Aggregated Verification Results for flows using EPPII at 5 ABRFC test basins

Hydrologic and Input Uncertainties

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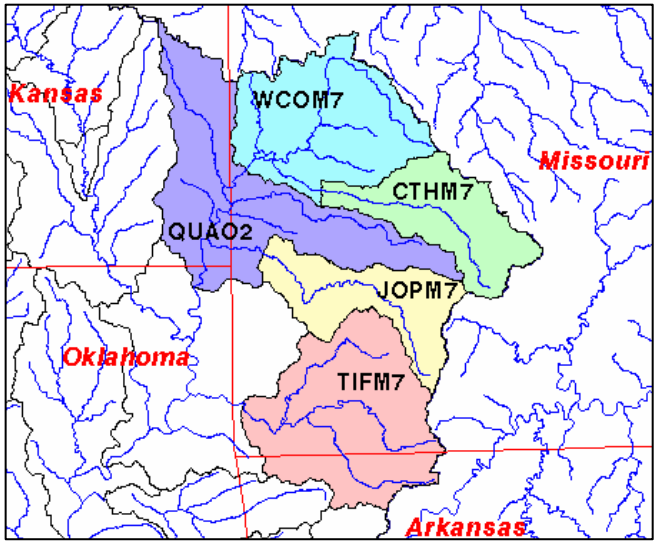
Computation

- Verification statistics computed for each individual basins at 3 different scales: annual, seasonal, and monthly
- Aggregated verification statistics computed as the weighted average of individual basin statistics
- Forecast flows generated for lead days 1 to 14 using short-term RFC-based precipitation and temperature ensembles from Ensemble Pre-Processor EPPII with optimized parameters
- Forecast flows compared to 2 references:
  - observed flow (show all errors – hydrologic and input uncertainties)
  - simulated flow (show only errors from input – input uncertainty)
- Verification period (dependent validation):
  03/06/2003 – 08/12/2005

Verification Results

- Individual test basins at ABRFC :

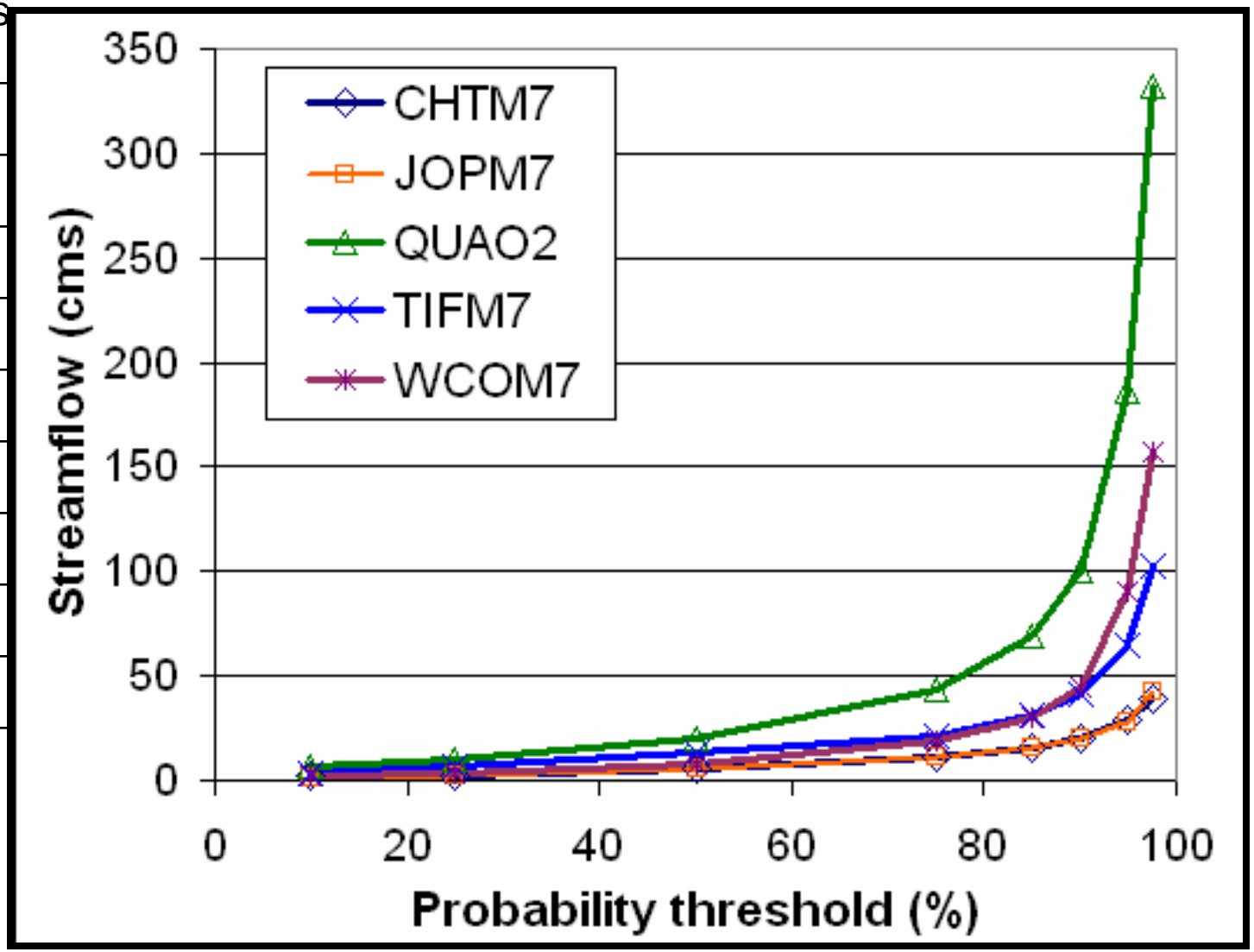


- Verification statistics:
  - Briers statistics (slides 4 to 8): annual scale
  - RPS & RPSS (slides 9 to 11): monthly scale
    Reliability diagrams (slides 12 to 24): annual and seasonal scales
  - ROC plots (slides 25 to 37): annual and seasonal scales

Streamflow Thresholds

Streamflow in cms

Percentile	
10.0	
25.0	
50.0	
75.0	
85.0	
90.0	
95.0	
97.5	

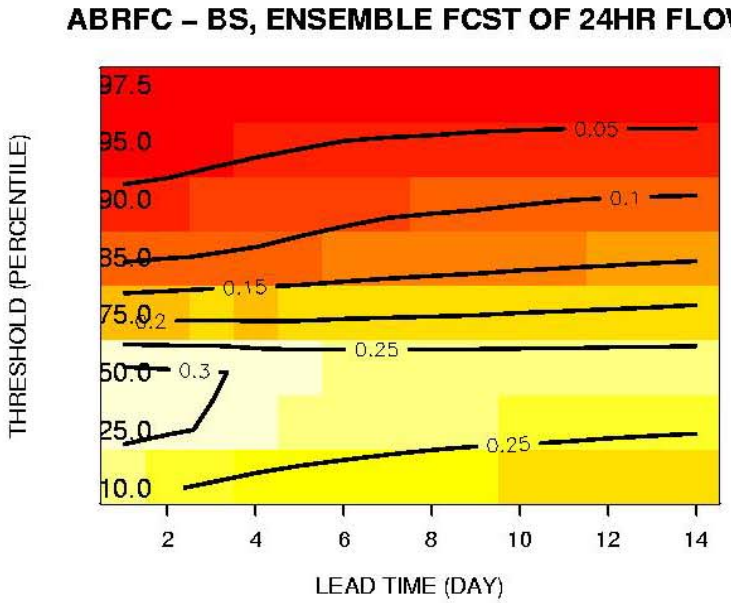


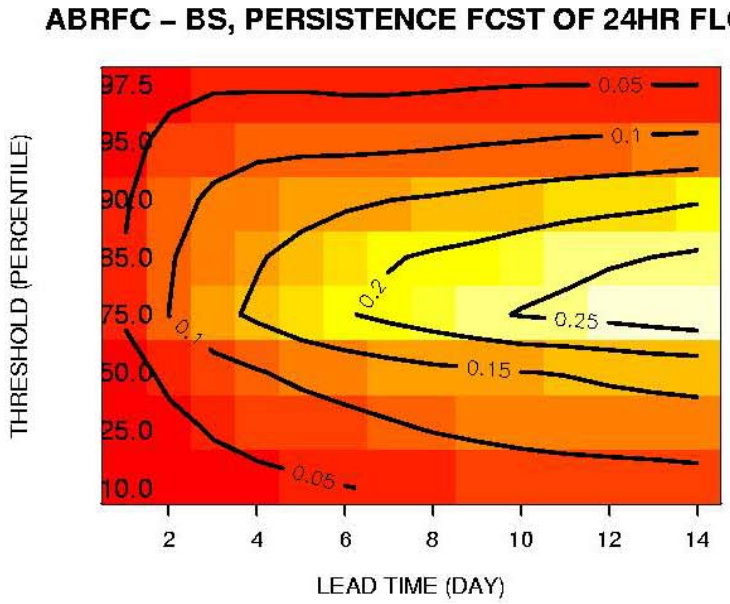
Briers statistics

- Annual results with observed and simulated flows
- Briers Skill Score (BSS) computed with 2 references: climatology and persistence

