

The Ensemble Situational Awareness Table: A Tool to Improve Forecasts for Extreme Weather Events

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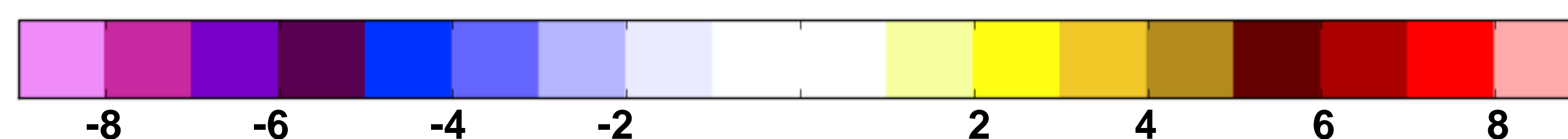
Motivation

- Ensemble forecasts contain highly useful information about the likelihood of extreme weather events, but forecasters often don't have time to mine the data in search of it
- Need tools that will mine the data and point out when there is the potential for an extreme weather event, as well as the extreme event's likelihood

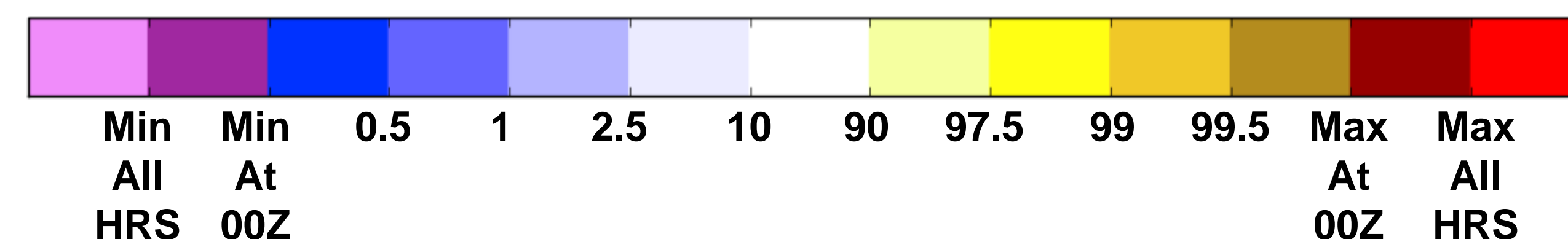
Method

- Leverage ensemble mean forecast as a confidence tool by comparing it to a reanalysis climatology and a model climatology
- Confidence in location and timing of extreme event when the mean departs significantly from climatology
- Compares NAEFS ensemble mean forecast to 1980 – 2010 CFSR climatology
- Compares GEFS ensemble mean forecast to 1985 – 2012 GEFS Reforecast ensemble mean climatology
- Compares forecast to climatology over a 21-day window that centers on the forecast's valid time
- Comparison to climatology done by calculating:

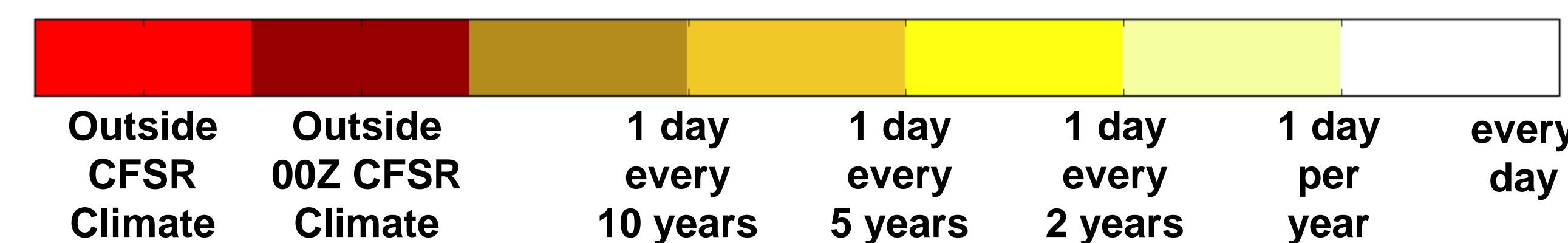
– **Standardized anomalies:** How different the forecast is from the climatological mean



