MARFC Verification Activities

November 18, 2008

QPF Verification (Deterministic)

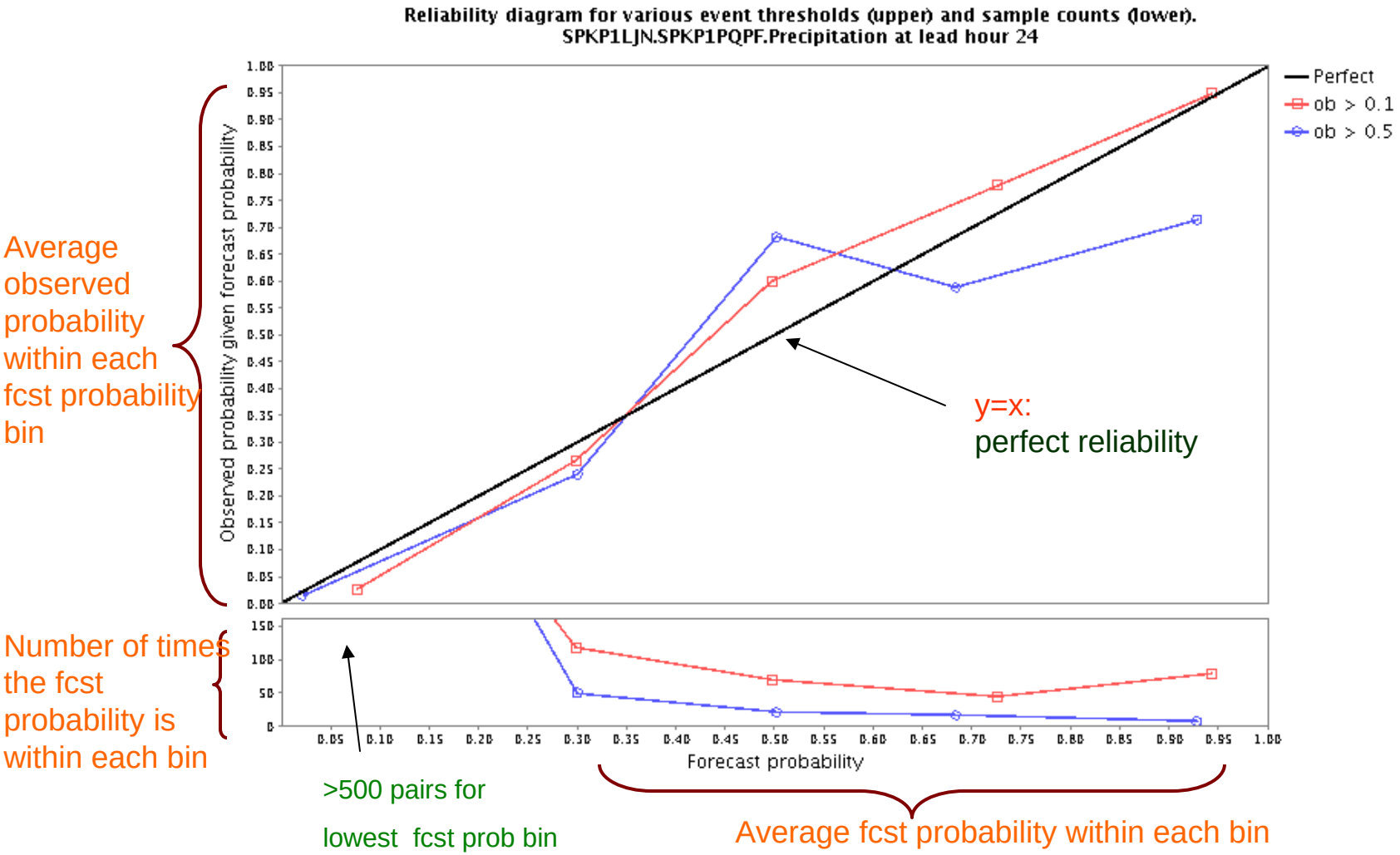
- Have been working on paired files for IVP of QPF versus observed MAP
- Since most pairs are 0 forecast, 0 observation, we are considering limiting the study to non-zero cases
- Seasonal and event–based analysis using IVP would be interesting, as well as comparing QPF verification to river verification results

EVS Testing and Analysis

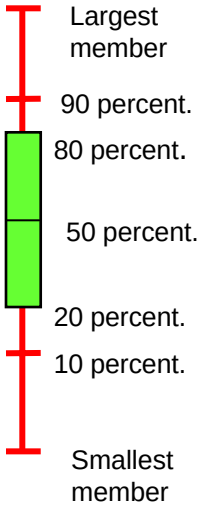
- Continuing to use the data from the Juniata basin to test the features of EVS. This includes:
- a) additional metrics
- b) aggregation methods
- c) narrowing analysis to a season
- d) narrowing analysis to a fcst condition

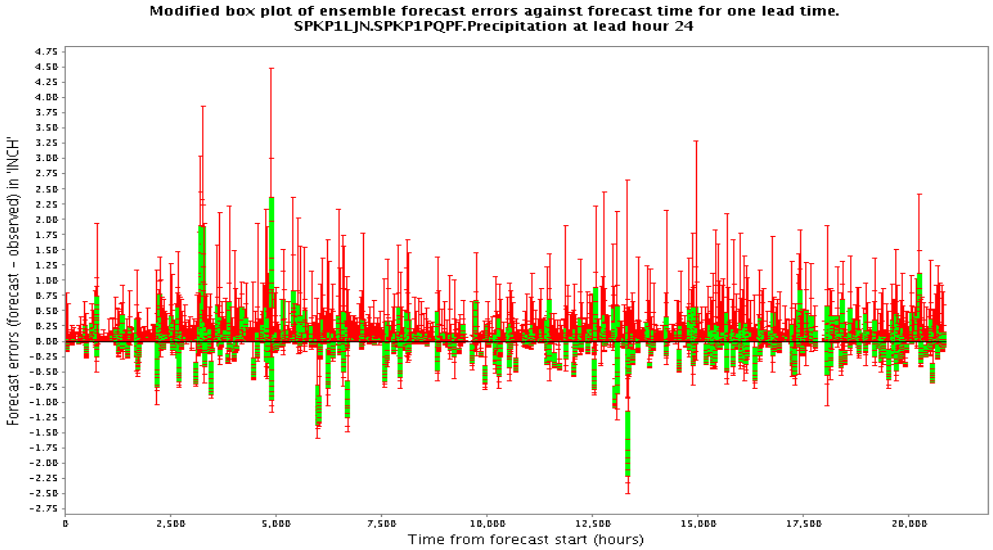
(e.g. ens mean > 10 cms)