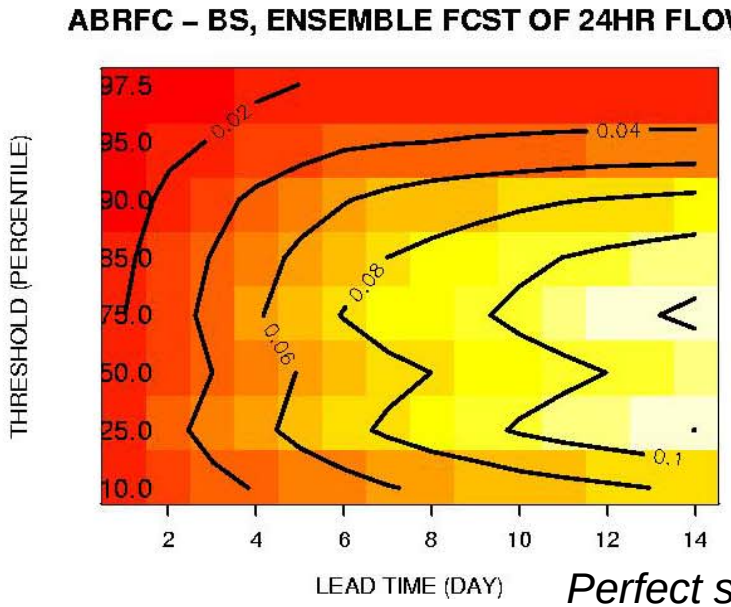
Briers Score Statistics

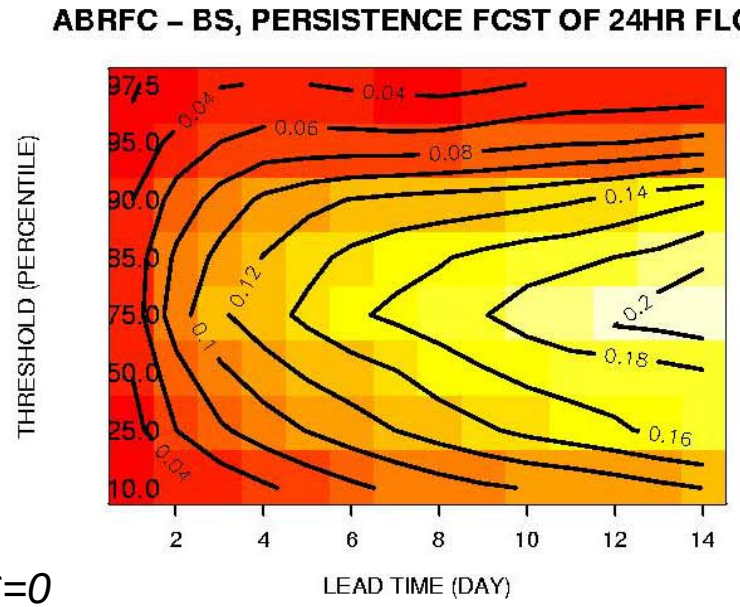
Reference flow: observed





Reference flow: simulated

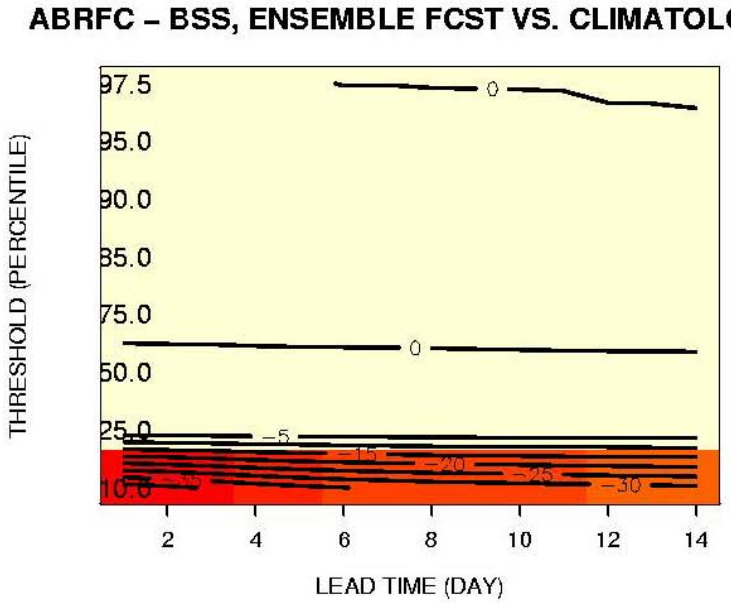


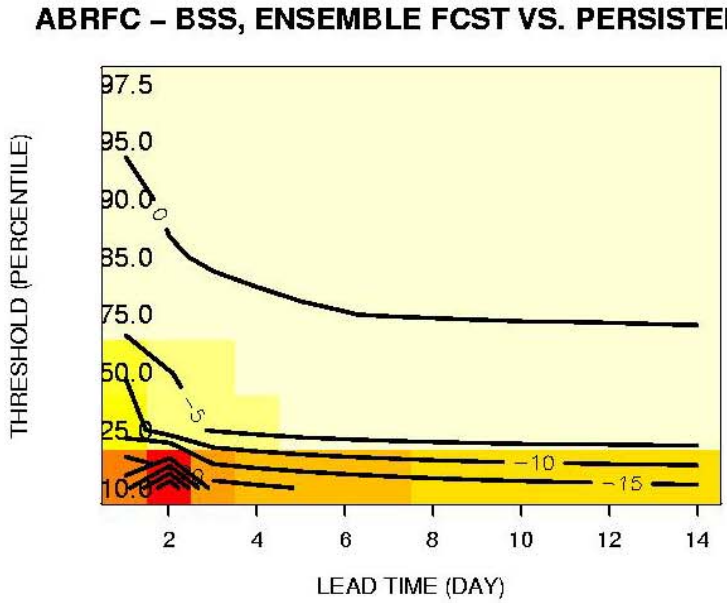


Perfect score: BS=0

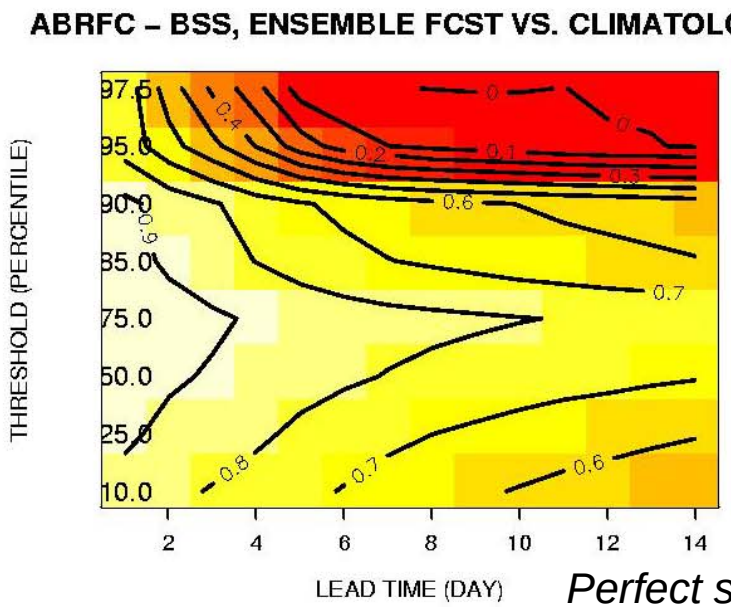
Briers Skill Score Statistics

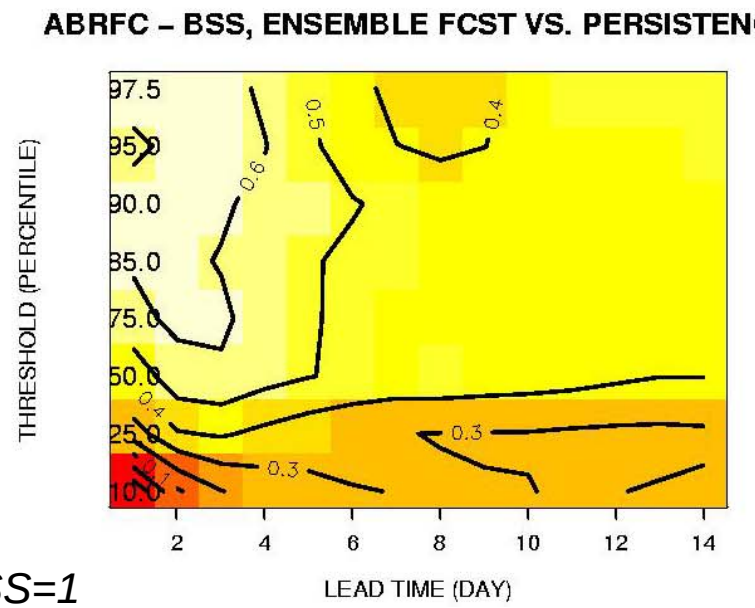
Reference flow: observed





Reference flow: simulated

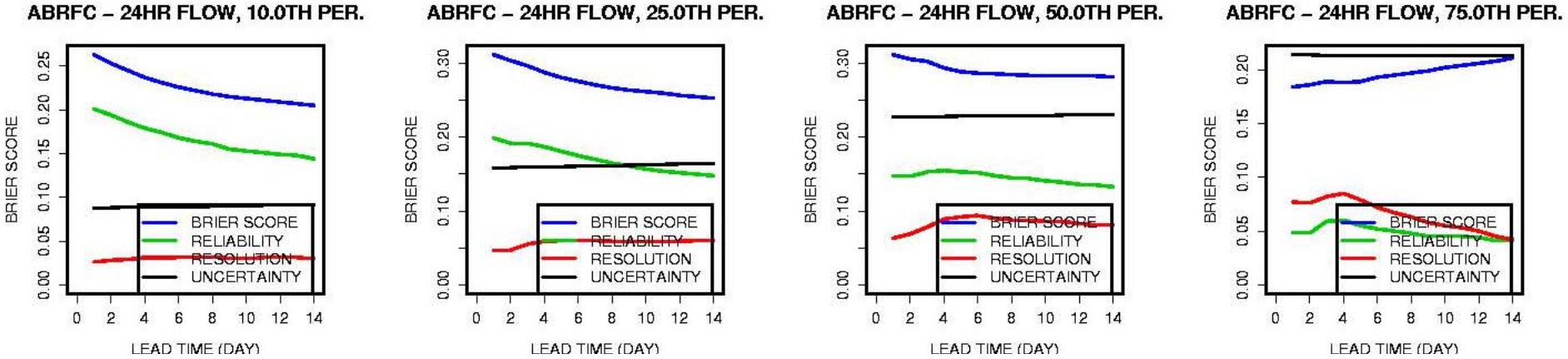




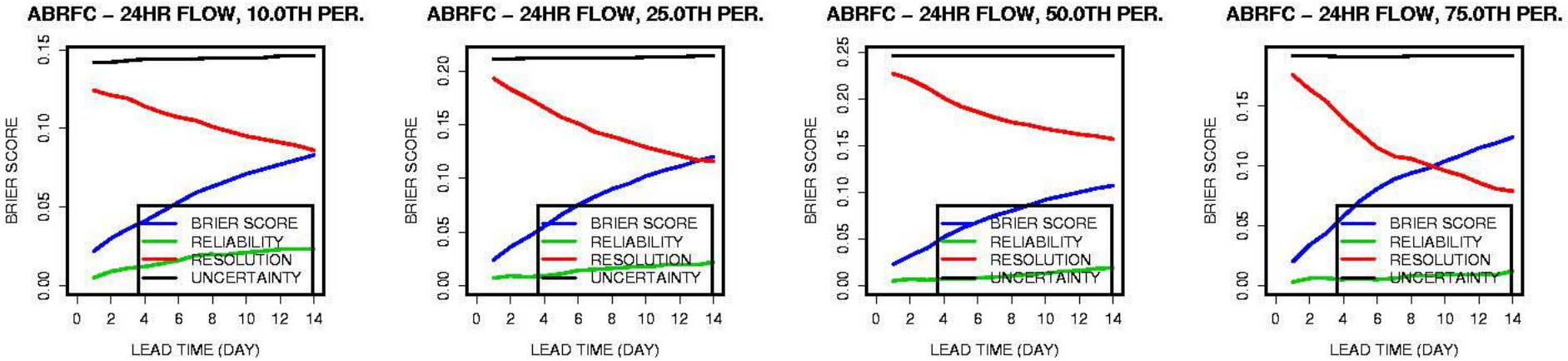
Perfect score: BSS=1

Briers Score Statistics

Reference flow: observed



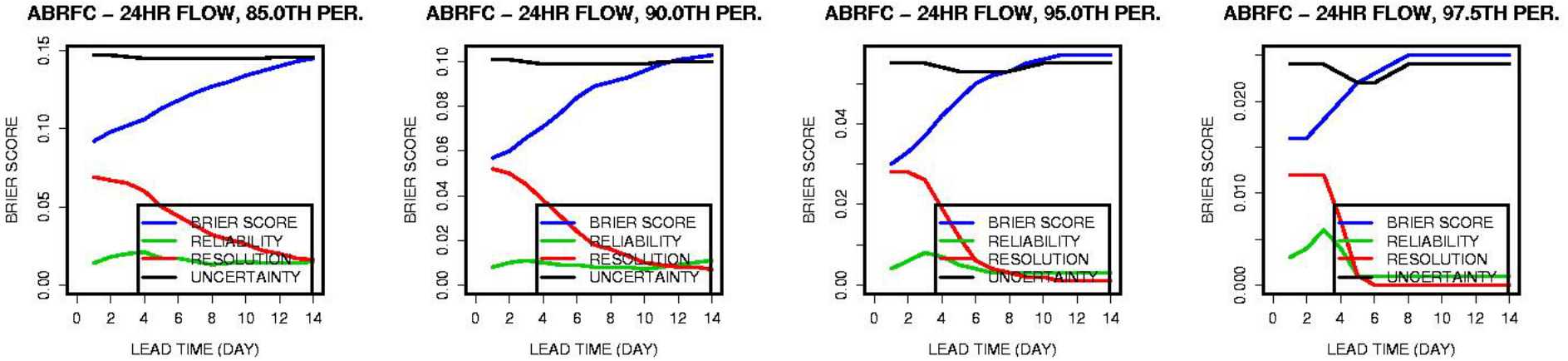
Reference flow: simulated



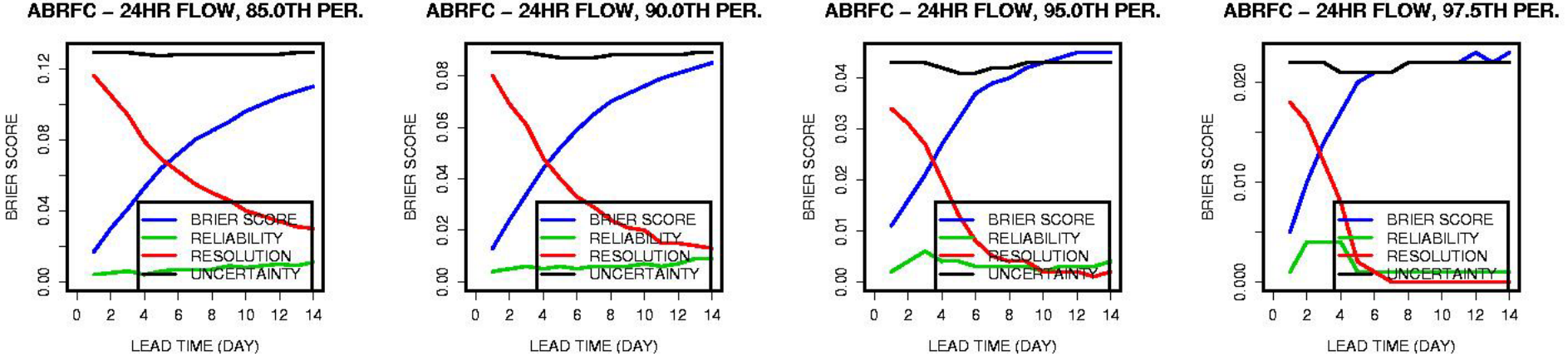
BS=Reliability – Resolution + Uncertainty

Briers Statistics

Reference flow: observed



Reference flow: simulated



BS=Reliability – Resolution + Uncertainty

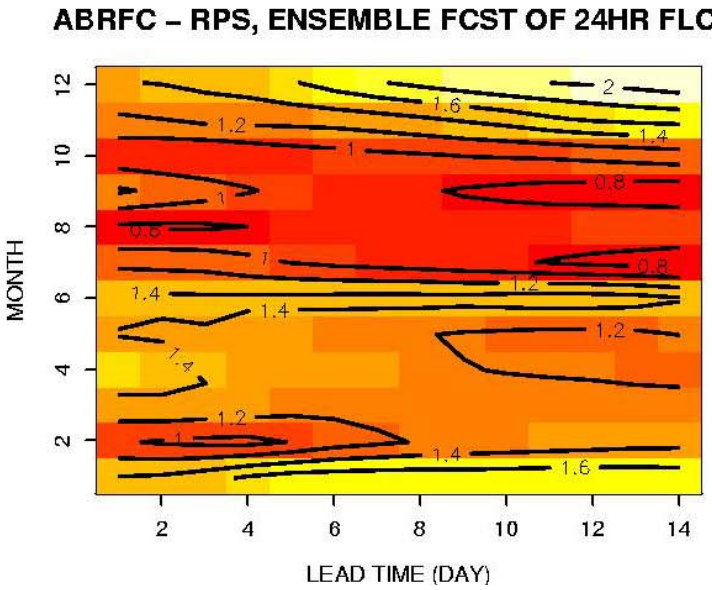
RPS & RPSS statistics

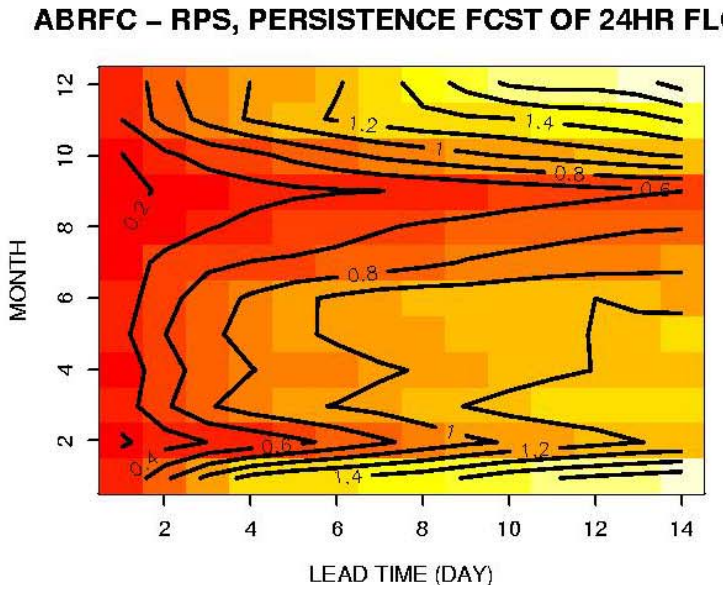
- Monthly results with observed and simulated flows
- RPSS computed with 2 references:

