



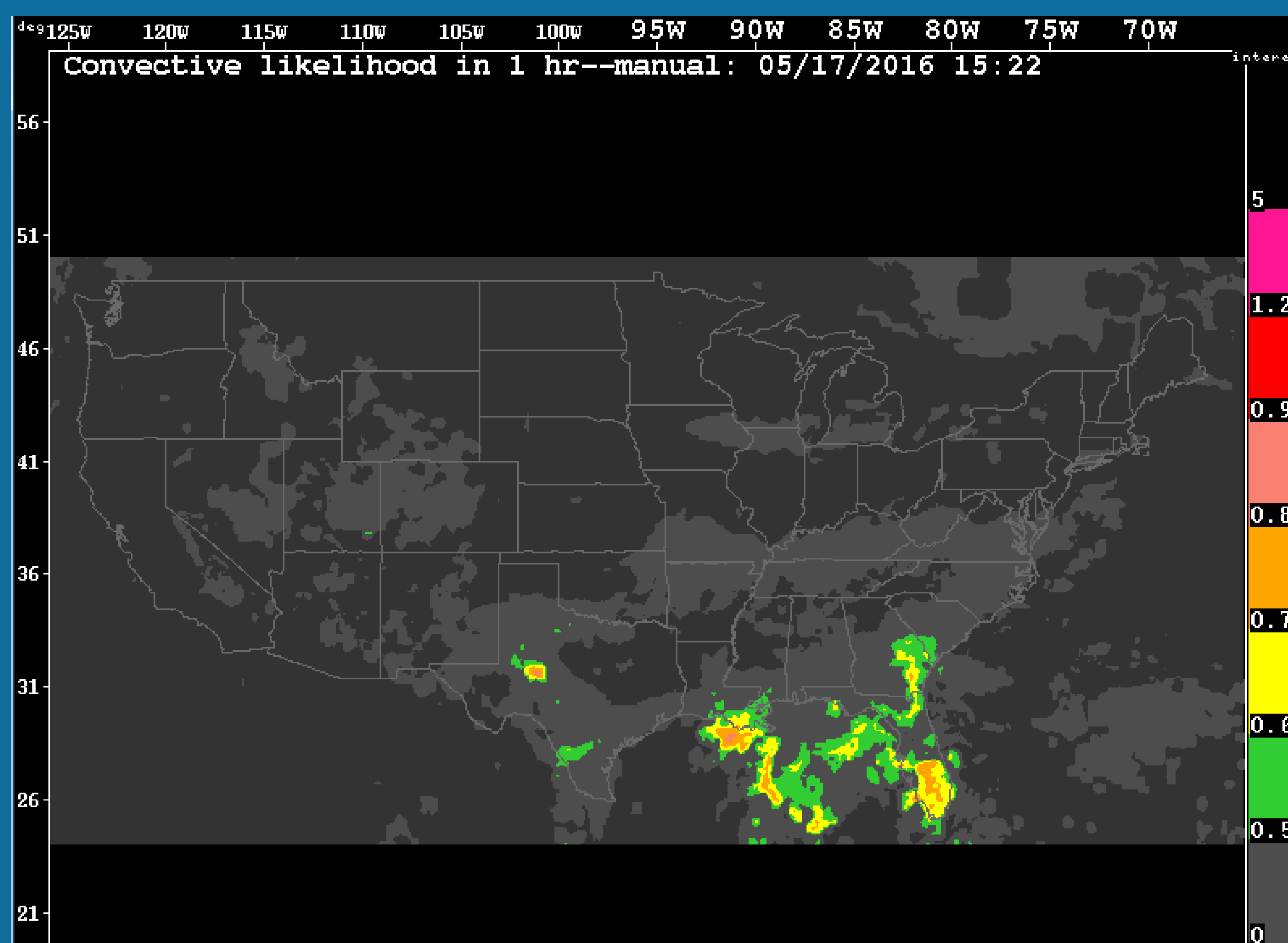
Evaluation of NCAR's AutoNowCaster for Operational Application within the National Weather Service