– **Percentiles:** Where the forecast falls with respect to climatology



– **Return intervals:** How often the forecasted value shows up in the climatology



• **Results displayed in dynamic table at:**
<http://ssd.wrh.noaa.gov/satable/>

The Table

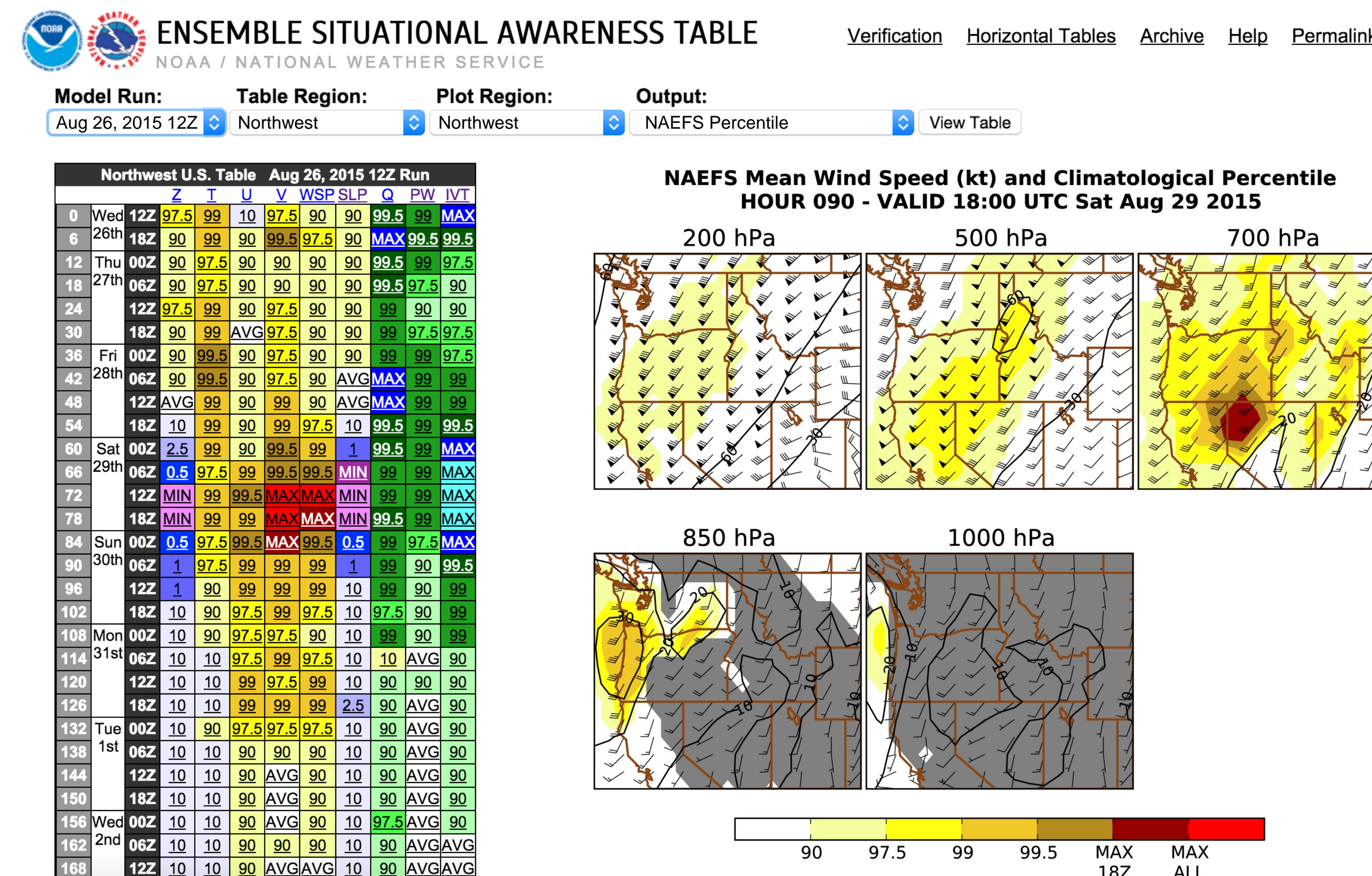


Fig. 1. The Ensemble Situational Awareness Table displaying what percentile of the CFSR climatology the NAEFS ensemble mean forecast initialized at 1200 UTC 26 Aug 2015 falls in over the Pacific Northwest