Additional Metric: Reliability Diagram

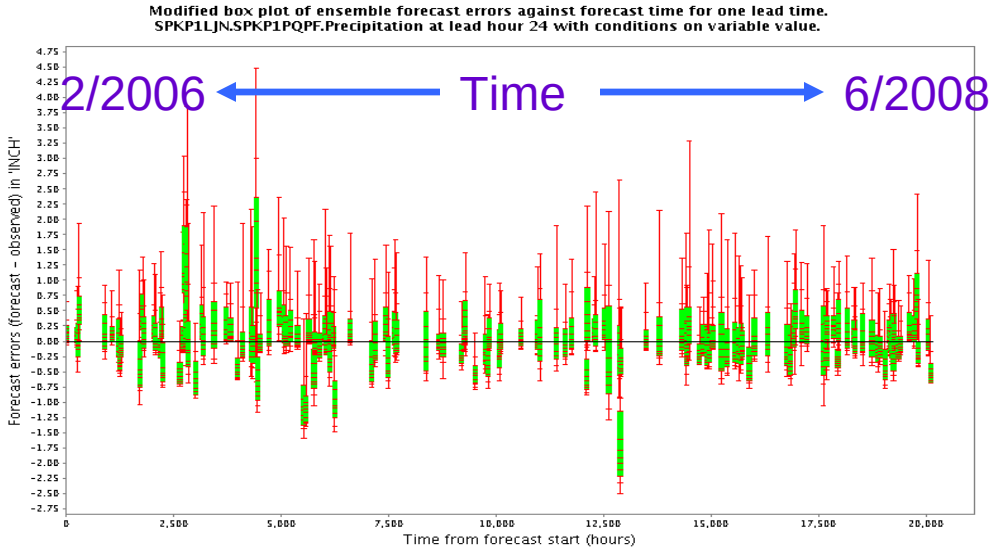


All data versus refined by forecast value





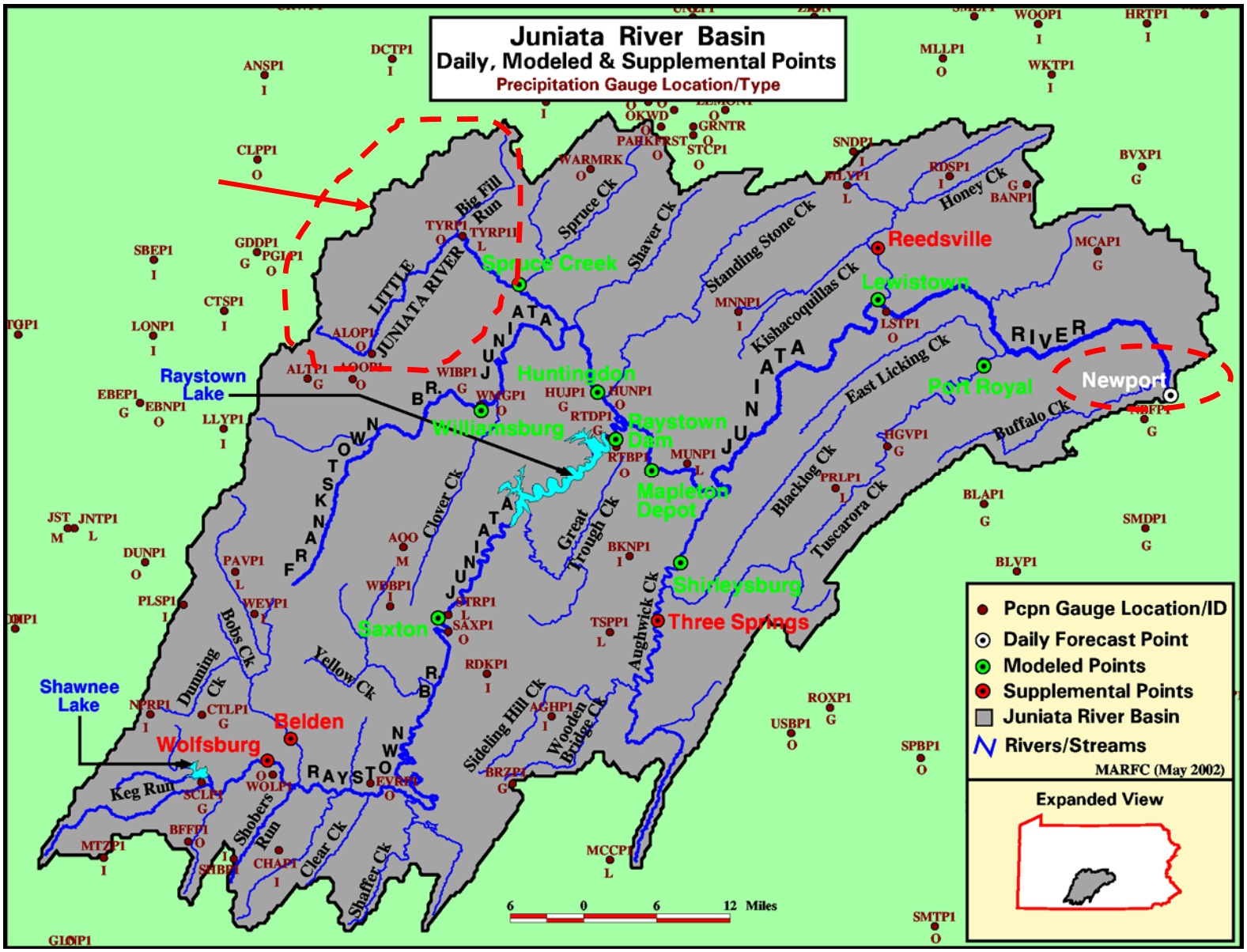
All data includes many events where the forecast was zero.



We have limited the analysis to only cases where the ensemble mean forecast was > 0.25”

Expanding Juniata Case Study

- Will be attempting to recover/recreate the ensemble forecasts from before 2/2006 and within gaps within the 2/2006-6/2008 period
- Analysis at additional points, including regulated flows such as Huntingdon and Mapleton

