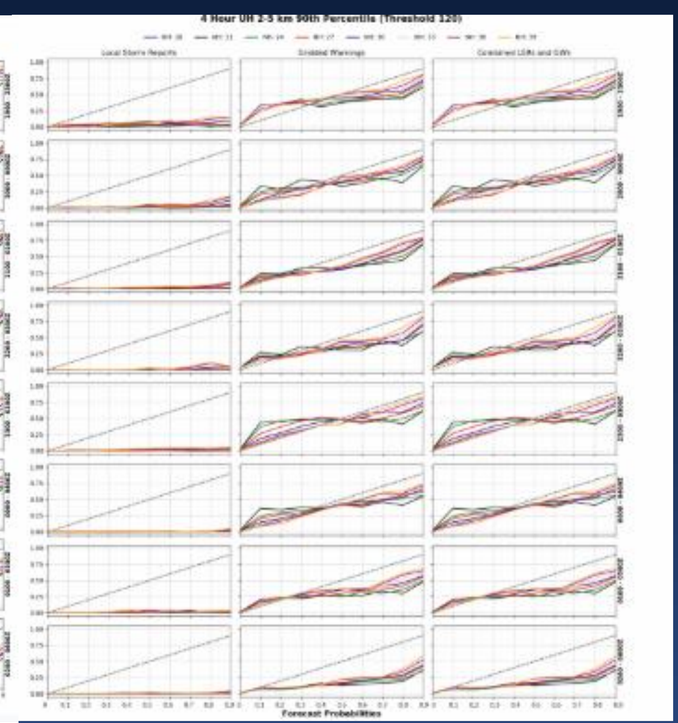
NMEP: 18, 21, 24, 27, 30, 33, 36, and 39 km
Thresholds: 120 $m^2 s^{-2}$

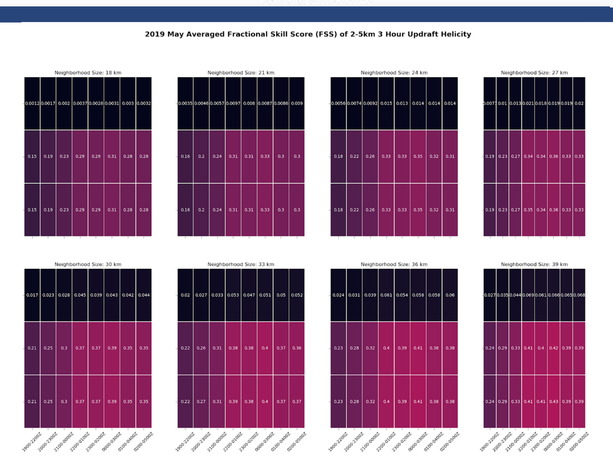
Data and Results

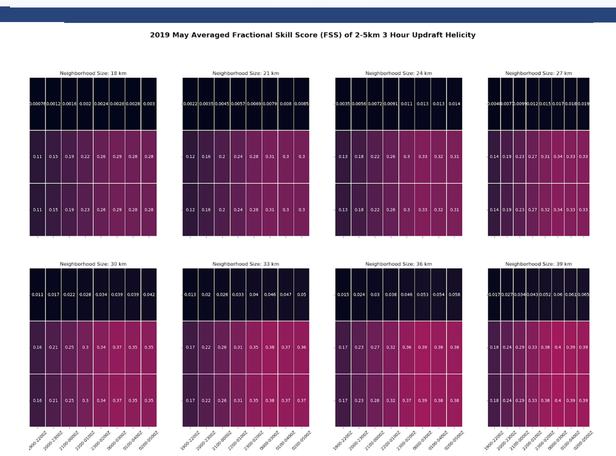


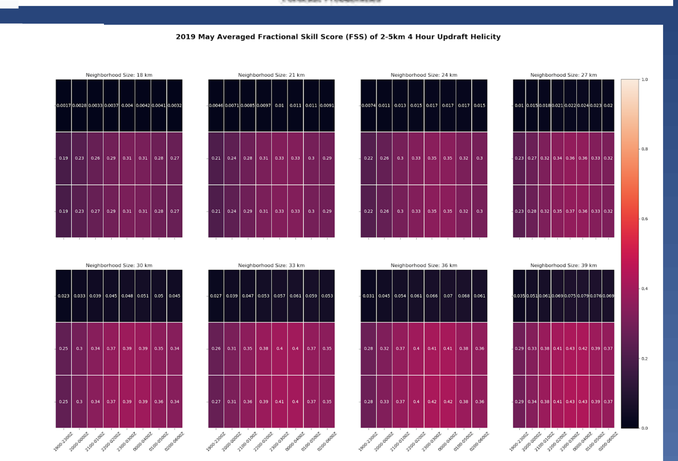












Conclusions

- NWS warnings = more relevant info for the **spatial scales** at which WoFS probabilities provides forecast guidance
- Lower thresholds **decrease reliability** in tested variables
- Larger neighborhood size and 3 and 4 hour period forecasts **more skillful**

Future Work

- Additional verification metrics (**MRMS MESH, azimuth shear**)
- Test additional **neighborhood sizes and thresholds**
- Determine **most useful combination of observations** to use as verification metrics

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