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OVERVIEW

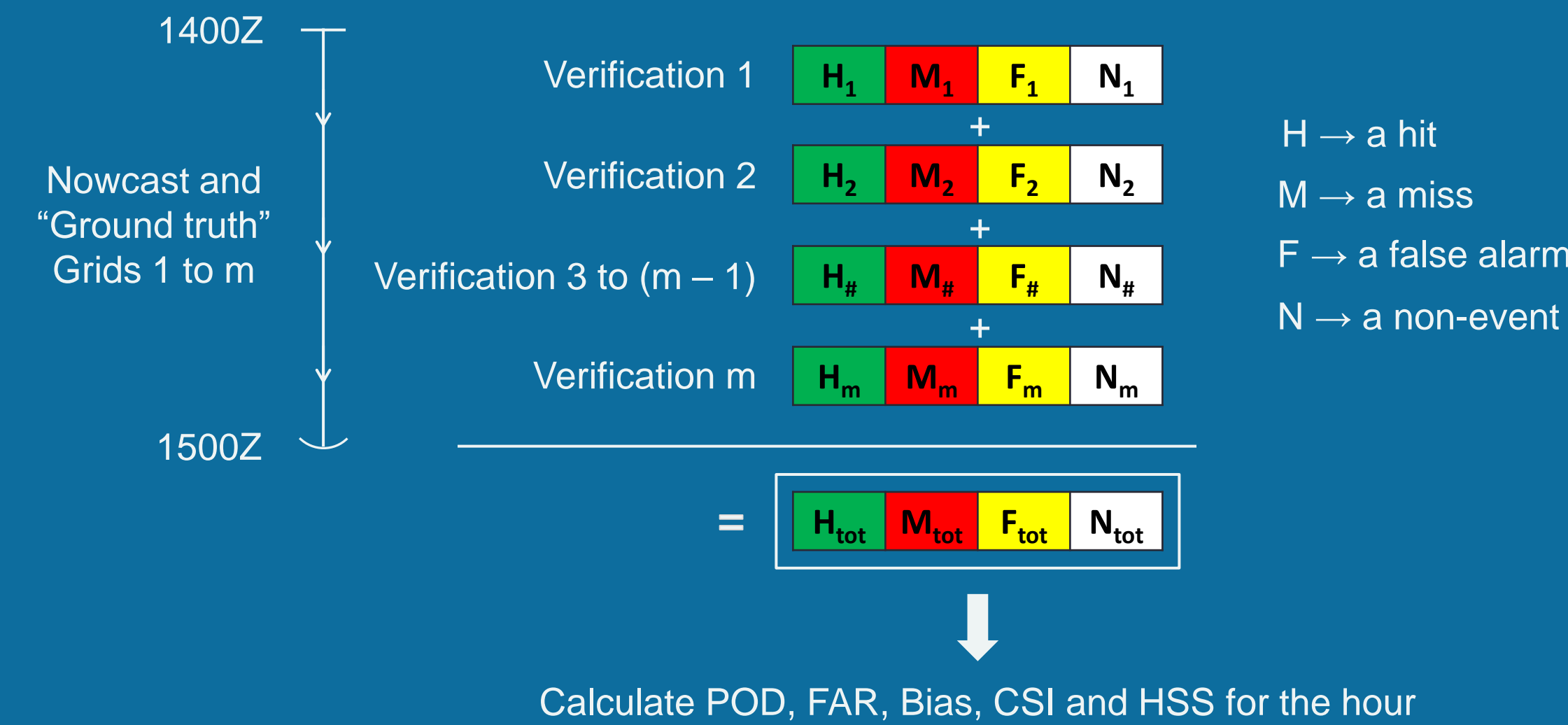
- NCAR's AutoNowCaster (ANC) is designed to nowcast areas where storms are considered likely to form and/or be sustained, and vice-versa. How?
- ANC ingests NWP model output, GOES satellite data, surface METAR data, and NWS radiosonde data in order to analyze characteristic features of the atmosphere. The results of the analyses are 60-minute predictors which are converted into dimensionless likelihood fields.
- The likelihood fields have a dynamic range from -1 to 1, where increasing positive values correspond to an increasing likelihood of storm initiation and/or sustainment, and vice-versa.
- The likelihood fields are weighted and summed to produce a 60-minute Convective Likelihood (CL) field.
- In essence, ANC attempts to analyze, weight, and sum various data in a manner analogous to that of a forecaster.