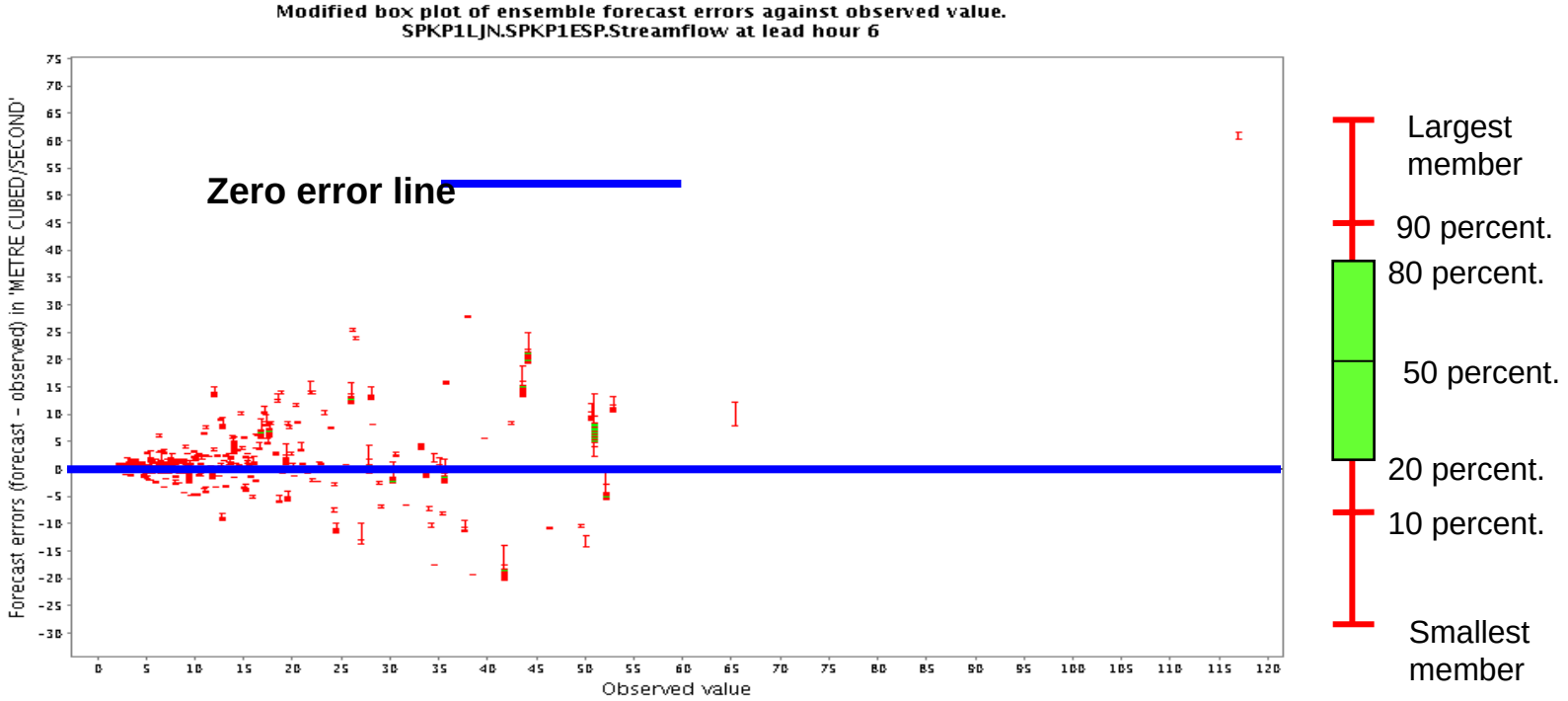


Map by David Solano, senior HAS

We issue 7-day ESP forecasts each day for 10 simulated points.

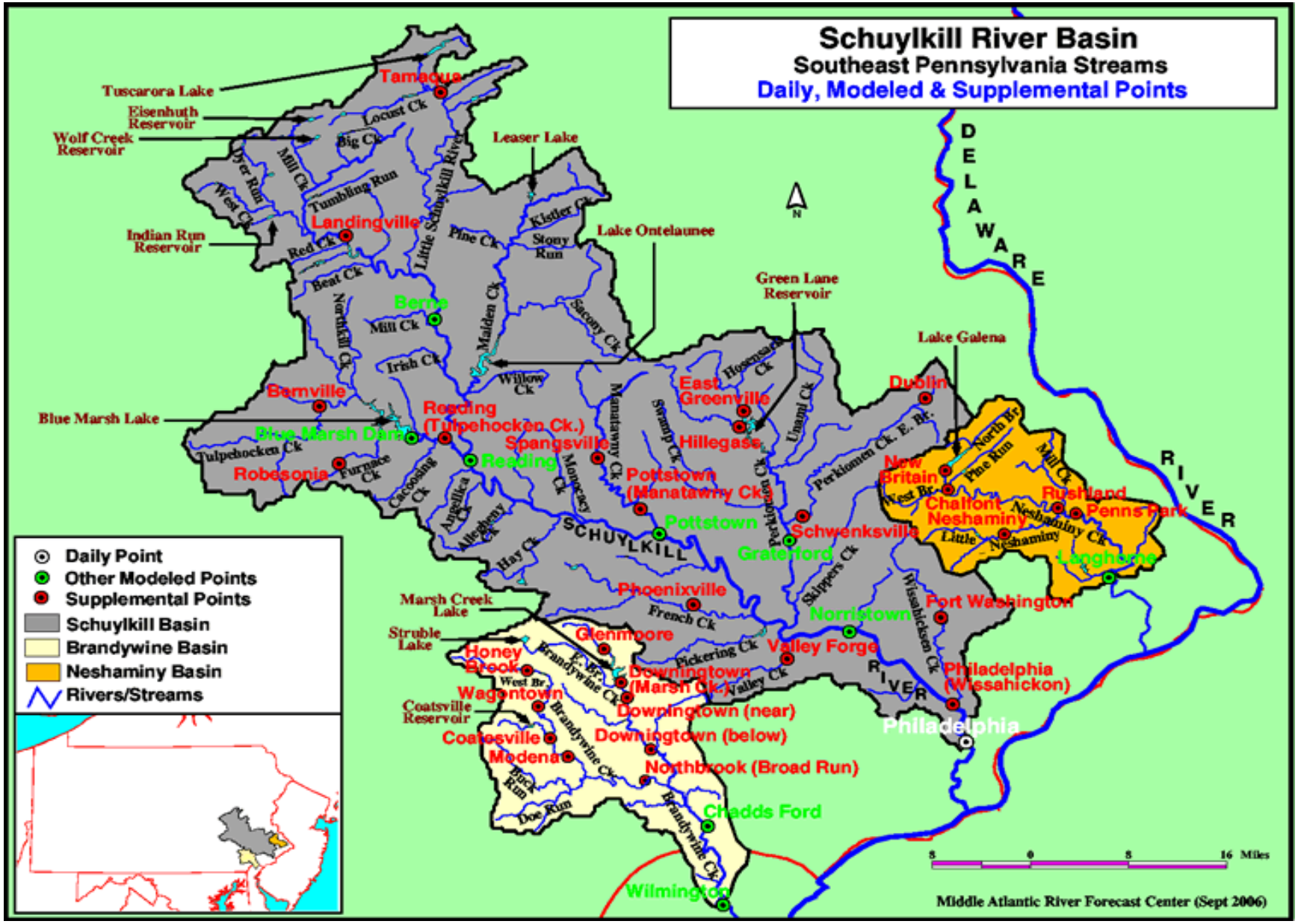
Post-Processor Experiments

- Would like to use the post-processor to improve the ensemble forecasts by increasing this spread to capture the hydrologic uncertainty



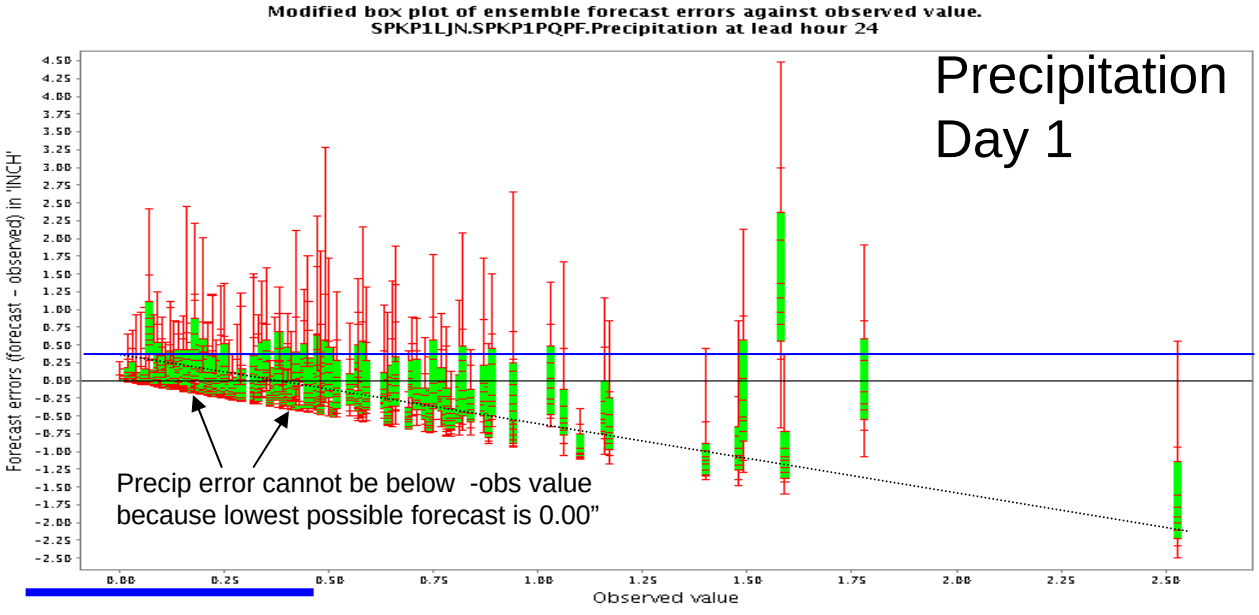
Other Ensembles

- Verify MARFC ensemble forecasts created by other methods, such as based on the SREF meteorological plumes and long-term ESP forecast
- Compare MARFC short-term PQPF ensembles to OHD Hindcaster enesemble simulations
- Also, short term ESP forecasts are generated for the Schuylkill Basin