climatology and persistence

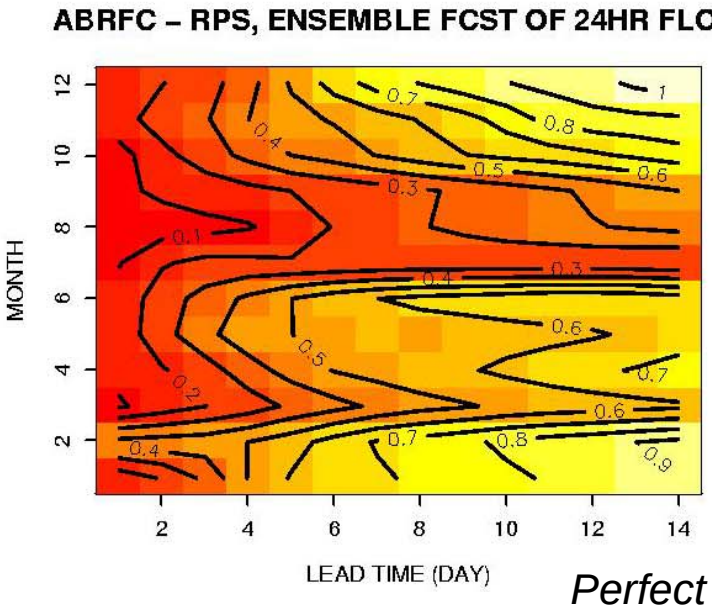
RPS Statistics

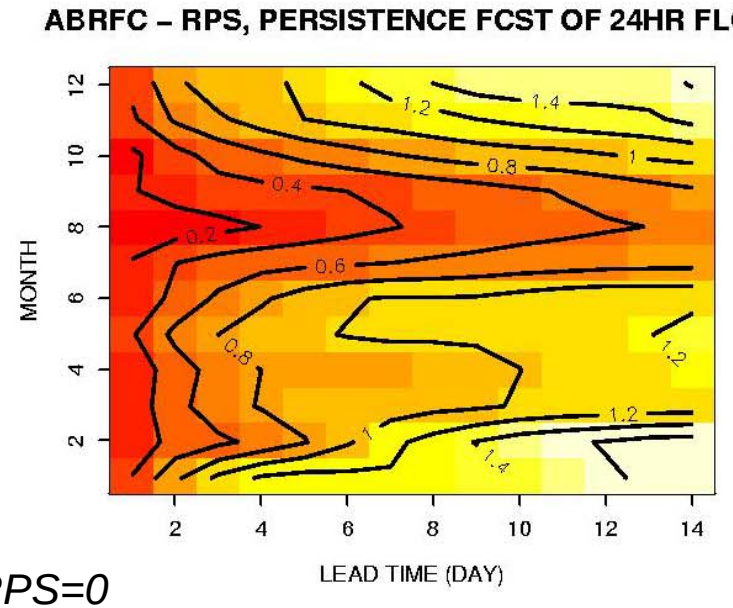
Reference flow: observed





Reference flow: simulated

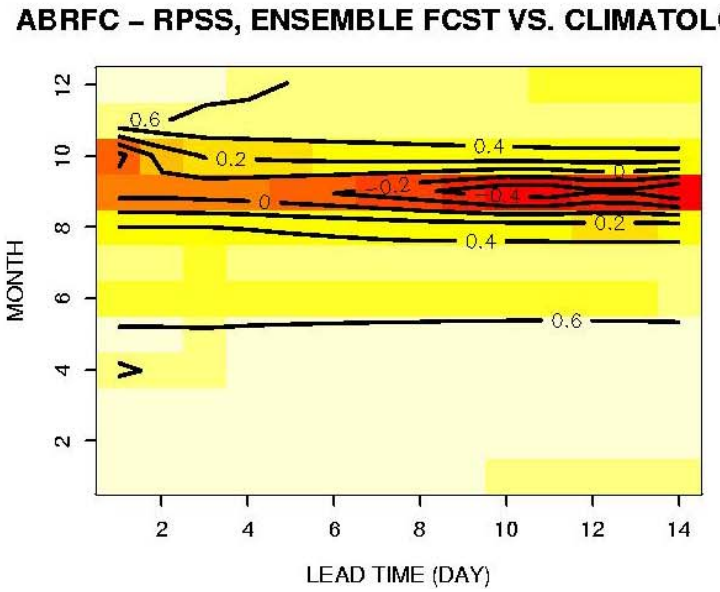


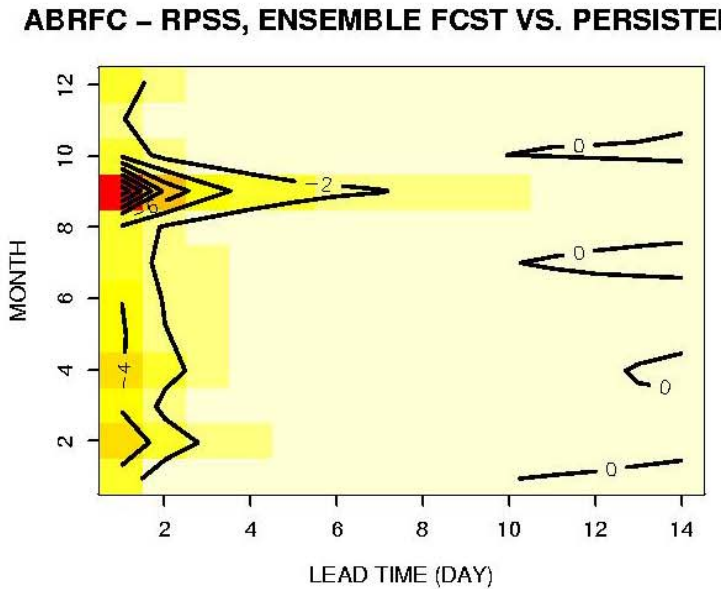


Perfect score: RPS=0

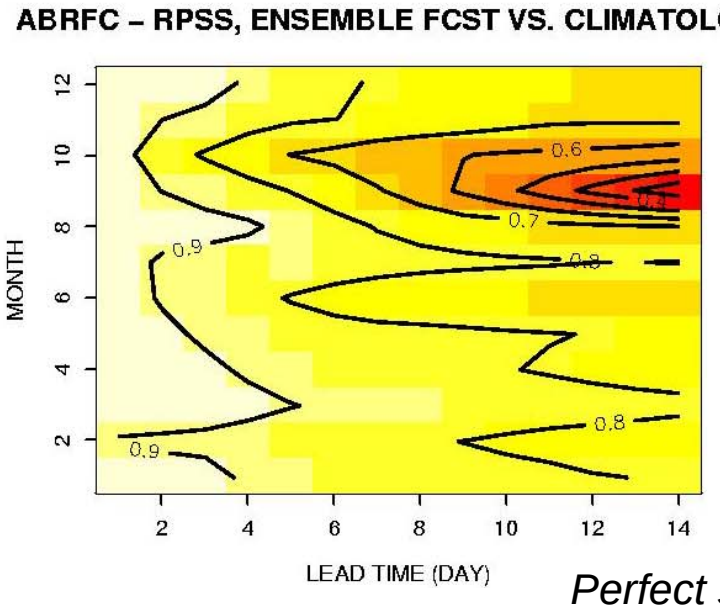
RPSS Statistics

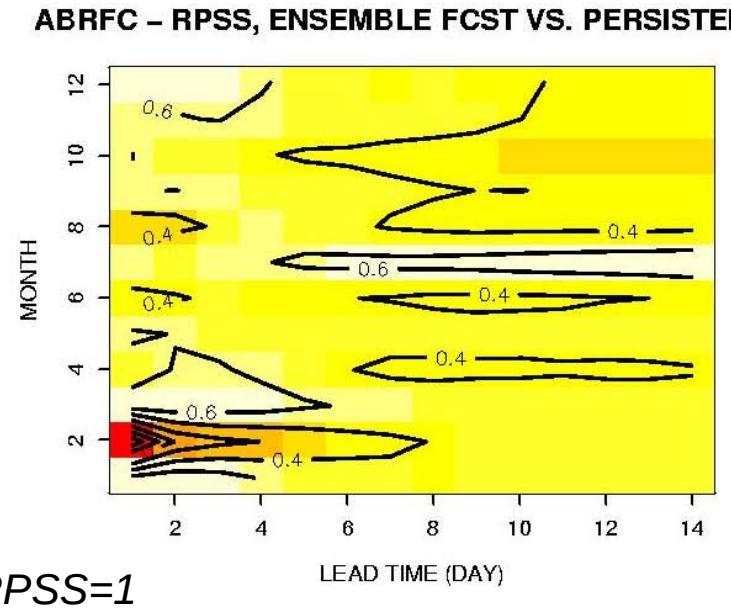
Reference flow: observed





Reference flow: simulated





Perfect score: RPSS=1

Reliability statistics

- Annual results with observed and simulated flows

- Threshold values:

10%, 25%, 50%, 75%, 85%, 90%, 95%, 97.5%

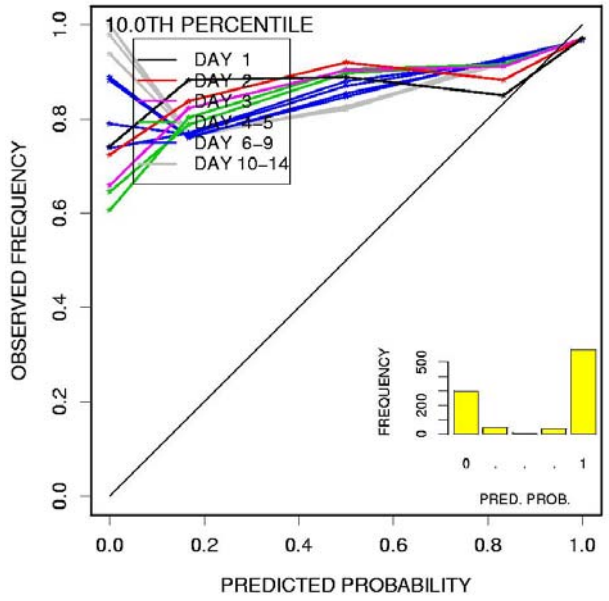
- Reliability plot with 5 probability bins

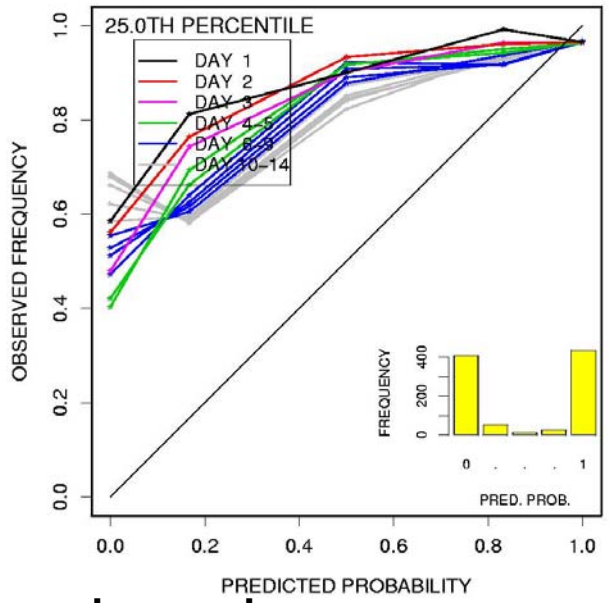
Reliability Statistics

Reliability Diagram (agreement between forecast probability and mean observed frequency) for a range of threshold percentiles for the 24-hr annual flow

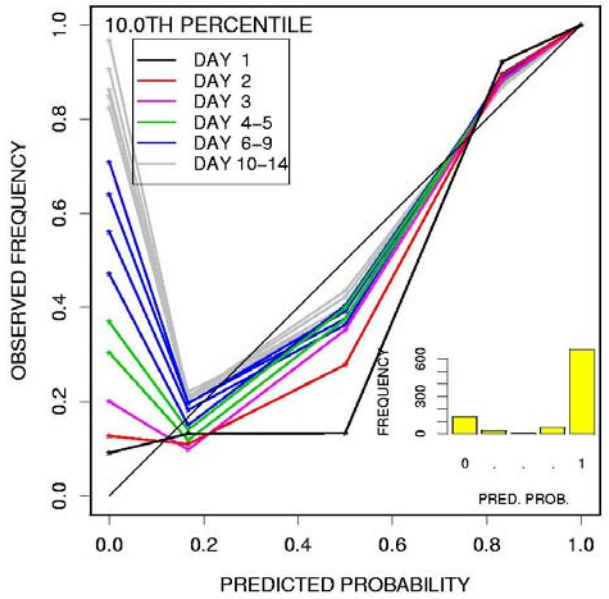
With 5 bins

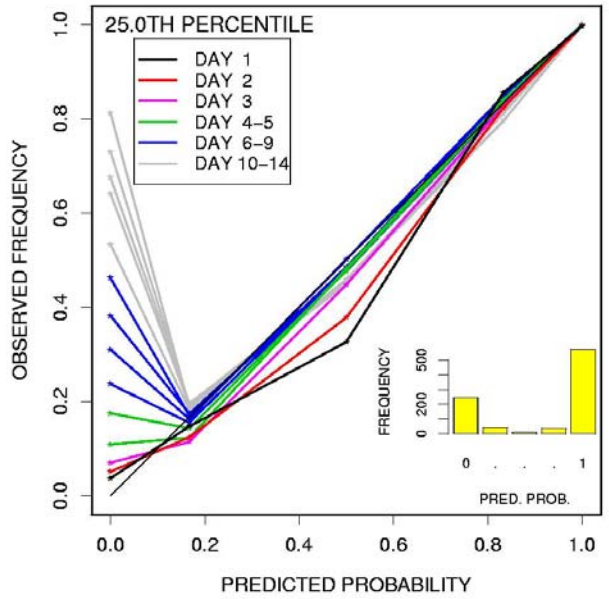
Deviation from diagonal gives conditional bias





Reference flow: observed





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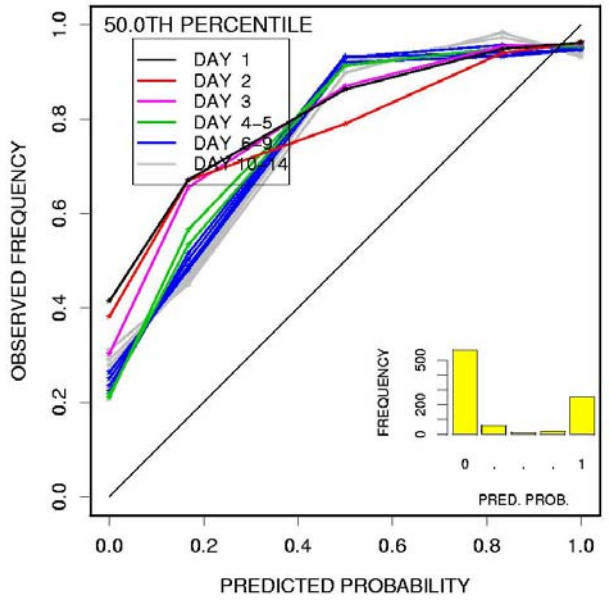
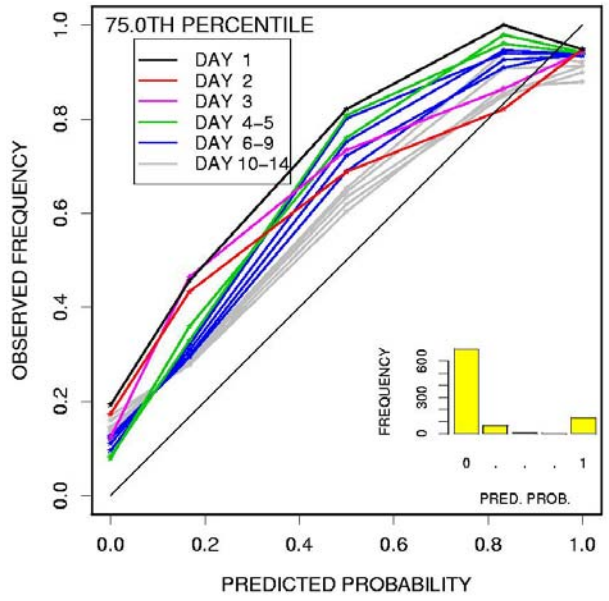
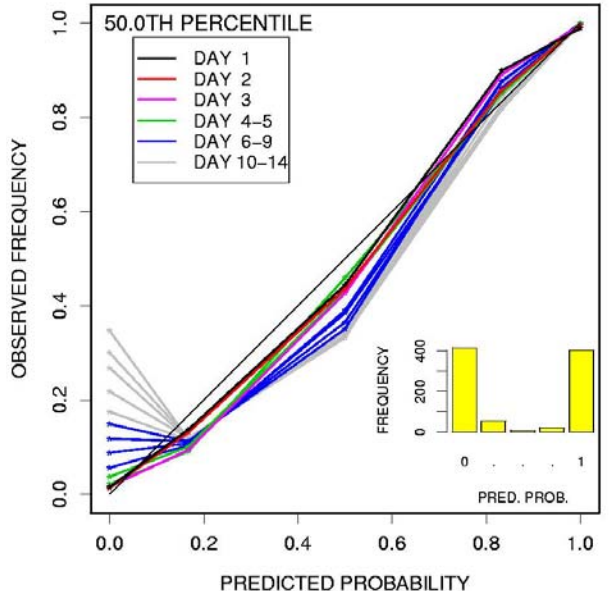
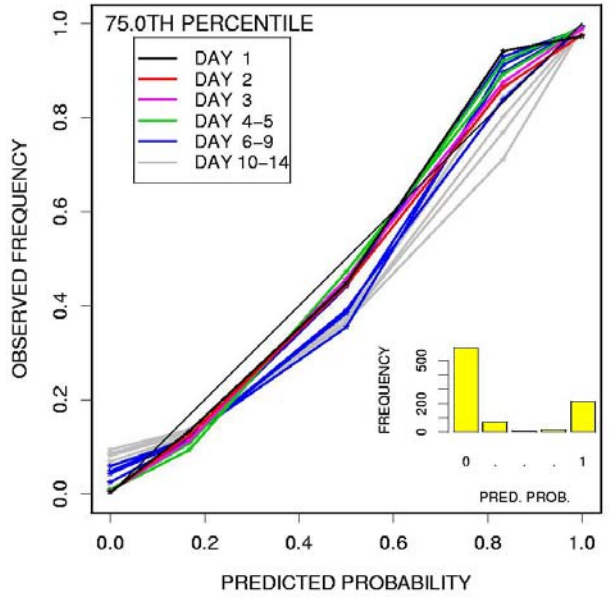




Reference flow: observed





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Reliability Statistics

Reliability Diagram (agreement between forecast probability and mean observed frequency) for a range of threshold percentiles for the 24-hr annual flow