ANC's 60-minute Nowcast of Convective Likelihood

METHODS

Hourly Statistics

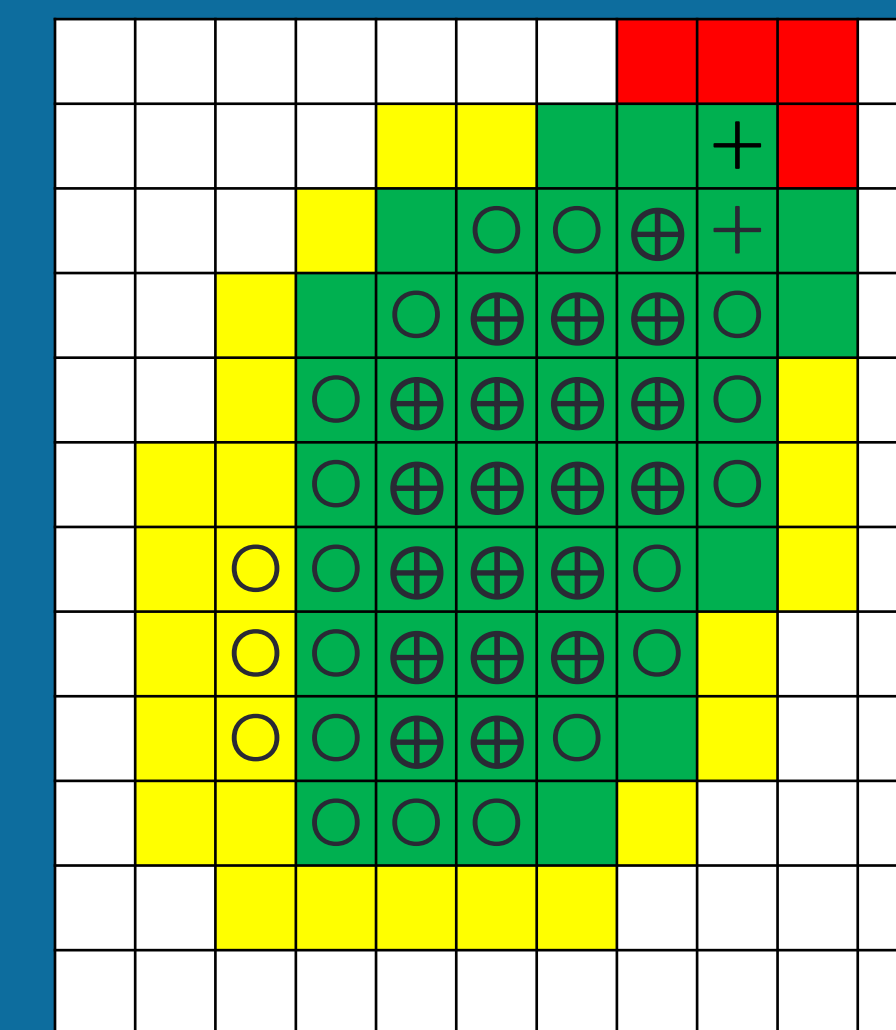


Spatial Neighborhoods

N = the neighborhood size parameter
 It yields a $(2N + 1)$ by $(2N + 1)$ neighborhood.