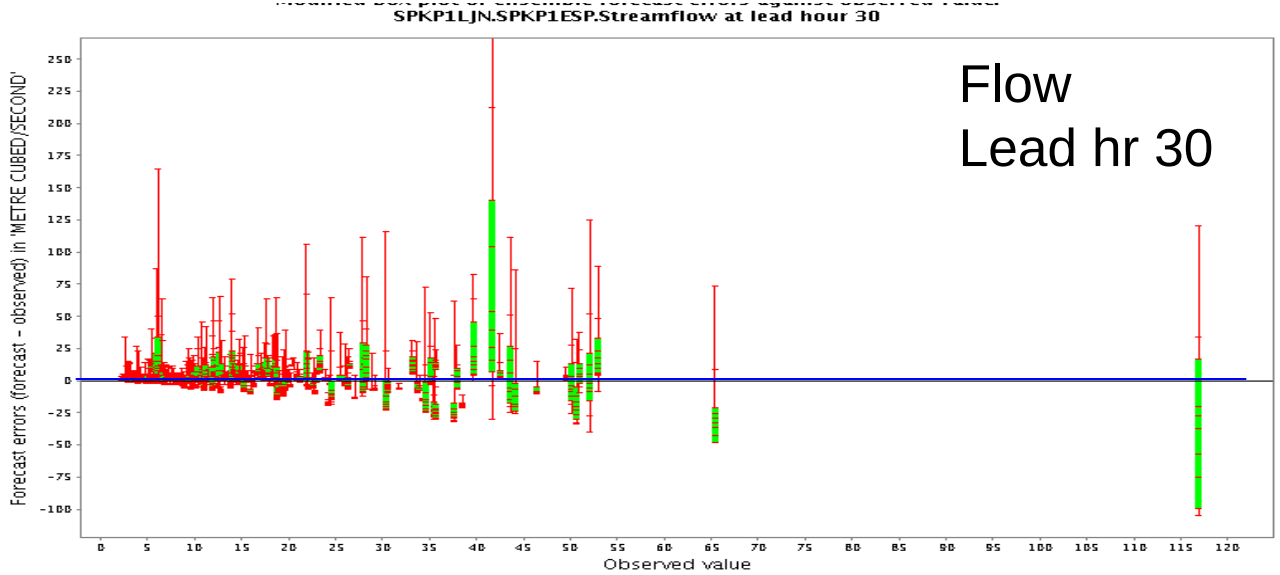

Schuylkill River Basin
Southeast Pennsylvania Streams
Daily, Modeled & Supplemental Points
Tuscarora Lake
Eisenhuth Reservoir
Wolf Creek Reservoir
Indian Run Reservoir
Blue Marsh Lake
Marsh Creek Lake
Struble Lake
Coatsville Reservoir
Lake Ontelaunee
Leaser Lake
Green Lane Reservoir
Lake Galena
Tamaqua
Landingville
Berne
Barnville
Blue Marsh Dam
Reading (Tulpehocken Ck.)
Reading
Robesonia
Spangsville
East Greenville
Hillegass
Pottstown (Manatawny Ck.)
Pottstown
Graterford
Schwenksville
Phoenixville
Glenmoore
Honey Brook
Wagontown
Coatesville
Modena
Downingtown (Marsh Ck.)
Downingtown (near)
Downingtown (below)
Northbrook (Broad Run)
Chadds Ford
Wilmington
Dublin
New Britain
Chalfont
Neshaminy
Rushland
Penns Park
Langhorne
Norristown
Valley Forge
Fort Washington
Philadelphia (Wissahickon)
Philadelphia
SCHUYLKILL
RIVER
DELAWARE
RIVER
Daily Point
Other Modeled Points
Supplemental Points
Schuylkill Basin
Brandywine Basin
Neshaminy Basin
Rivers/Streams
5 0 5 16 Miles
Middle Atlantic River Forecast Center (Sept 2006)

Review of Case Study

Spruce Creek
Day 1 Precipitation, Hour 30 Streamflow (QPF)