With 5 bins

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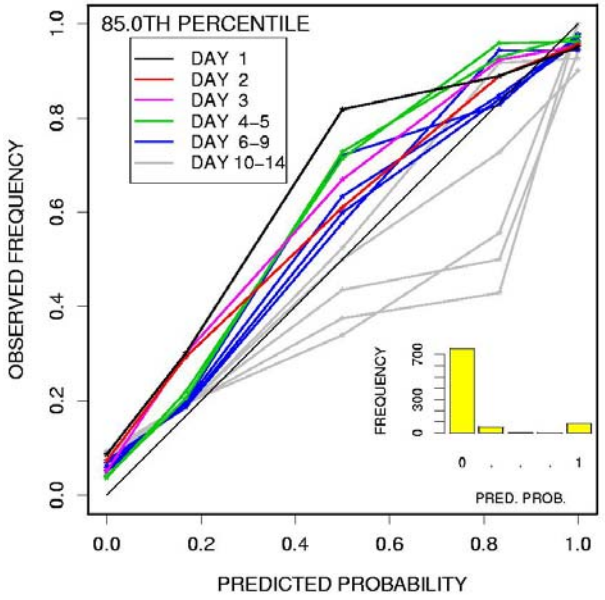
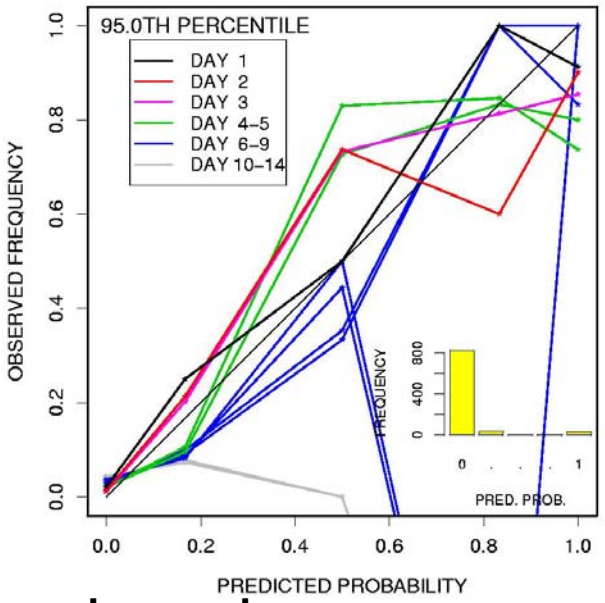
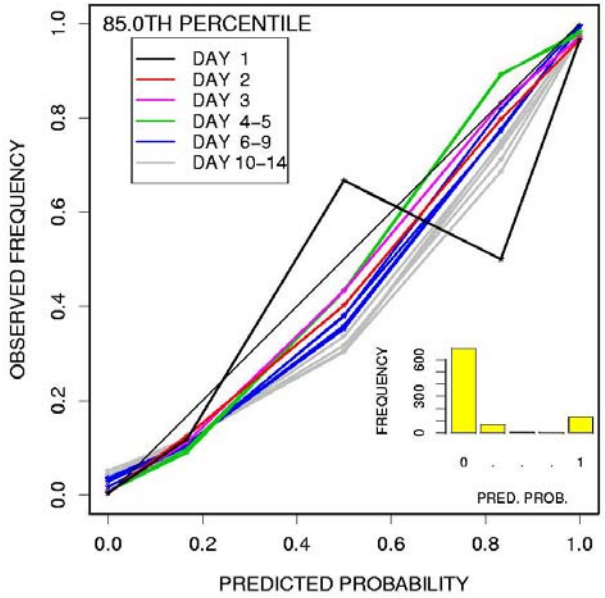
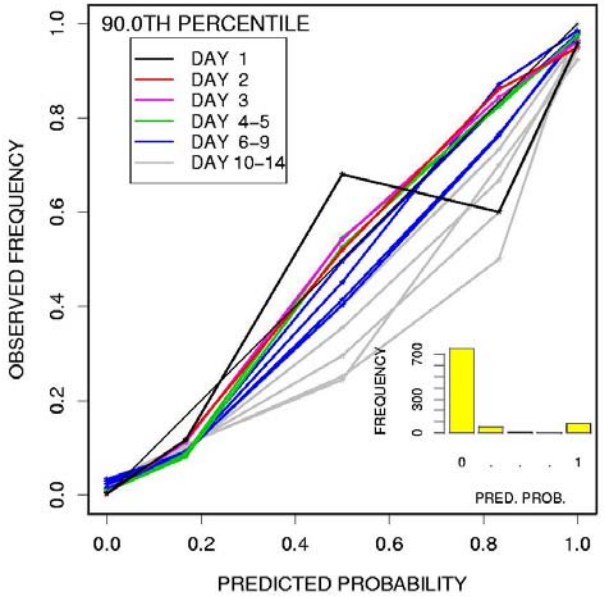




Reference flow: observed





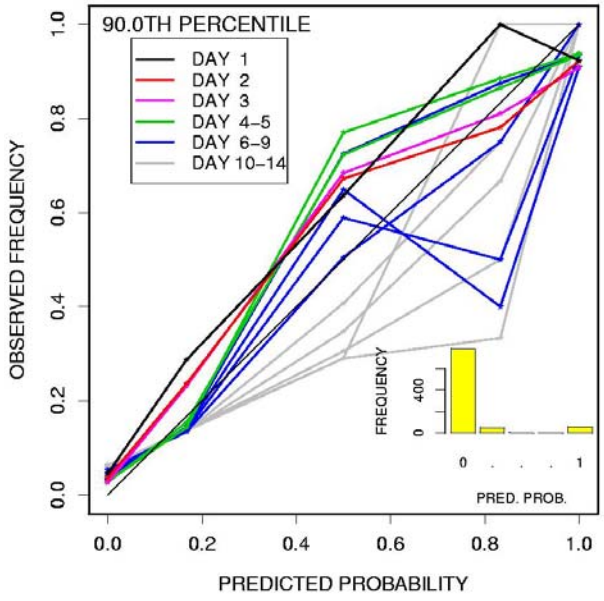
Reference flow: simulated

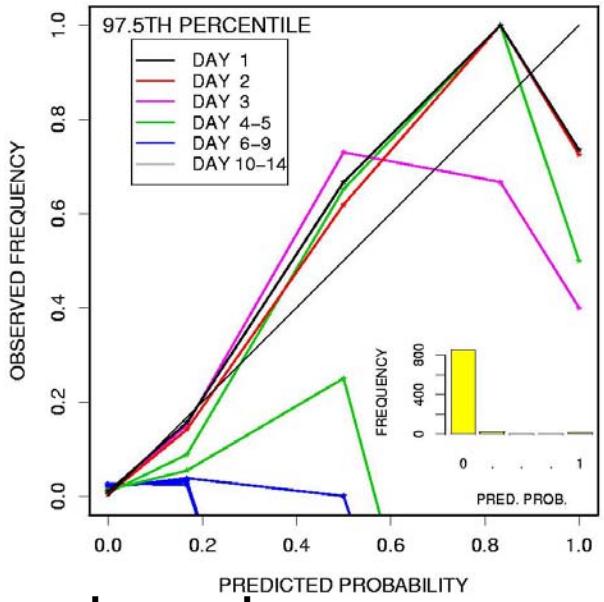
Reliability Statistics

Reliability Diagram (agreement between forecast probability and mean observed frequency) for a range of threshold percentiles for the 24-hr annual flow

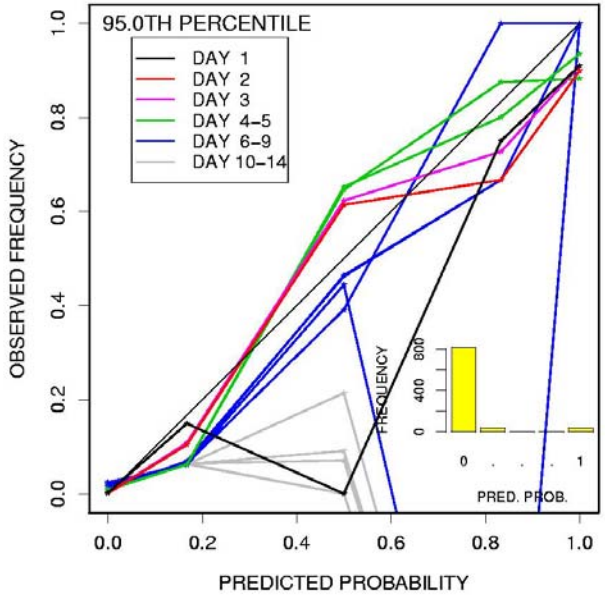
With 5 bins

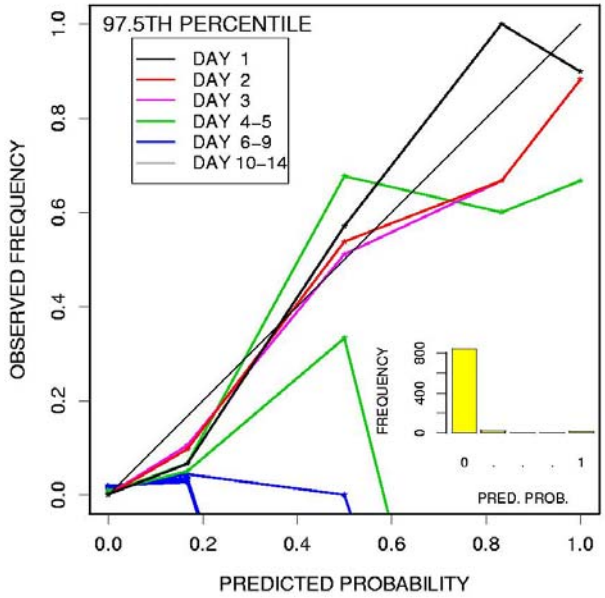
Deviation from diagonal gives conditional bias





Reference flow: observed





Reference flow: simulated

Reliability statistics

- Seasonal results with simulated flows:
  - Winter: December - February
  - Spring: March - May
  - Summer: June - August
  - Fall: September - November

- Threshold values:

10%, 25%, 50%, 75%, 85%, 90%, 95%

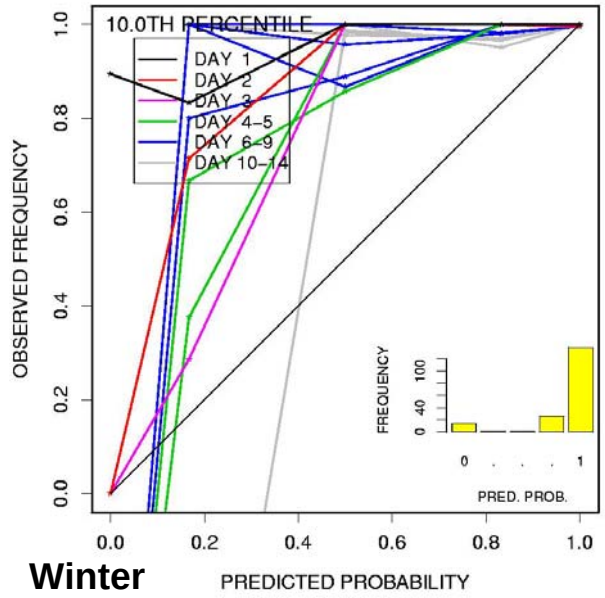
- Reliability plot with 5 probability bins

Reliability Statistics

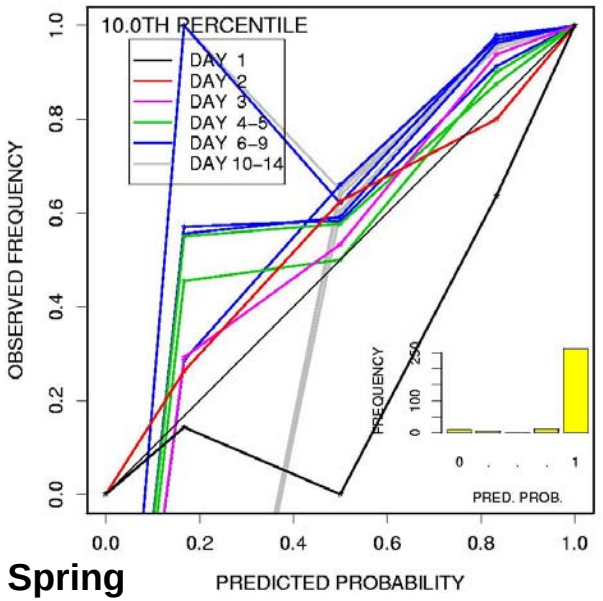
Reliability Diagram (agreement between forecast probability and mean observed frequency) for a range of threshold percentiles for the 24-hr seasonal flow

With 5 bins

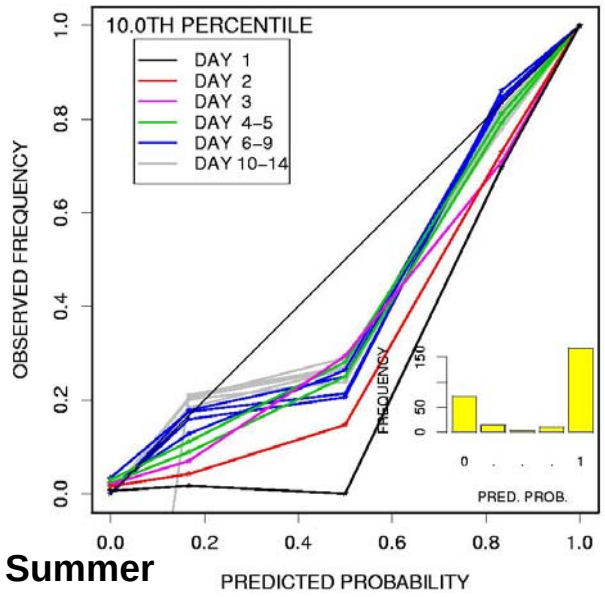
Deviation from diagonal gives conditional bias



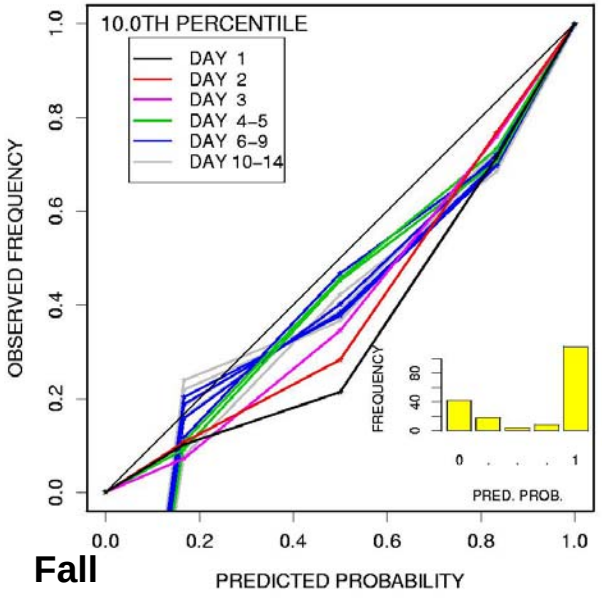
Winter



Spring



Summer



Fall

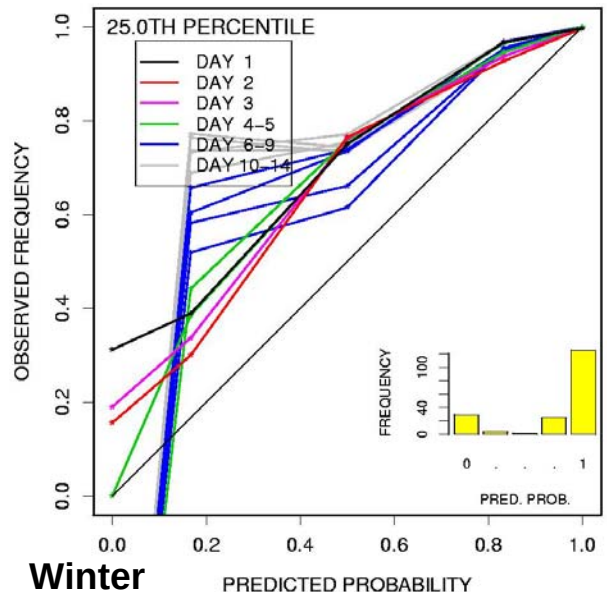
Reference flow: simulated

Reliability Statistics

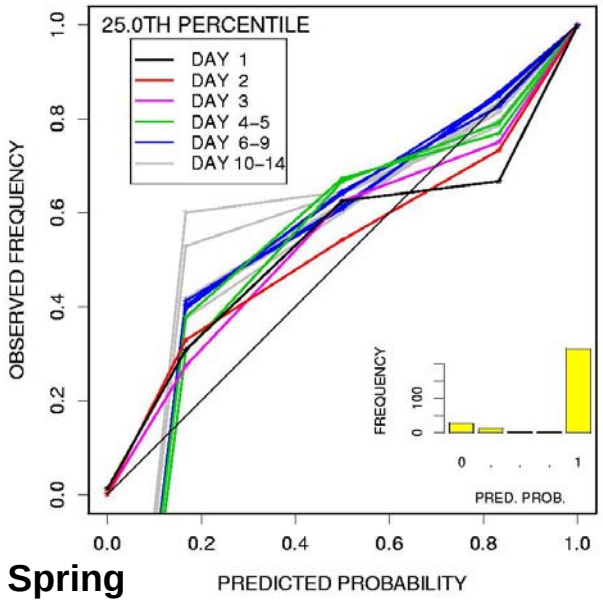
Reliability Diagram (agreement between forecast probability and mean observed frequency) for a range of threshold percentiles for the 24-hr seasonal flow