- → an event was forecasted
- ⊕ → an event was observed
- ⊕ → an event was both forecasted and observed

- a hit
- a miss
- a false alarm
- a non-event

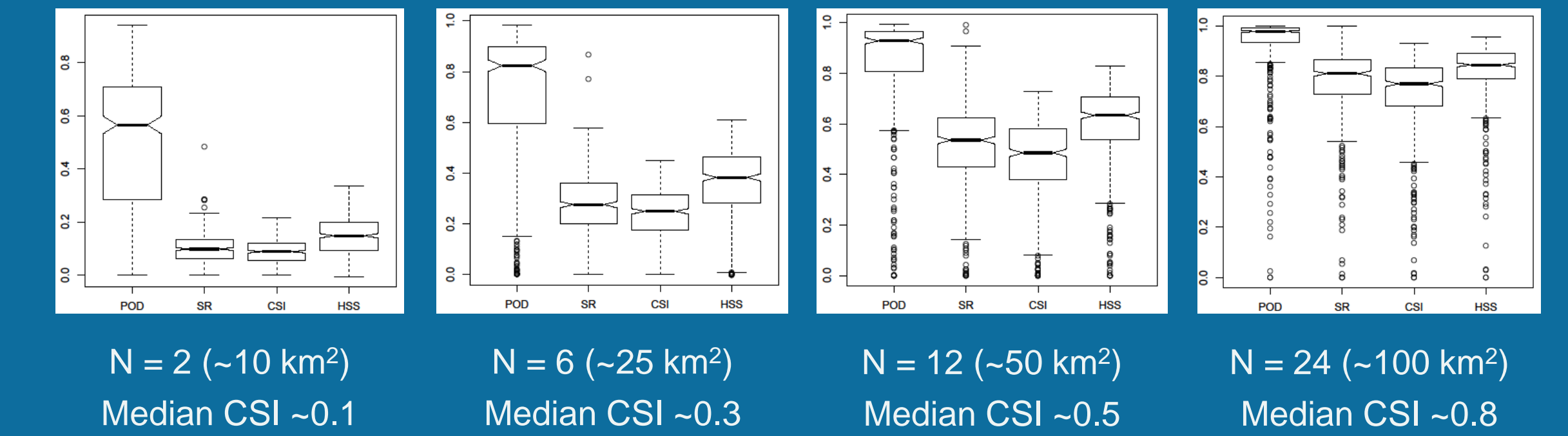


Example verification when $N = 1$, i.e., a 3 by 3 neighborhood

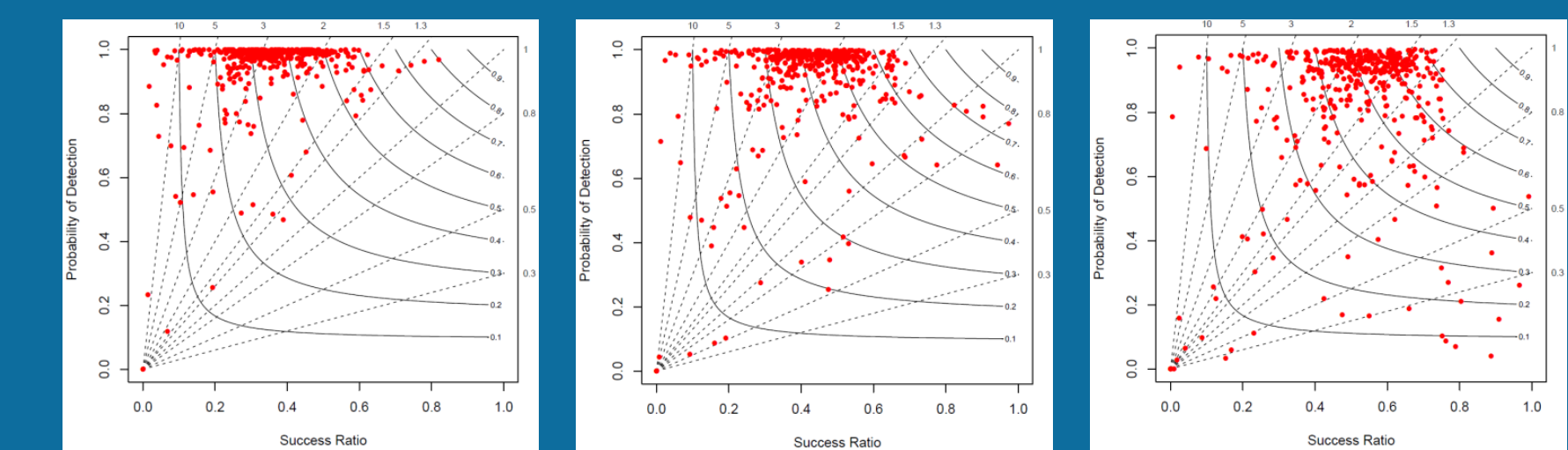
Attempting to match exactly the forecast value at a grid point with the observed value at the same grid point often results in poor verification scores. To represent the skill of ANC's nowcasts of CL in 1 hour better, we compared forecasts and observations using spatial neighborhoods around grid points.