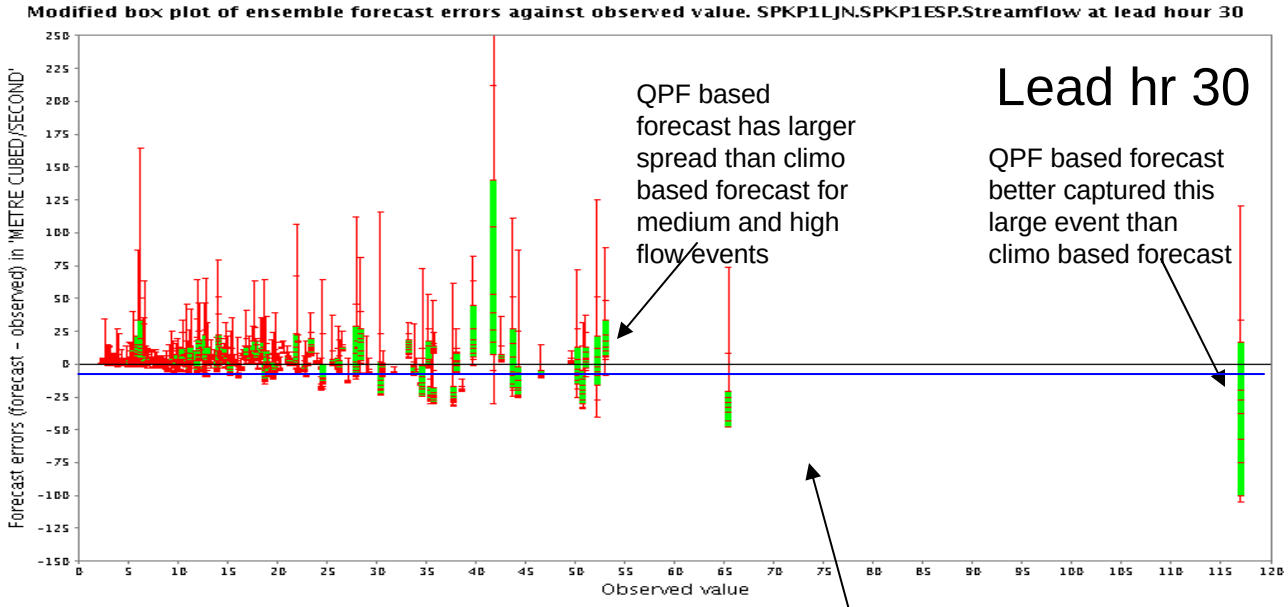


Zero error line

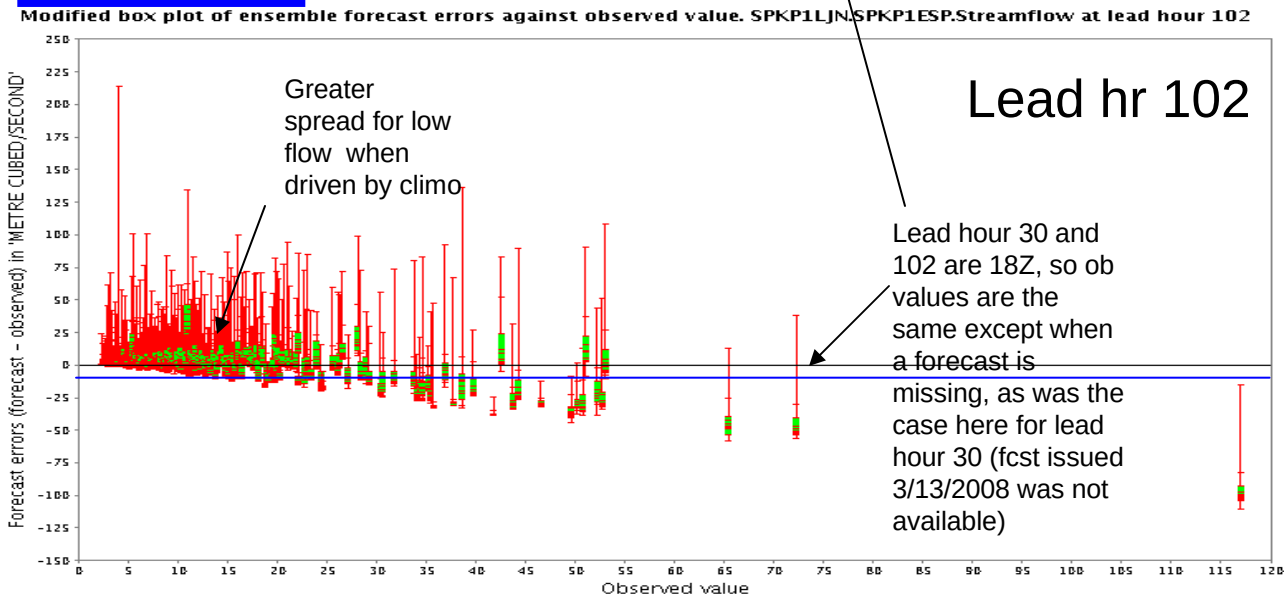


Spruce Creek Streamflow
QPF-based versus climatology-based

(note – vertical and horizontal scales identical in the two graphs)