With 5 bins

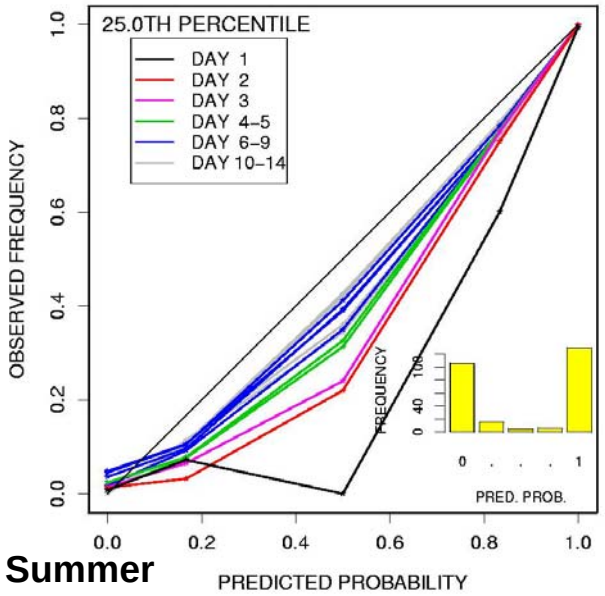
Deviation from diagonal gives conditional bias



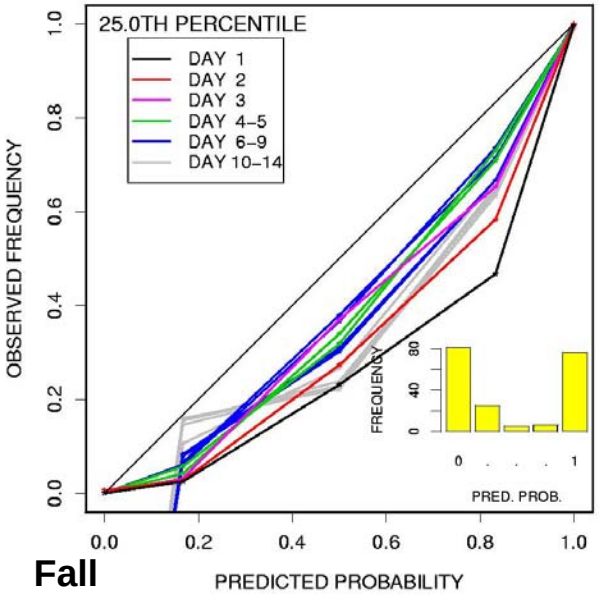
Winter



Spring



Summer



Fall

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With 5 bins

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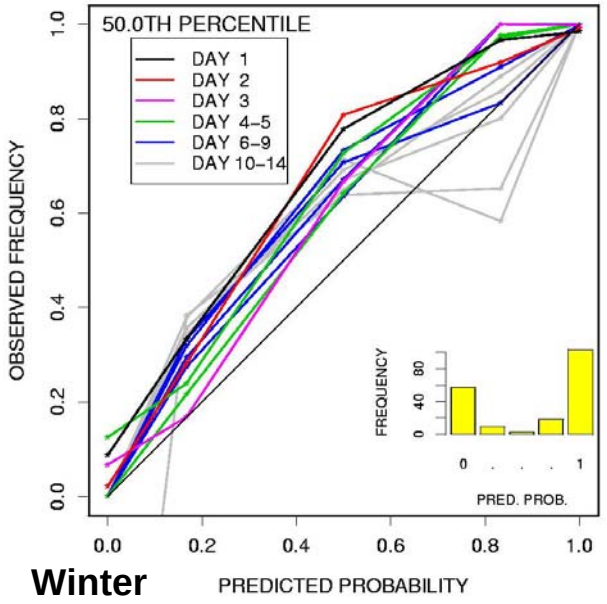
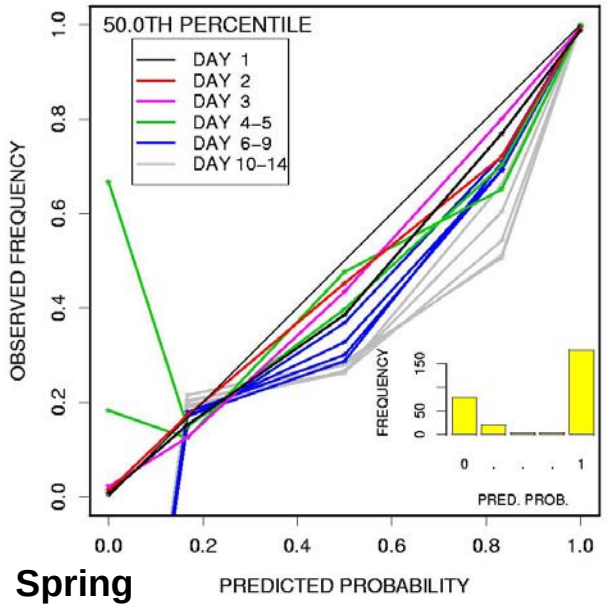
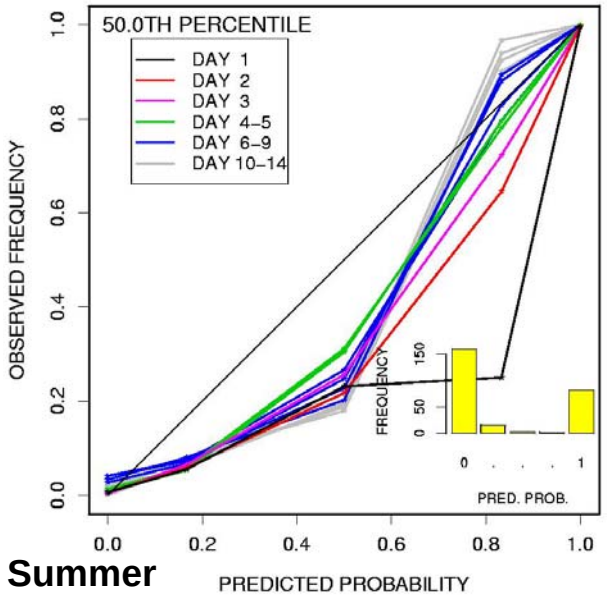


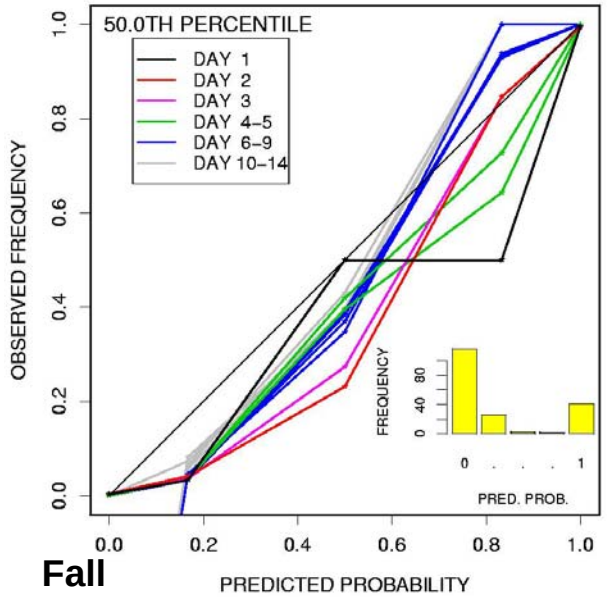
Winter



Spring



Summer



Fall

Reference flow: simulated

Reliability Statistics

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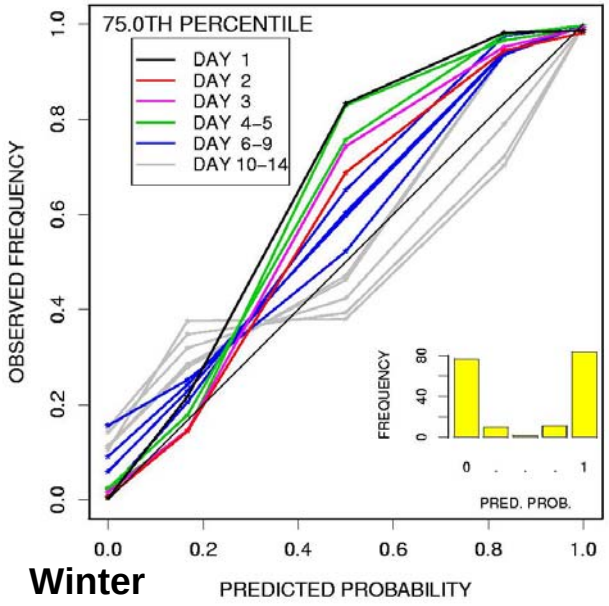
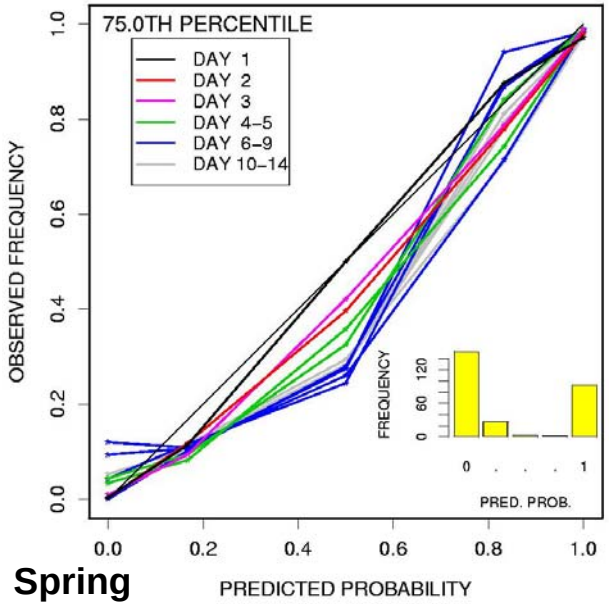
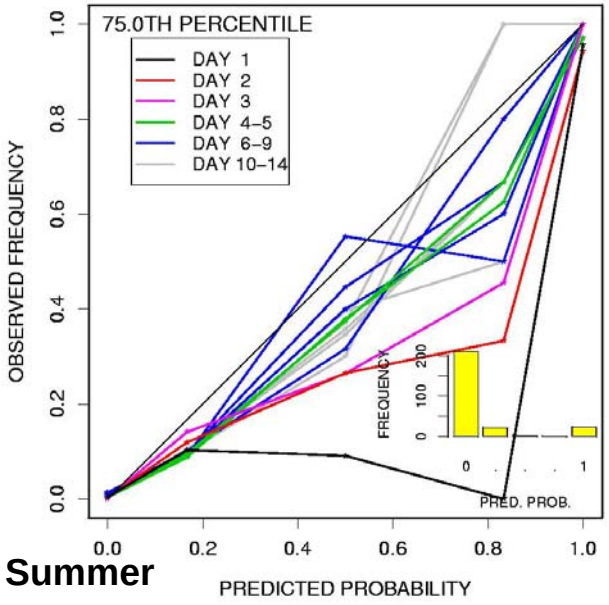


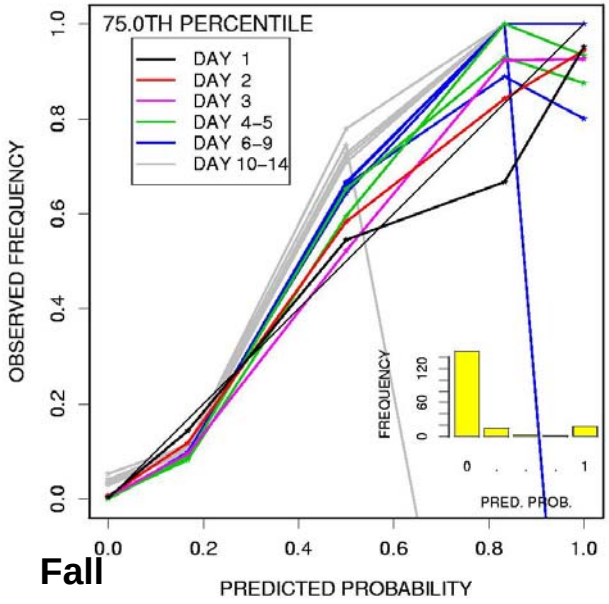
Winter



Spring



Summer



Fall

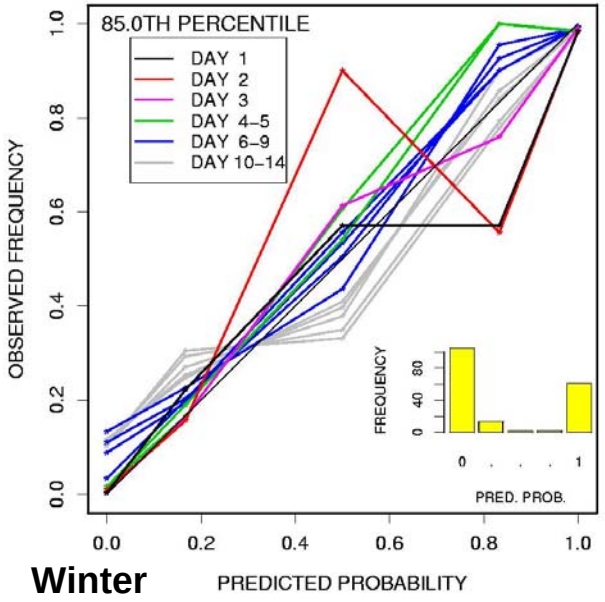
Reference flow: simulated

Reliability Statistics

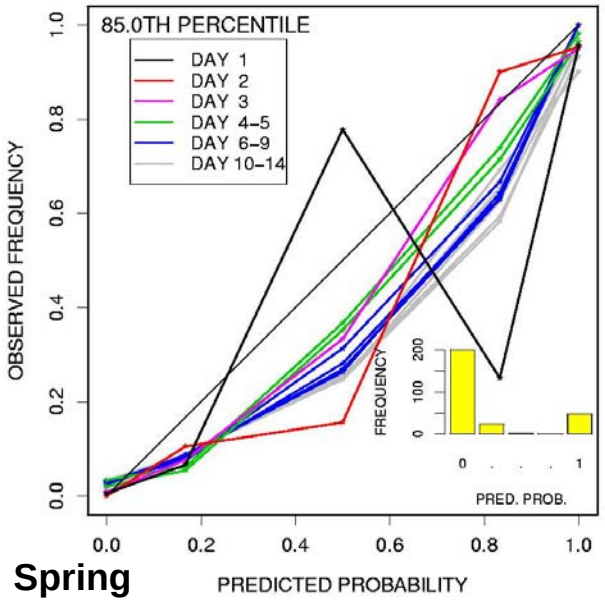
Reliability Diagram (agreement between forecast probability and mean observed frequency) for a range of threshold percentiles for the 24-hr seasonal flow

With 5 bins

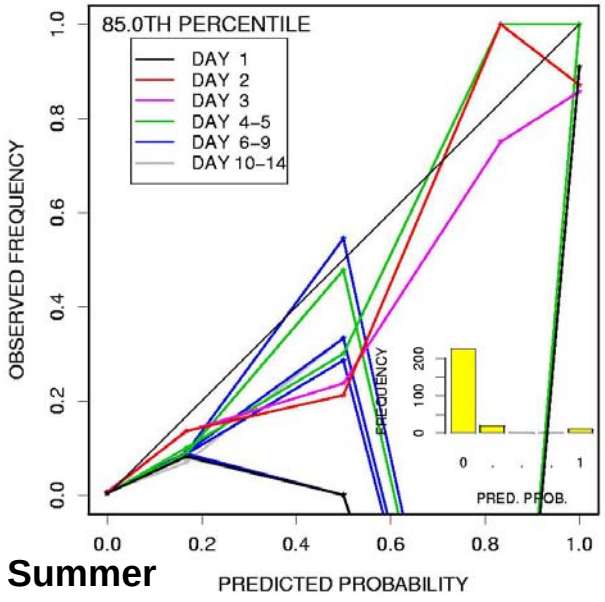
Deviation from diagonal gives conditional bias