Varying the neighborhood size parameter (N) helps determine the scale at which a desired level of skill is attained by the nowcasts of CL in 1 hour. Such verification rewards closeness by not requiring exact matches spatially between the nowcasts and what was observed.

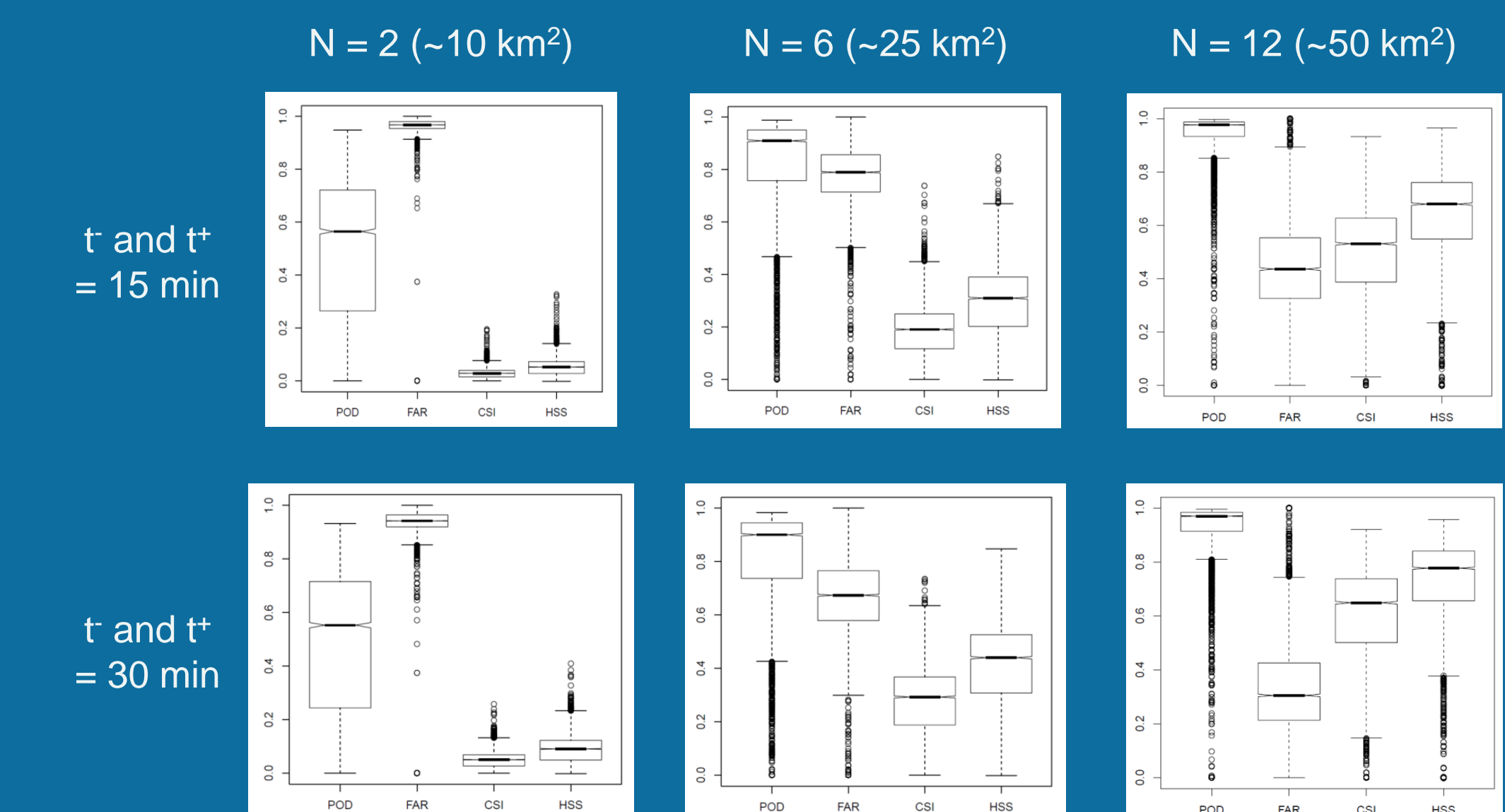
RESULTS



Verification for $N = 2$ (~10 km²), 6 (~25 km²), 12 (~50 km²), and 24 (~100 km²); a forecast event consists of a nowcast grid point whose CL value ≥ 0.6 ; an observed event consists of a "ground truth" grid point classified *either* as storm initiation *or* as an ongoing storm



Verification for $N = 12$ (~50 km²); a forecast event consists of a nowcast grid point whose CL value $\geq 0.4, 0.5,$ and 0.6 ; an observed event consists of a "ground truth" grid point classified *either* as storm initiation *or* as an ongoing storm