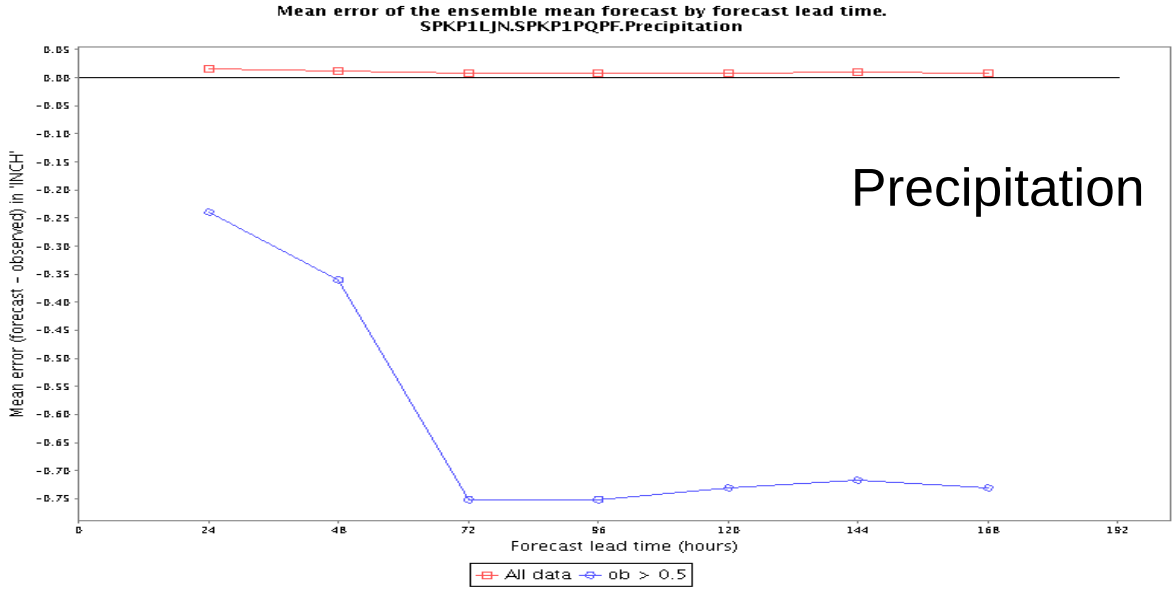
Zero error line

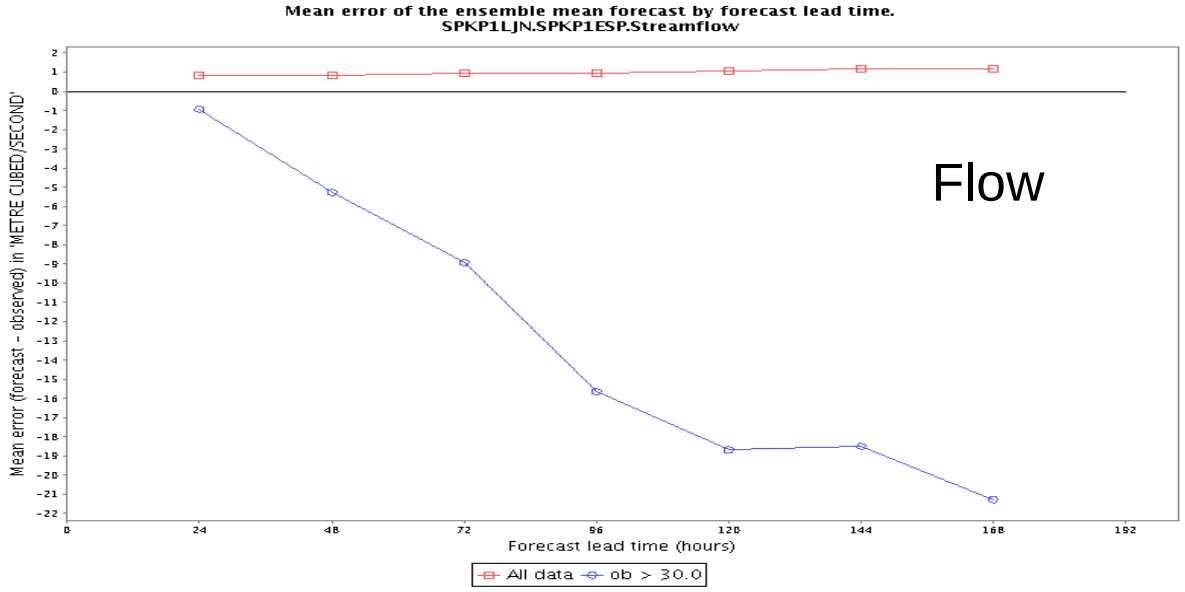


At Lead hour 30, QPF based PQPF is the primary forcing

Runoff at hour 102 is from climatology based PQPF

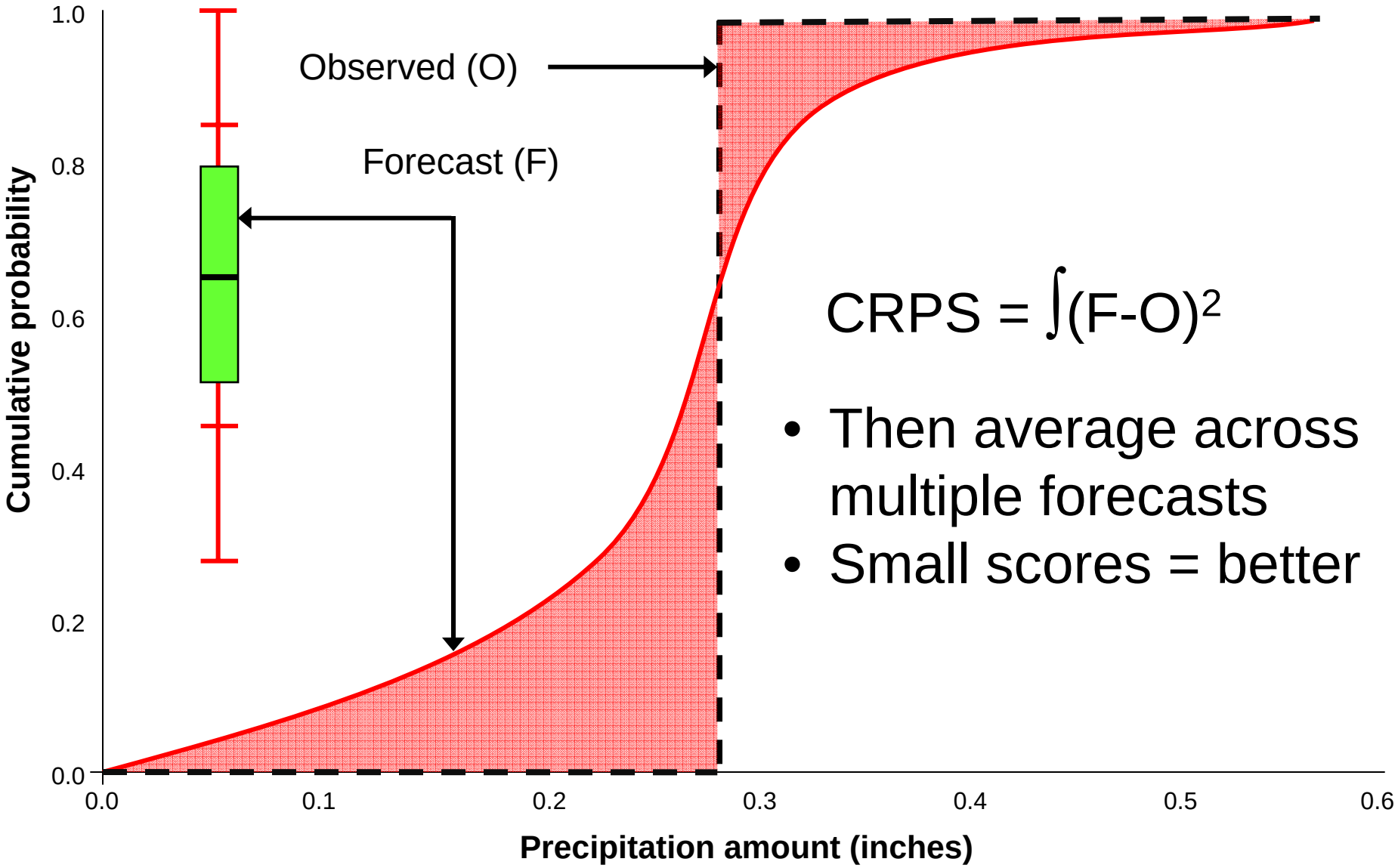
Mean Error (bias) in Ens Mean versus Observation





Precipitation and streamflow show little bias overall, but an underforecast bias (that worsens with lead time) for higher rain and higher water events.

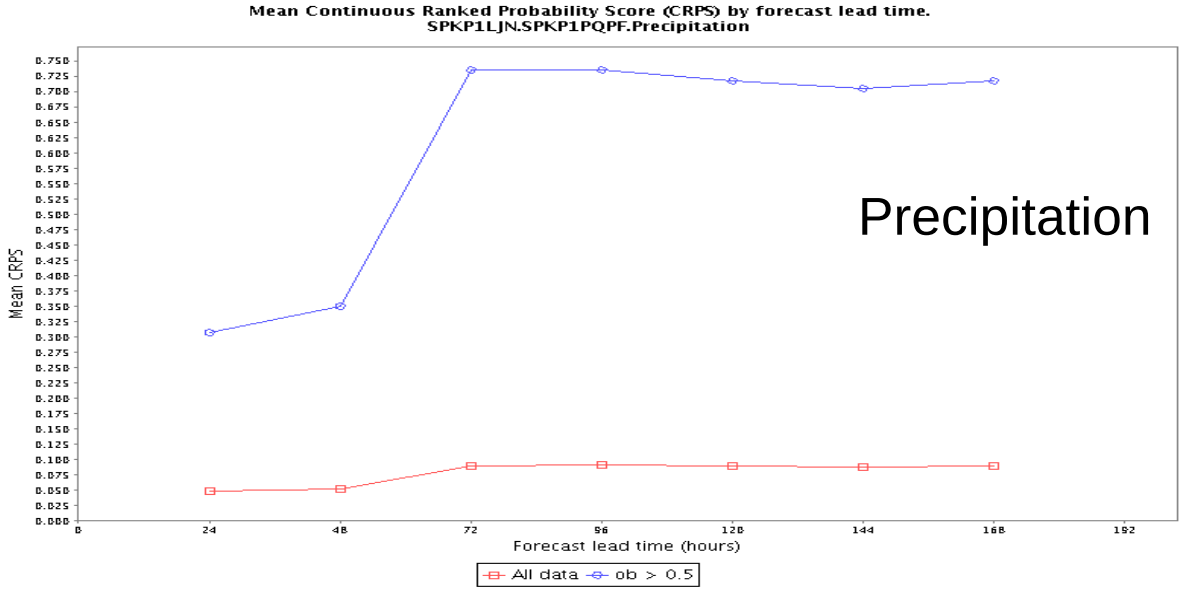
CRPS (slide by James Brown)