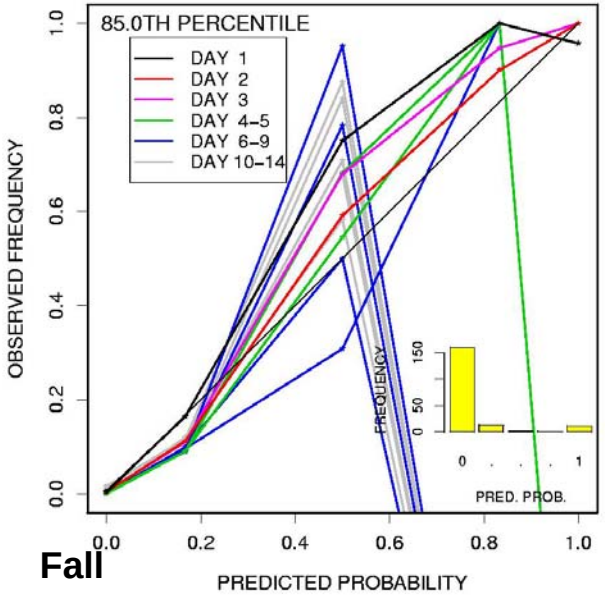
Winter



Spring



Summer



Fall

Reference flow: simulated

Reliability Statistics

Reliability Diagram (agreement between forecast probability and mean observed frequency) for a range of threshold percentiles for the 24-hr seasonal flow

With 5 bins

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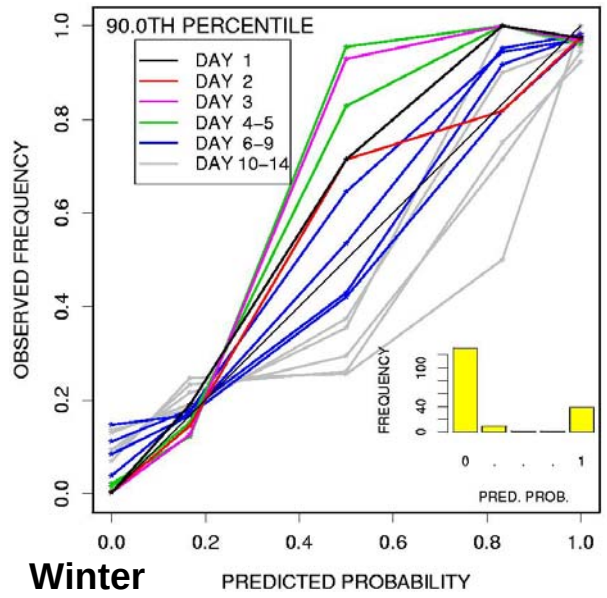
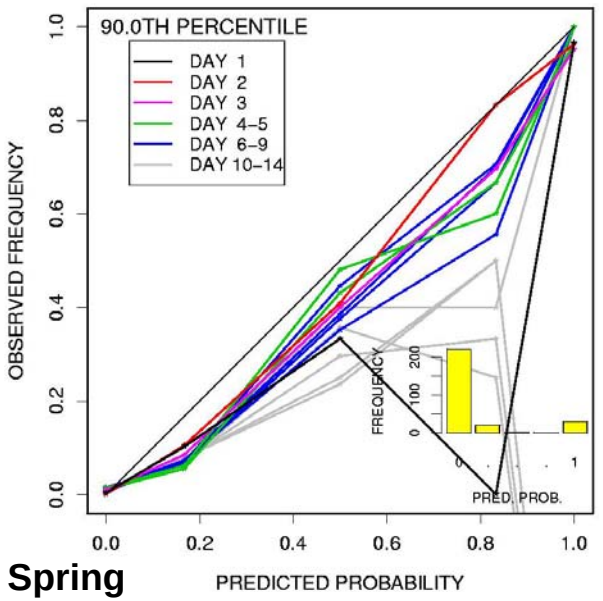
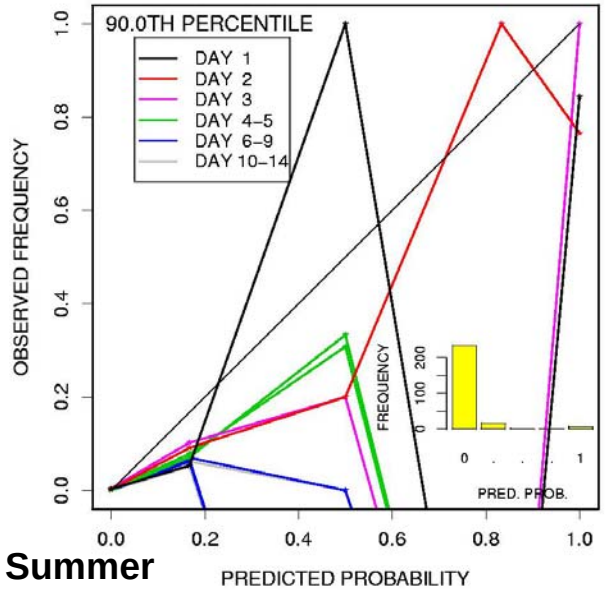


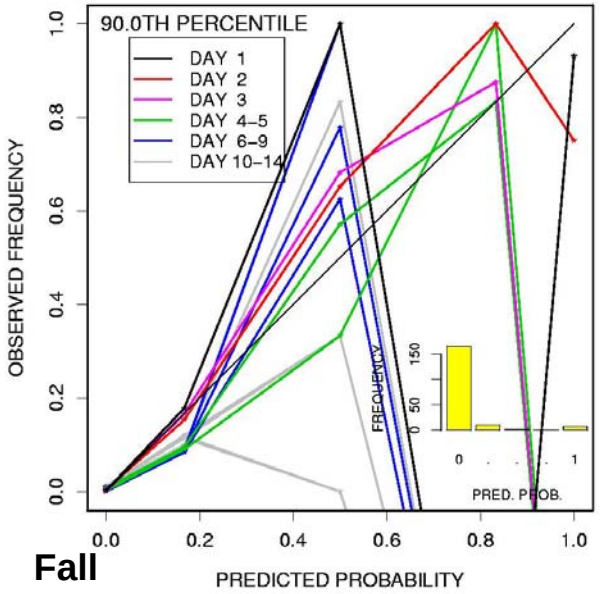
Winter



Spring



Summer



Fall

Reference flow: simulated

Reliability Statistics

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With 5 bins

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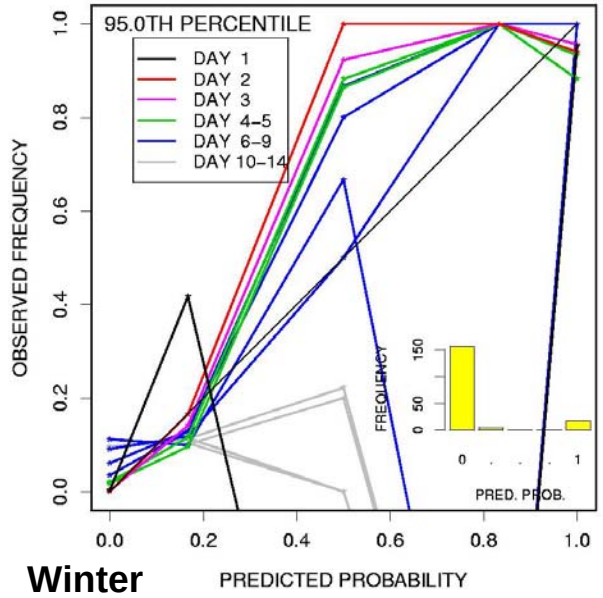
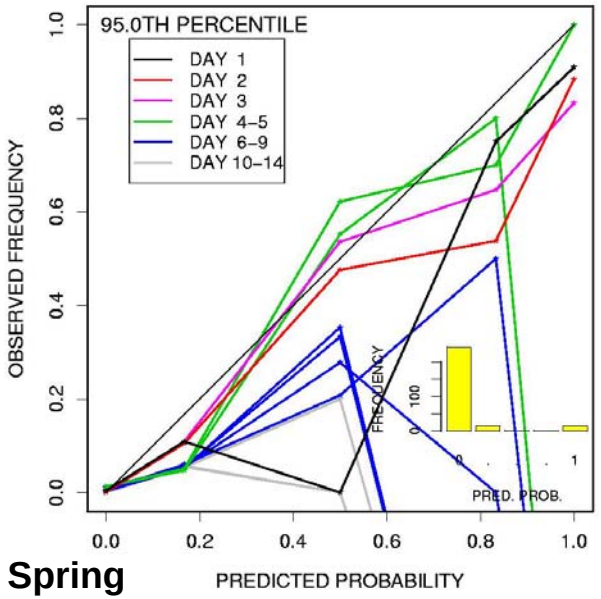
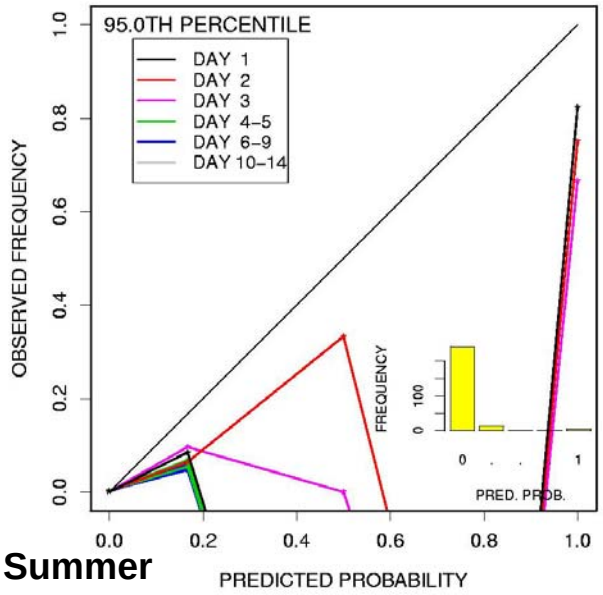


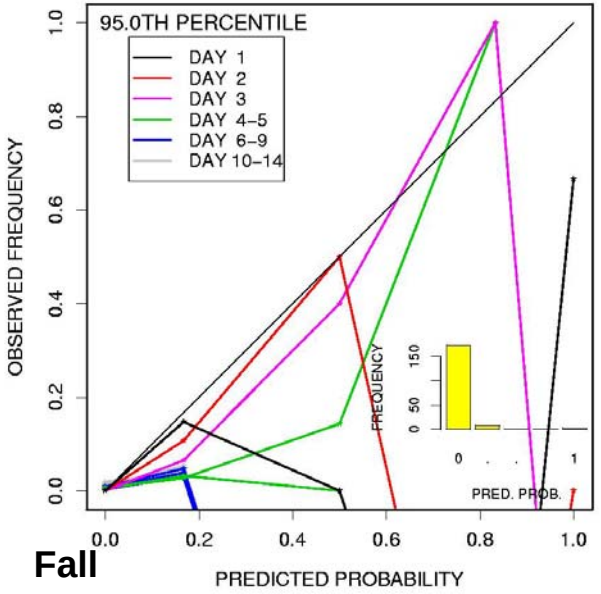
Winter



Spring



Summer



Fall

Reference flow: simulated

ROC statistics

- Annual results with observed and simulated flows

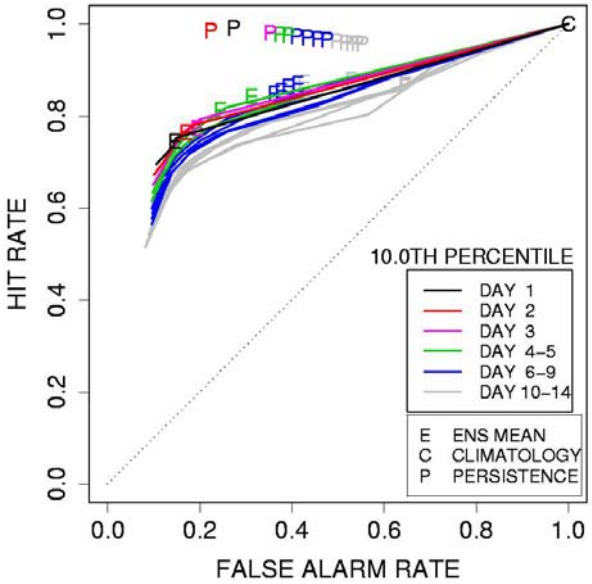
- Threshold values:

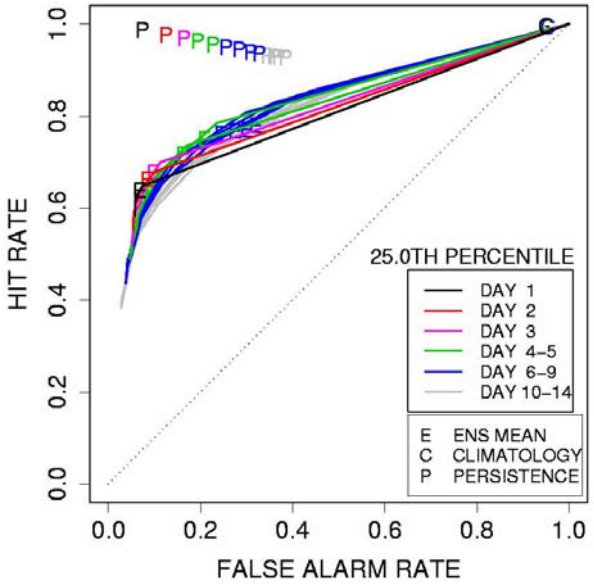
10%, 25%, 50%, 75%, 85%, 90%, 95%, 97.5%

- ROC diagram with 10 points

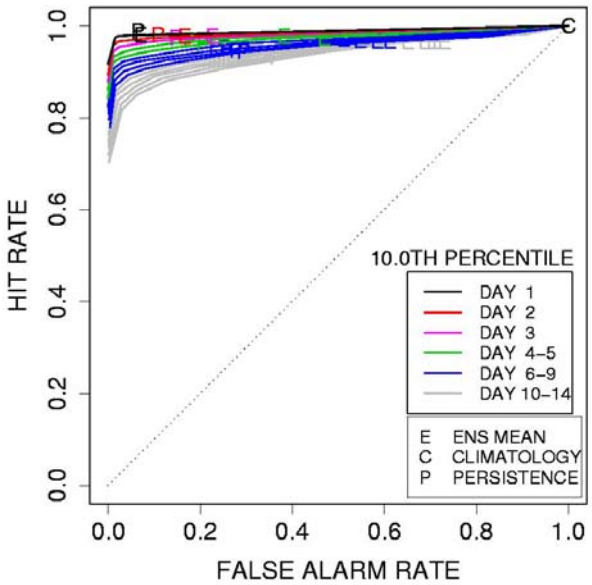
ROC Statistics

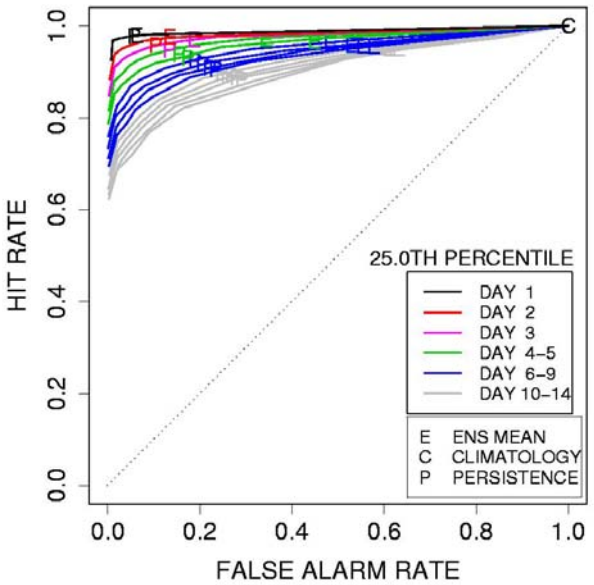
ROC
(ability of forecast to discriminate between events & non-events) for a range of threshold percentiles for the 24-hr annual flow