Case: Windstorm of 29 Aug 2015

- 2 Fatalities in western Washington, 300,000+ customers without power, widespread wind gusts of 50 mph – 70 mph

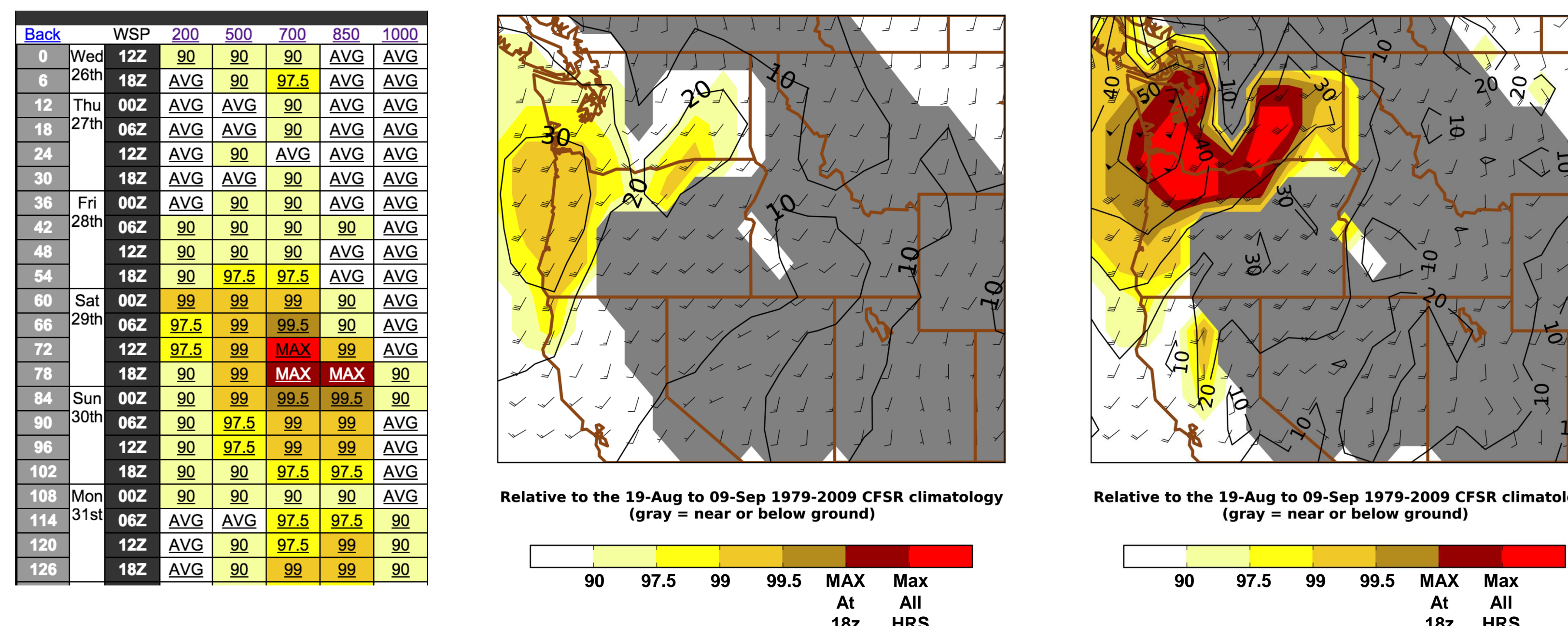


Fig. 2. (Left) The Ensemble Situational Awareness Table displaying maximum climatological percentile for wind speed (Center) NAEFS mean 850-hPa wind speed (kt) and climatological percentile valid at 1800 UTC 29 Aug 2015 and initialized at 1200 UTC 26 Aug (right) Corresponding GFS analysis of 850-hPa wind speed (kt) and climo percentile