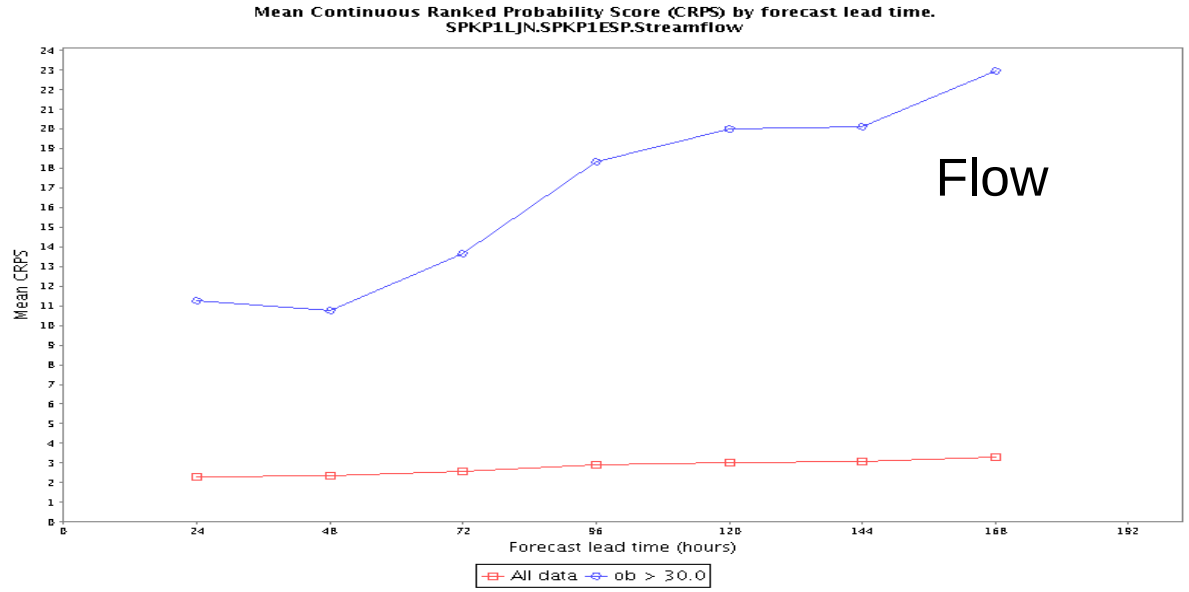


$$CRPS = \int (F-O)^2$$

- Then average across multiple forecasts
- Small scores = better

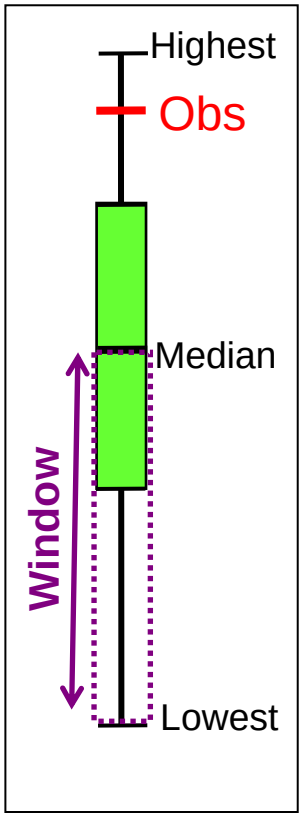
MCRPS for Spruce Creek

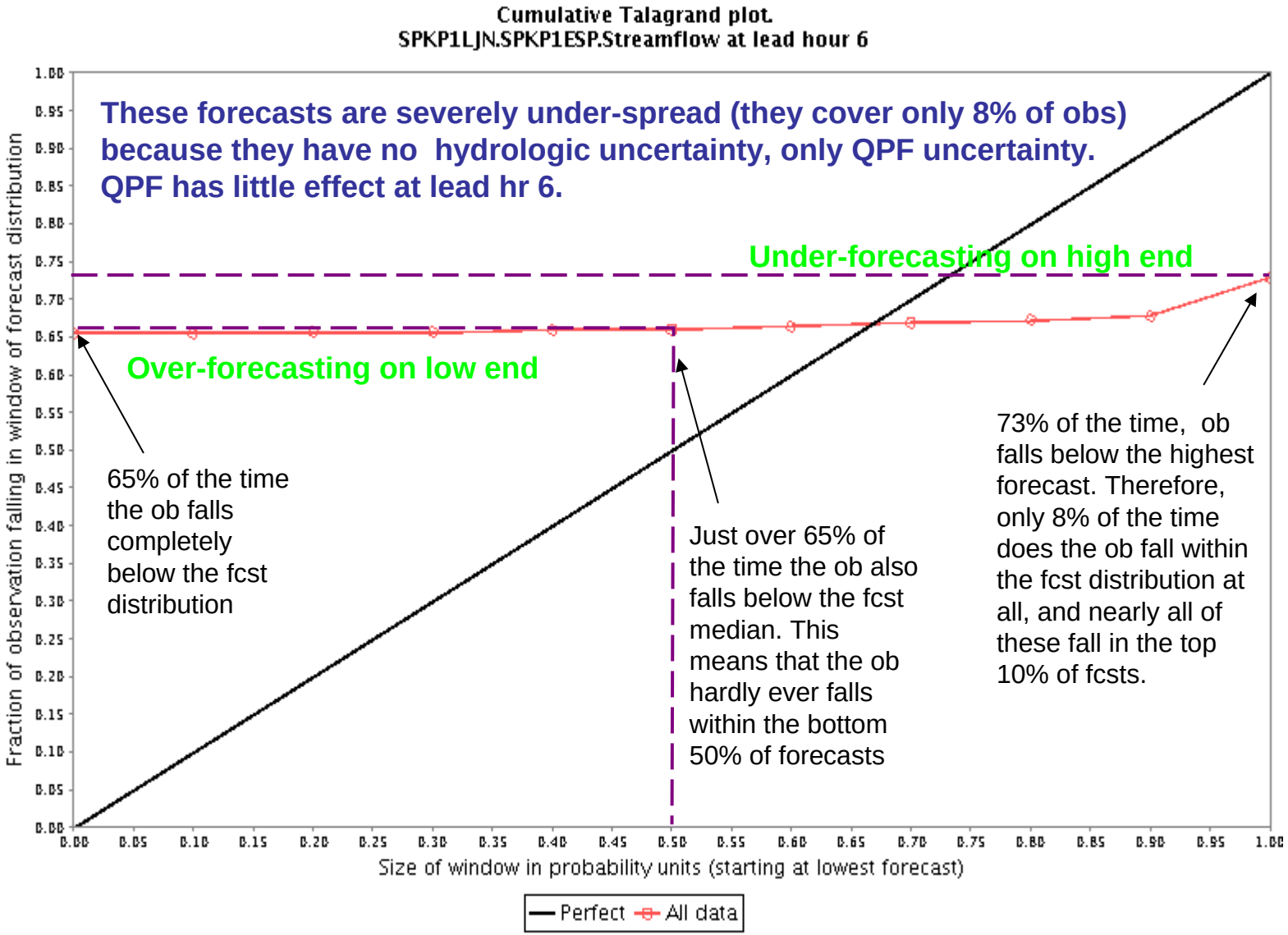




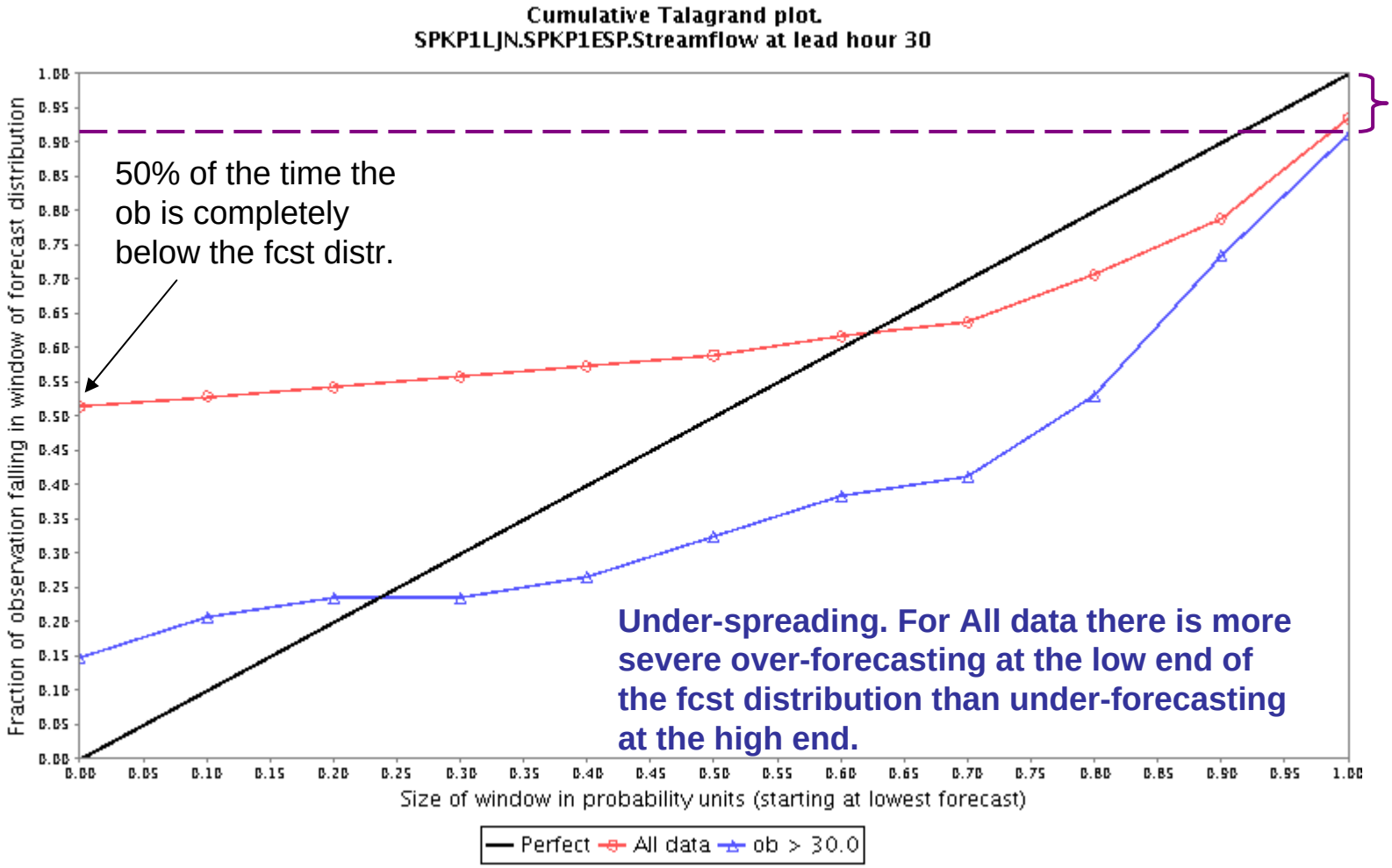
Deteriorating forecast accuracy with lead time, particularly for higher flow and higher precip events. Precip error increases abruptly in the transition from QPF based to climo based PQPF.

Reliability: Talagrand at 6hrs
Spruce Creek Streamflow