Reference flow: observed



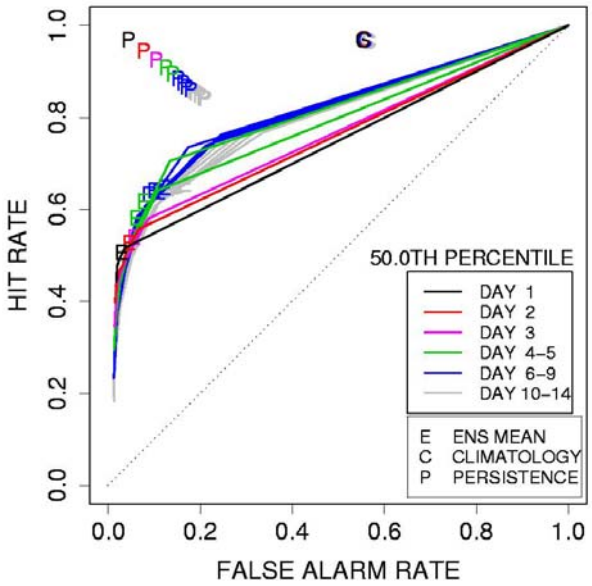


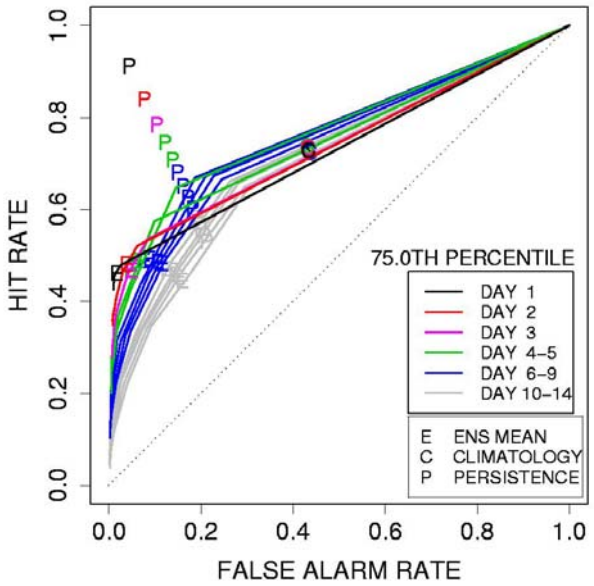
Reference flow: simulated

Perfect scores:
HR = 1 and FAR = 0

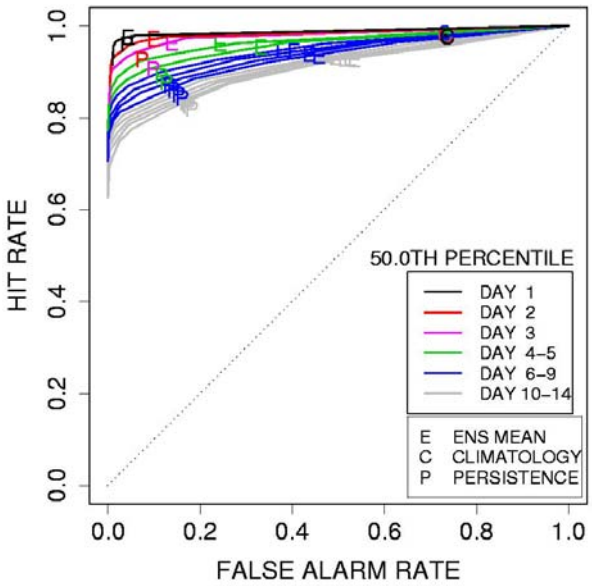
ROC Statistics

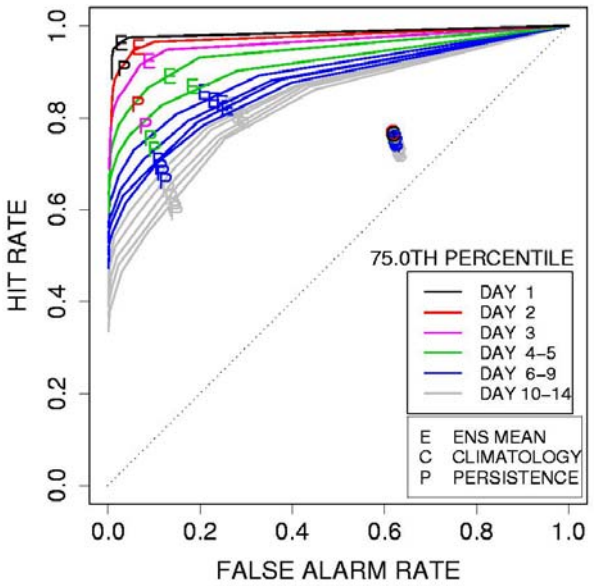
ROC
(ability of forecast to discriminate between events & non-events) for a range of threshold percentiles for the 24-hr annual flow





Reference flow: observed



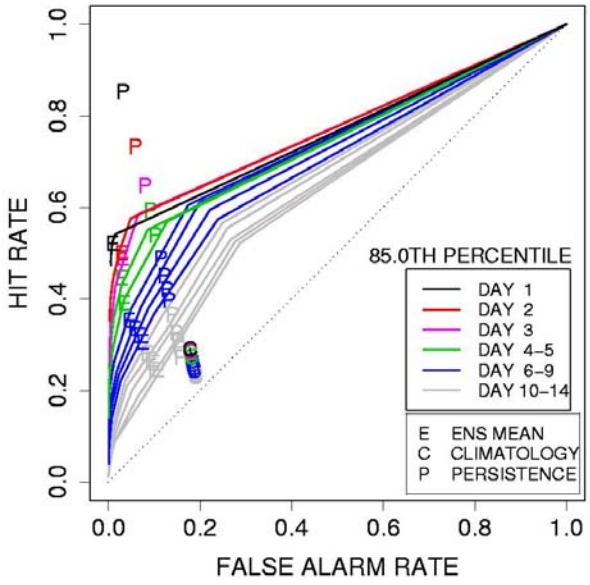


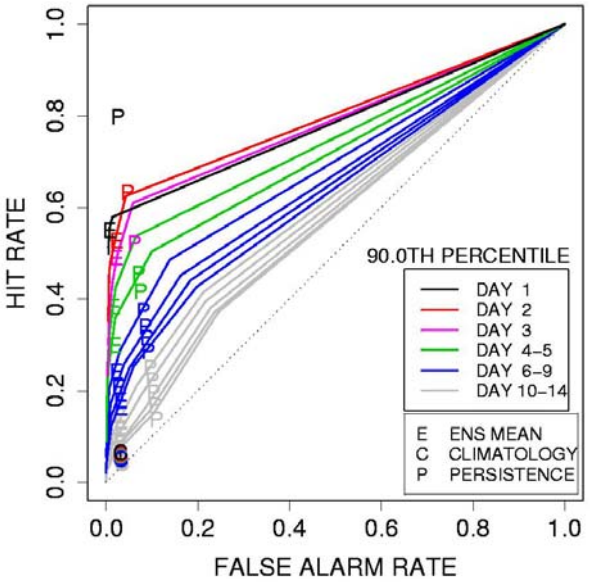
Reference flow: simulated

Perfect scores:
HR = 1 and FAR = 0

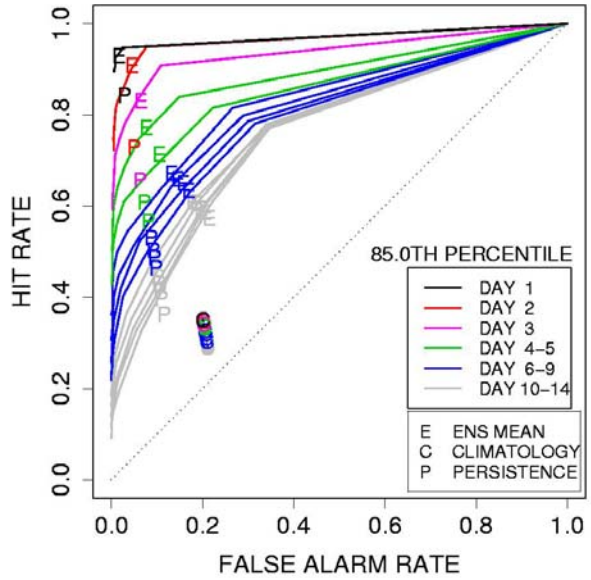
ROC Statistics

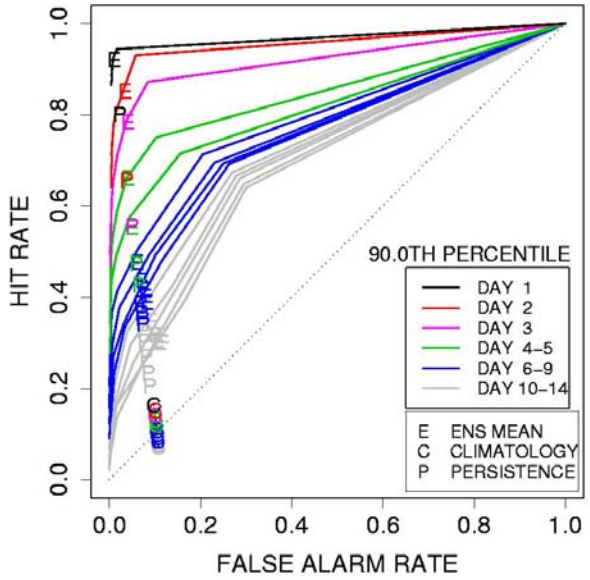
ROC
(ability of forecast to discriminate between events & non-events) for a range of threshold percentiles for the 24-hr annual flow





Reference flow: observed



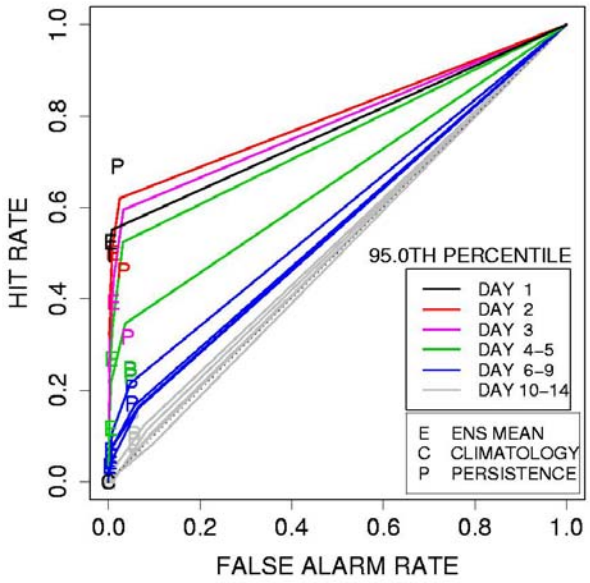


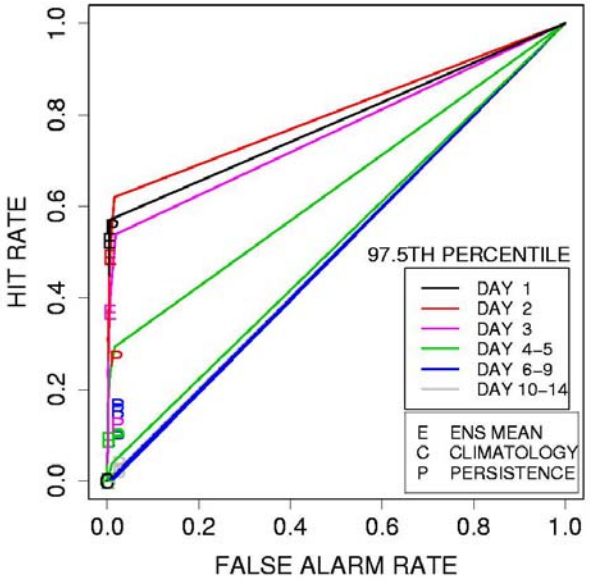
Reference flow: simulated

Perfect scores:
HR = 1 and FAR = 0

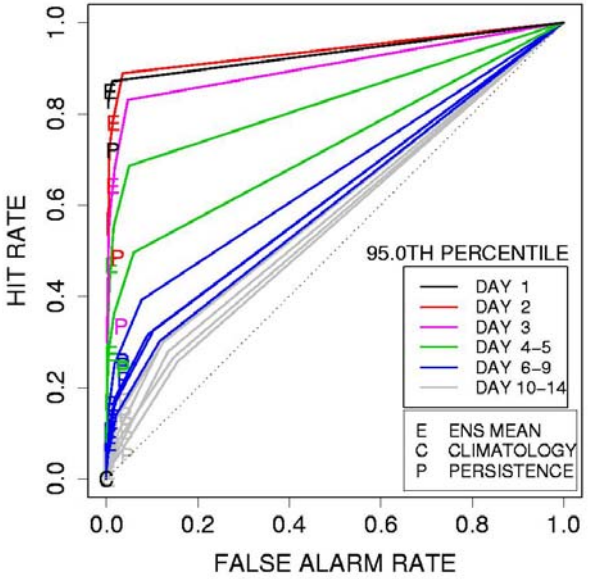
ROC Statistics

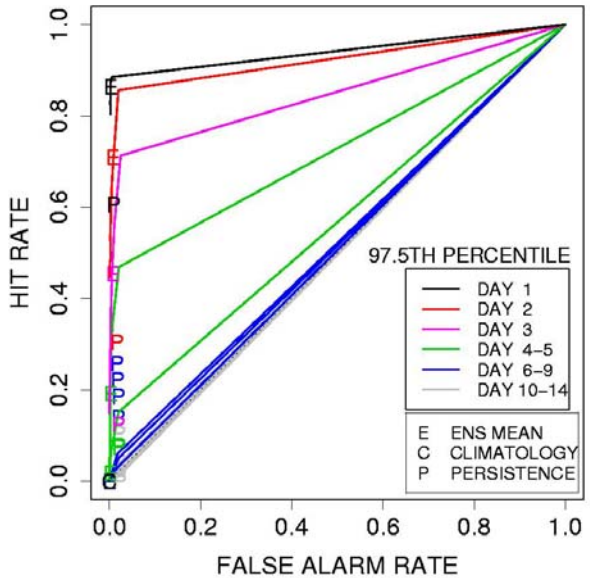
ROC
(ability of forecast to discriminate between events & non-events) for a range of threshold percentiles for the 24-hr annual flow





Reference flow: observed





Reference flow: simulated

Perfect scores:
HR = 1 and FAR = 0

ROC statistics

- Seasonal results with simulated flows:
  - Winter: December - February
  - Spring: March - May
  - Summer: June - August
  - Fall: September - November

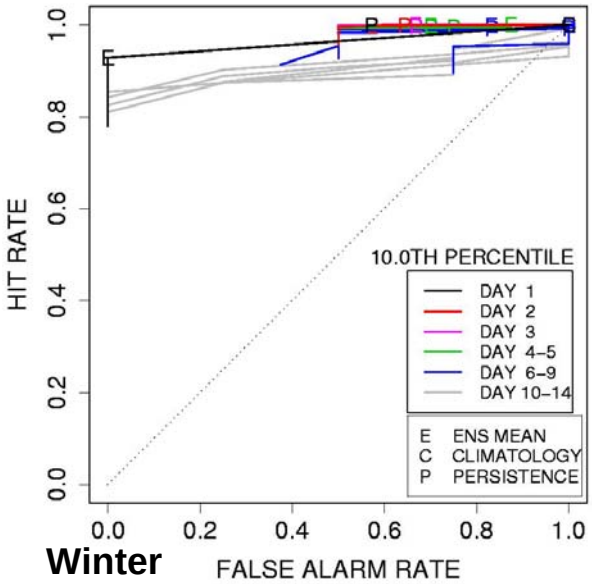
- Threshold values:

10%, 25%, 50%, 75%, 85%, 90%, 95%

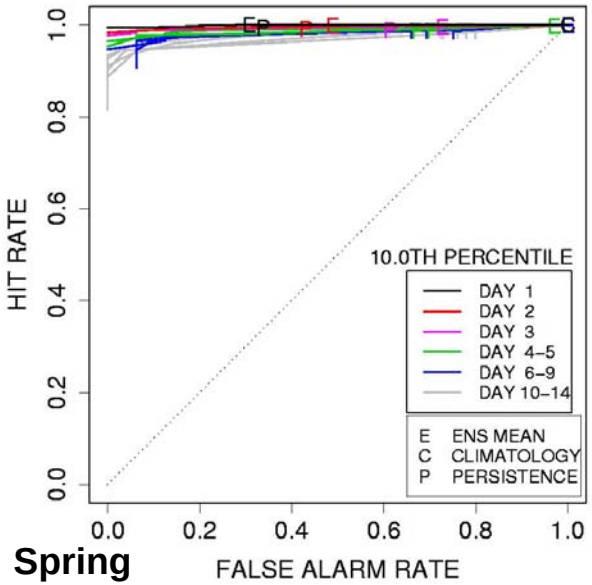
- ROC diagram with 10 points

ROC Statistics

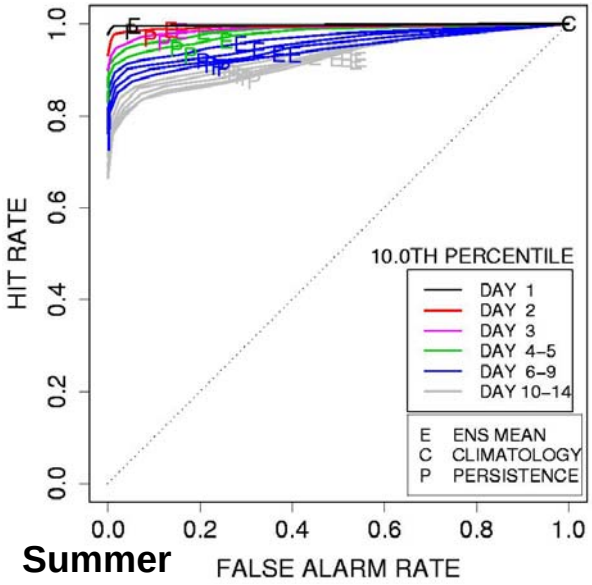
ROC
(ability of forecast to discriminate between events & non-events) for a range of threshold percentiles for the 24-hr seasonal flow