Summary and Future Work

- Table can provide ~5-day heads-up that an extreme weather event is likely
- Table visually communicates this information efficiently
- Tool is currently being transitioned to Integrated Dissemination Program (IDP) and will be available on IDP by March 2016
- This will allow for greater product stability

Case: Flooding of Late Dec 2015

- Multi-day rainfall event over OK, AR, MO, and IL that resulted in at least 20 fatalities

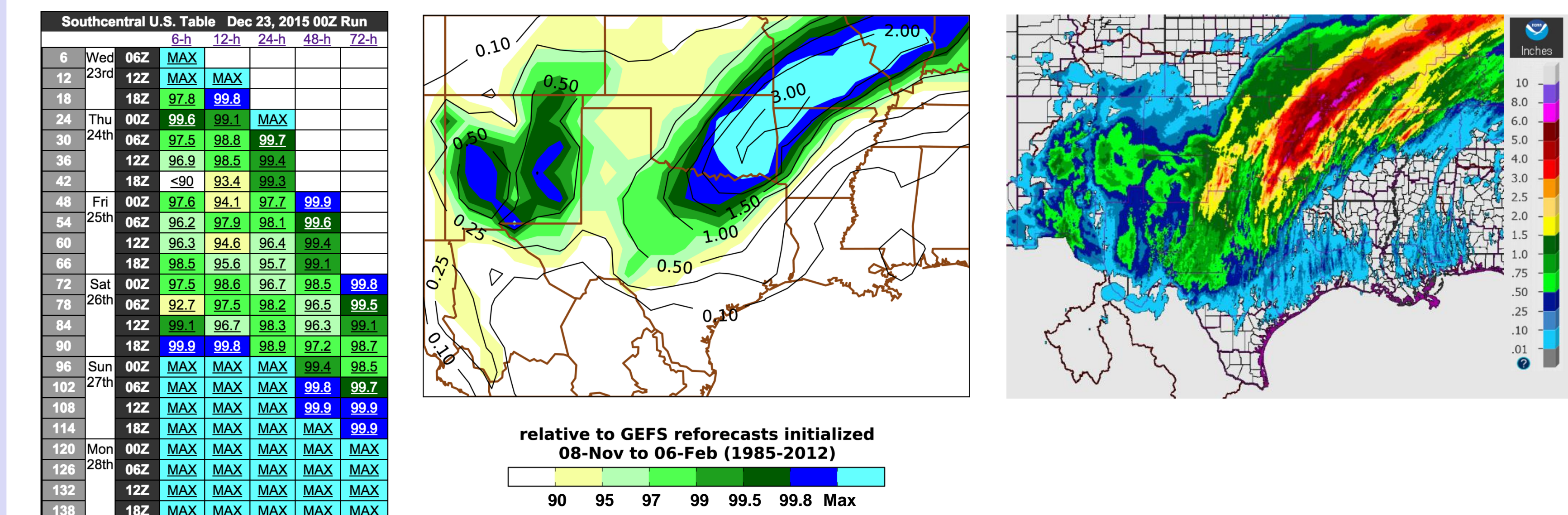


Fig. 3. (Left) The Ensemble Situational Awareness Table displaying maximum model climatological percentile for QPF (Center) GEFS mean 24-hour QPF (inches) and model climate percentile ending at 0000 UTC 28 Dec 2015 and initialized at 0000 UTC 23 Dec 2015 (right) 24-hour observed precipitation ending 0000 UTC 28 Dec 2015

How Skillful is the NAEFS Mean?