Reliability: Talagrand at 30 hrs
Spruce Creek Streamflow

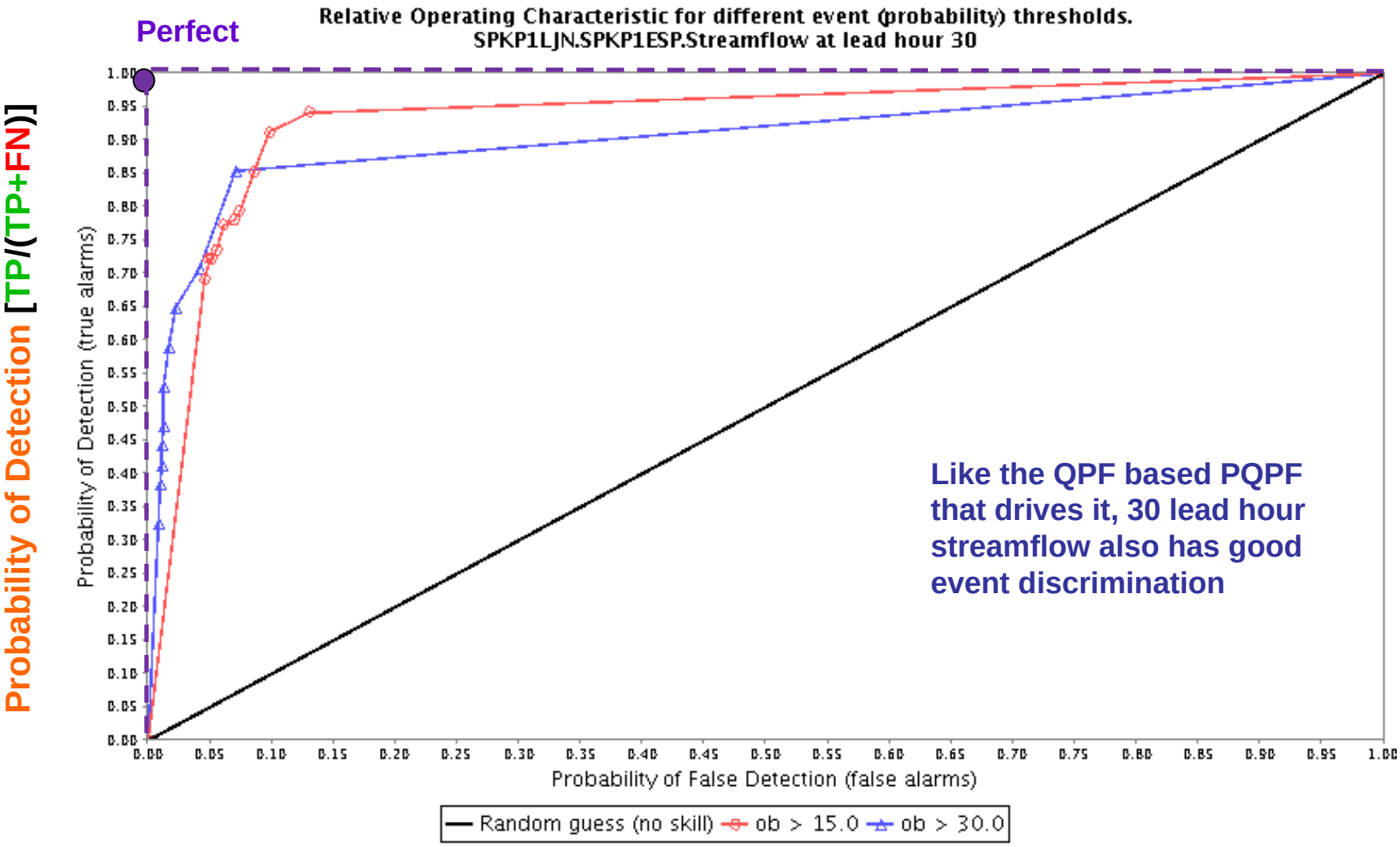


50% of the time the ob is completely below the fcst distr.

~8% of the time the ob is completely above the fcst distr.

Under-spreading. For All data there is more severe over-forecasting at the low end of the fcst distribution than under-forecasting at the high end.

Discrimination: ROC at 30 hrs
Spruce Creek Streamflow



Probability of Detection [TP/(TP+FN)]

Probability of False Detection [FP/(FP+TN)]