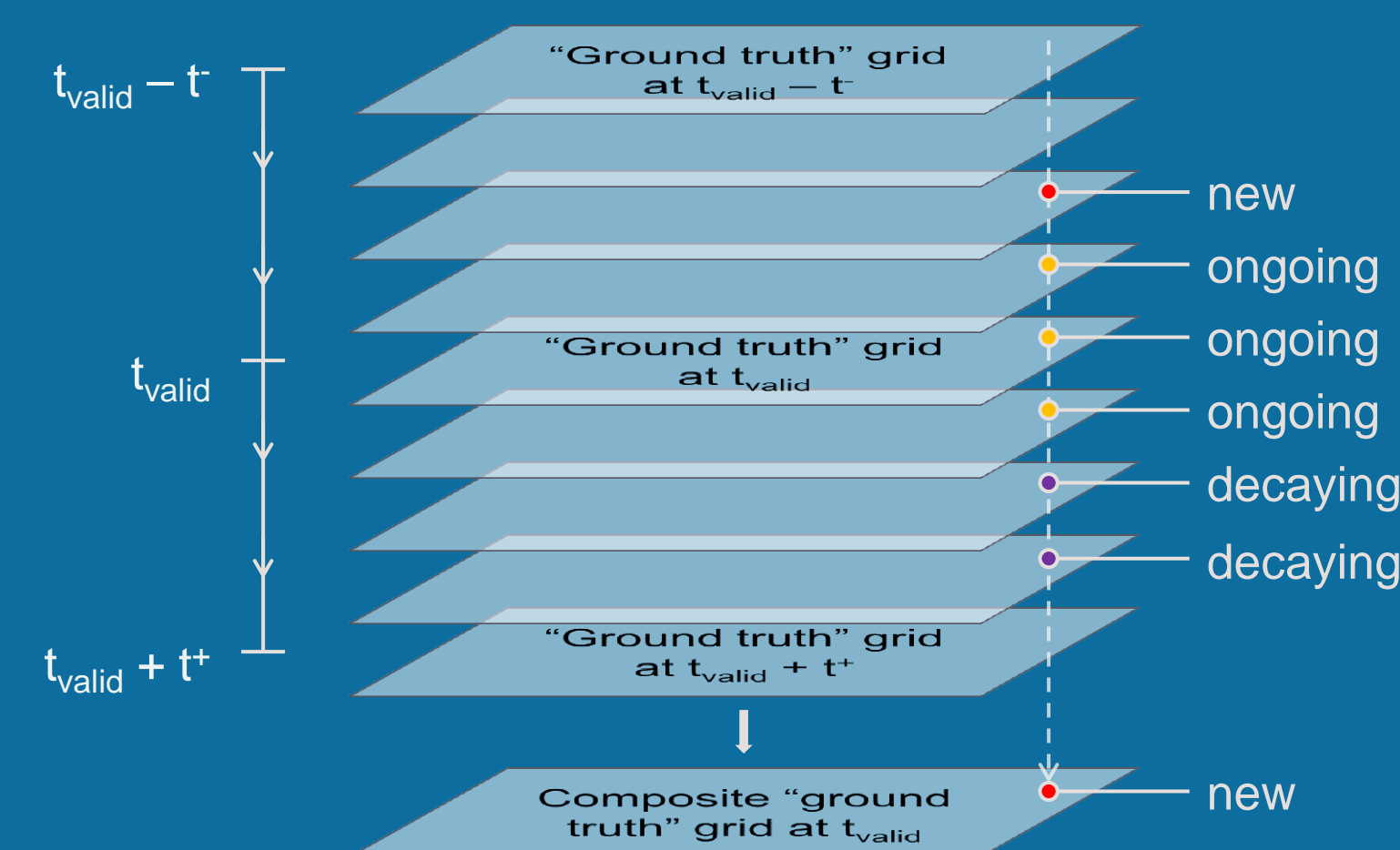
Verification for $N = 2$ (~10 km²), 6 (~25 km²), and 12 (~50 km²); t and $t^* = 15$ and 30 min; a forecast event consists of a nowcast grid point whose CL value ≥ 0.7 ; an observed event consists of a "ground truth" grid point classified *solely* as storm initiation

OBJECTIVES

How do we measure the performance of the 60-minute nowcasts of CL, i.e.,

- What is the *smallest* spatial scale at which ANC's 60-minute nowcasts of CL can skillfully nowcast the general areas where *both* new storms may initiate *and* existing storms should be sustained, and to what values of CL does this apply?
- What is the *smallest* spatial scale at which ANC's 60-minute nowcasts of CL can skillfully nowcast the general areas *solely* where new storms may initiate, and to what values of CL does this apply?
- To what degree, if any, are ANC's 60-minute nowcasts of CL subject to temporal ambiguity?

Temporal Relaxation



When verifying storm initiation—a rare event—nowcasting it for one time but observing it at another time contributes to the double penalty of nowcasted-by-not-observed and observed-but-not-nowcasted. The penalty can be alleviated by using temporal relaxation during the verification process.

CONCLUSIONS

- At a spatial scale of ~50 km and with no temporal relaxation, grid points with values ≥ 0.6 in ANC's 60-minute nowcasts of CL skillfully nowcast the general areas where both new storms may initiate and existing storms should be sustained.
- At a spatial scale of ~50 km and within 45 to 90 minutes from the nowcast issuance time, grid points with values ≥ 0.7 in ANC's 60-minute nowcasts of CL skillfully nowcast the general areas where new storms may initiate.
- ANC's 60-minute nowcasts of CL can best improve situational awareness when interpreted as guidance at a spatial scale of ~50 km and within a time frame anywhere between 45 and 90 minutes of the issuance times.