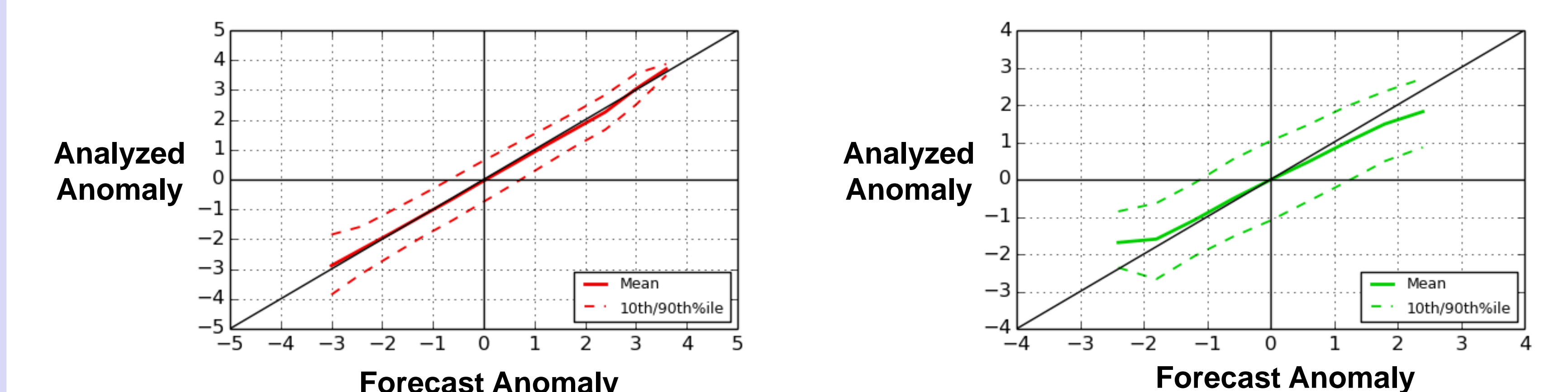


Fig. 4. (Left) Reliability diagram showing observed vs forecasted 500-hPa geopotential height anomalies at forecast hour 144 (Right) Same as for left but at forecast hour 240

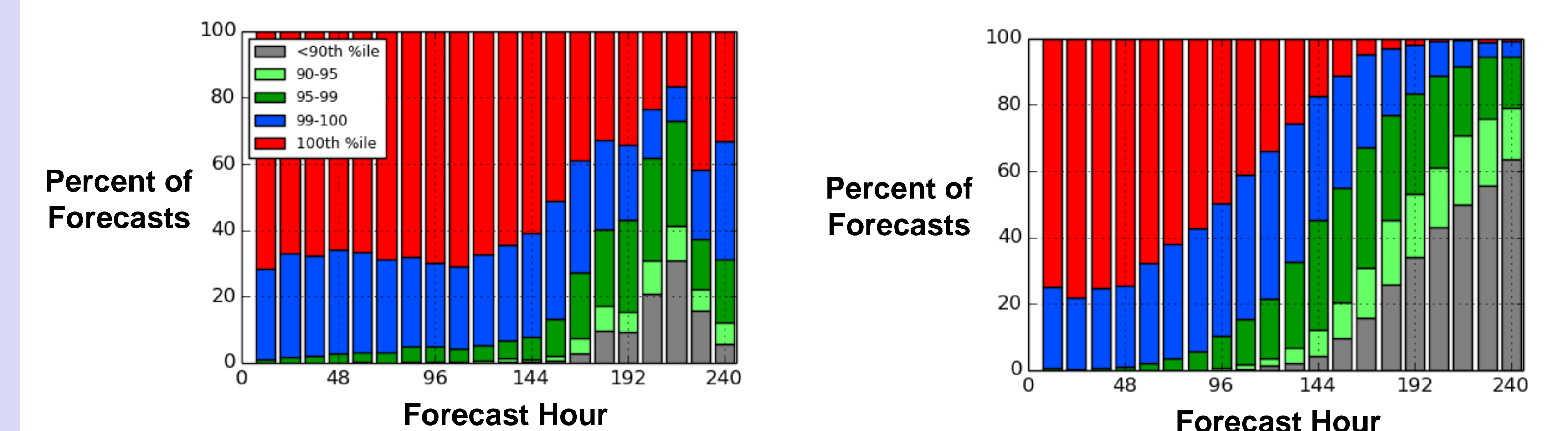


Fig. 5. (Left) Verification of 100th percentile forecasts of 500 hPa geopotential height – can be interpreted as false alarm rate (Right) The forecasted percentile for analyzed 100th percentile 500 hPa geopotential height events – can be interpreted as probability of detection

- An enhanced version of the tool will be released during Summer 2016
- Enhancements include:
 - More regional domains (e.g., Atlantic and Pacific Oceans)
 - More variables, especially surface variables (e.g., 2m temp)
 - dprog/dt