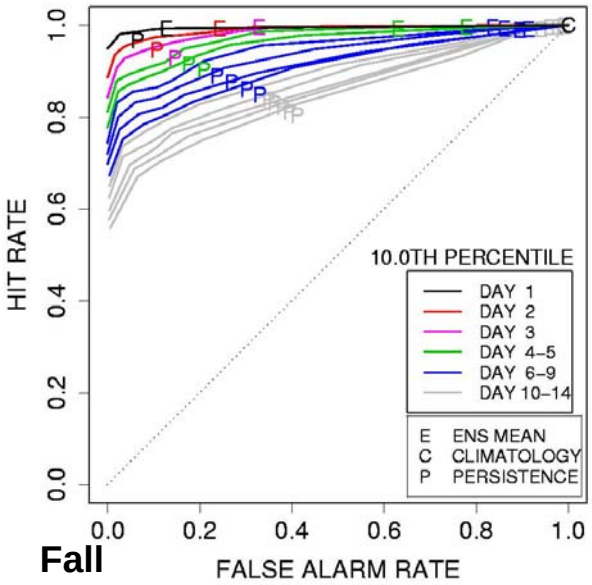
Winter



Spring



Summer



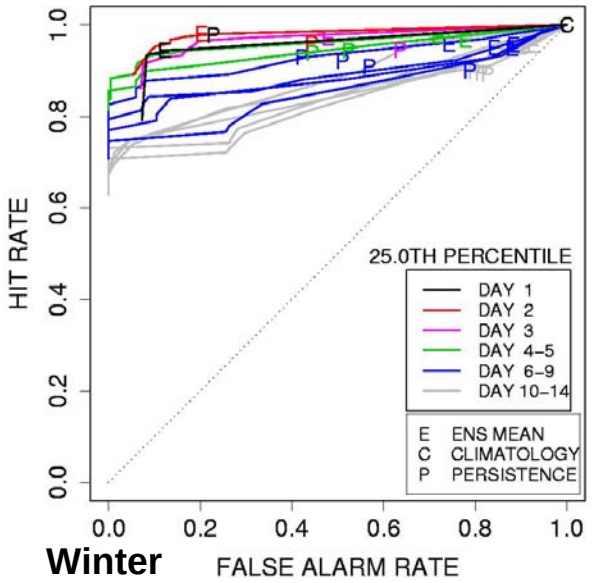
Fall

Perfect scores:
HR = 1 and FAR = 0

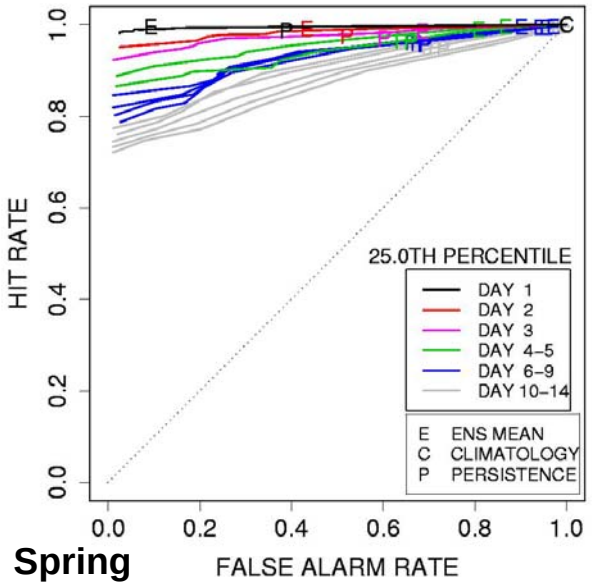
Reference flow: simulated

ROC Statistics

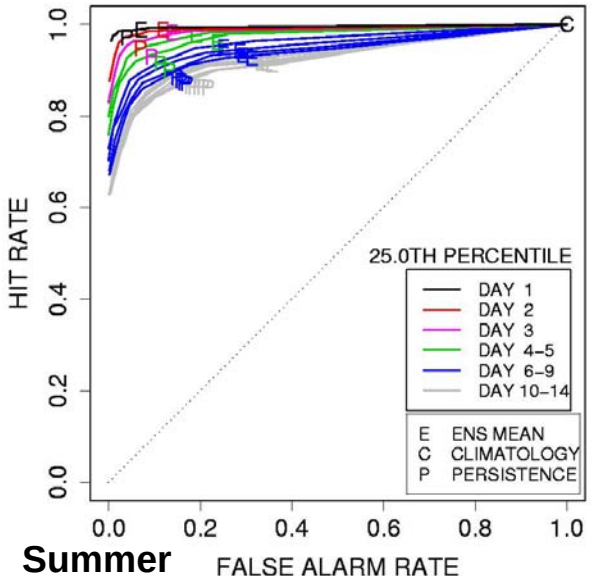
ROC
(ability of forecast to discriminate between events & non-events) for a range of threshold percentiles for the 24-hr seasonal flow



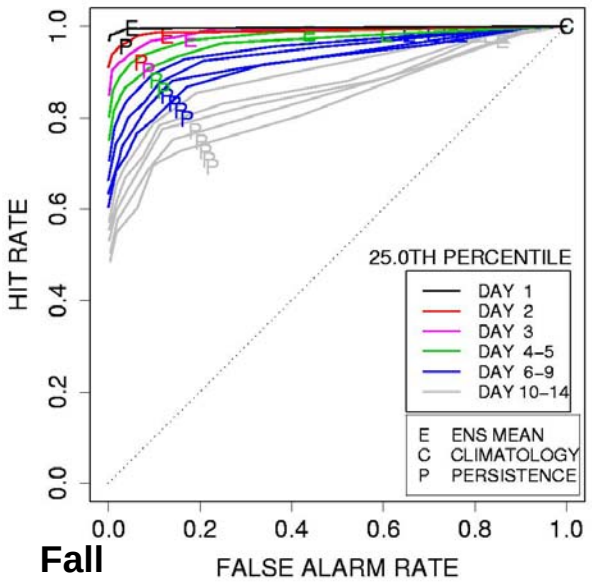
Winter



Spring



Summer



Fall

Perfect scores:
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Reference flow: simulated

ROC Statistics

ROC
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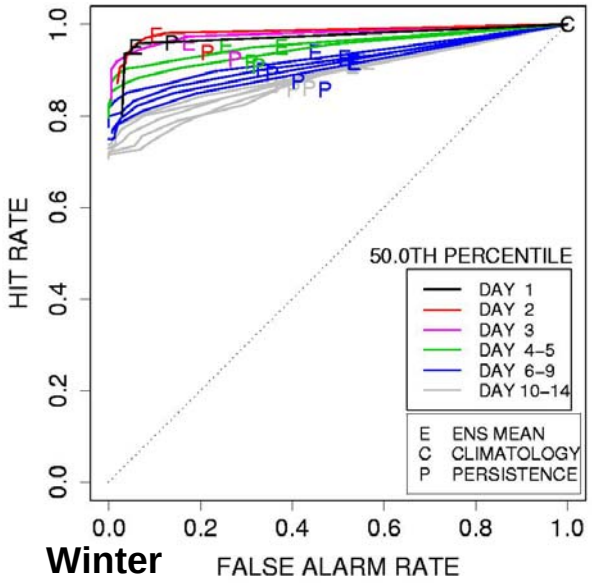
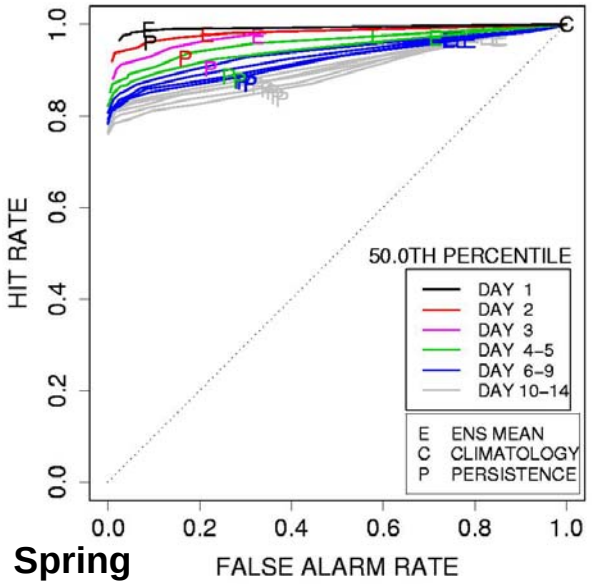
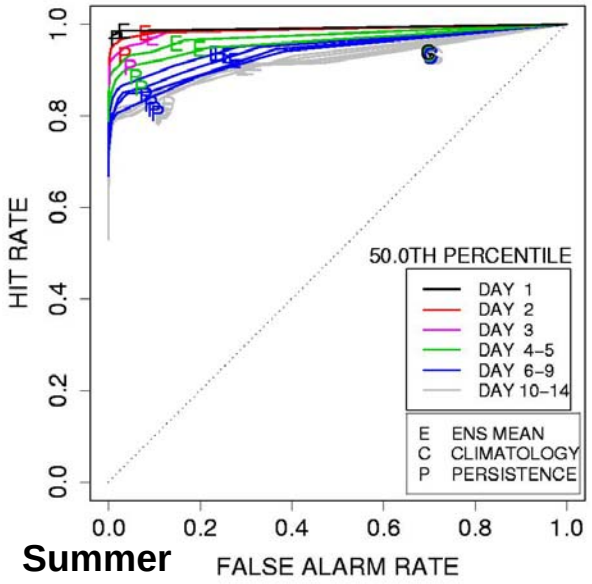


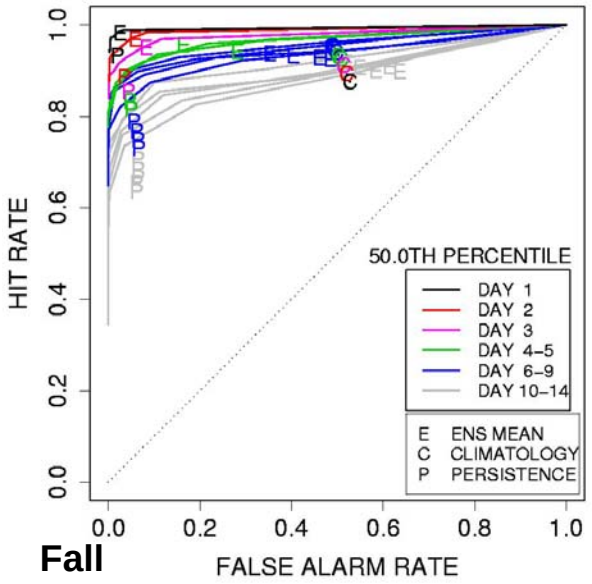
Winter



Spring



Summer



Fall

Perfect scores:
HR = 1 and FAR = 0

Reference flow: simulated

ROC Statistics

ROC
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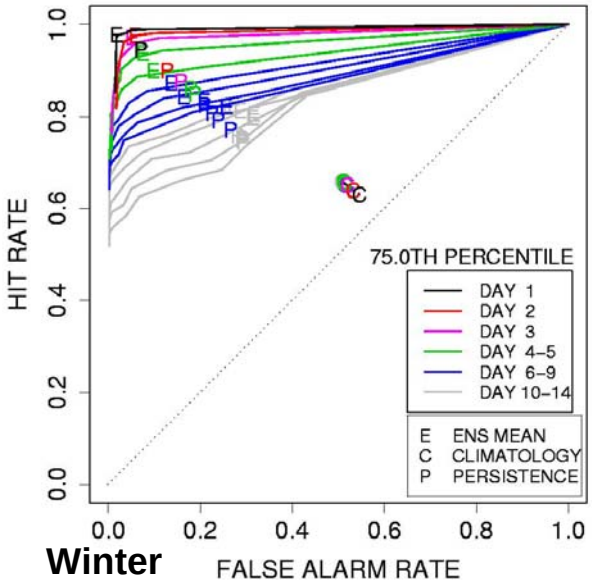
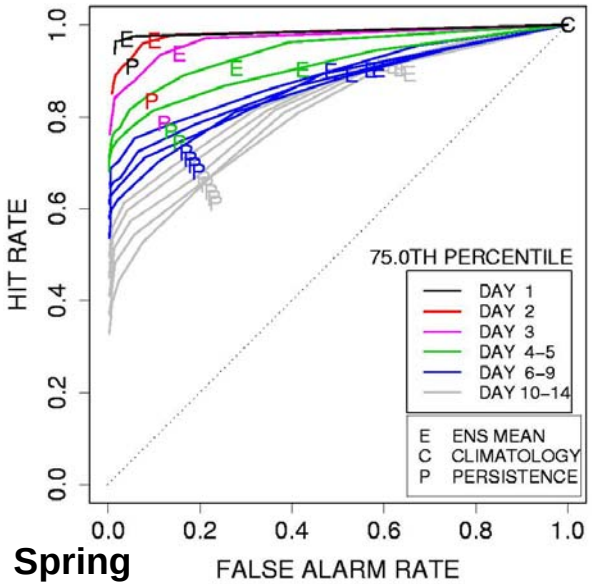
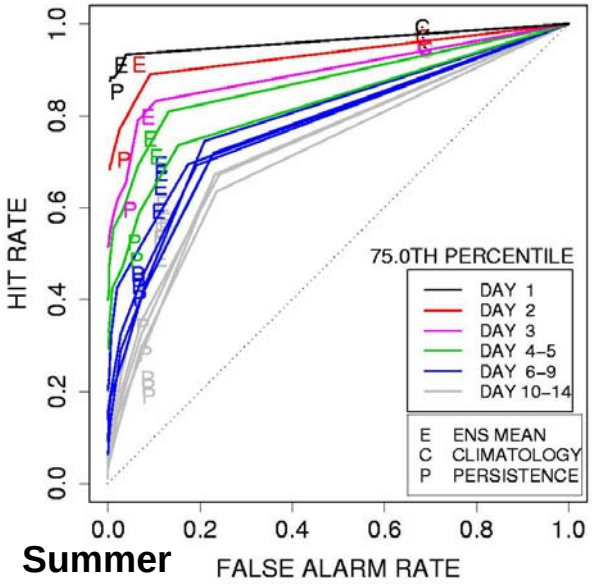


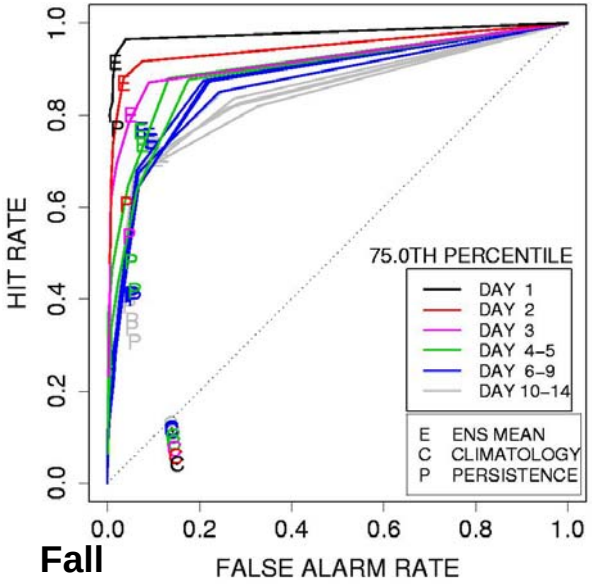
Winter



Spring



Summer



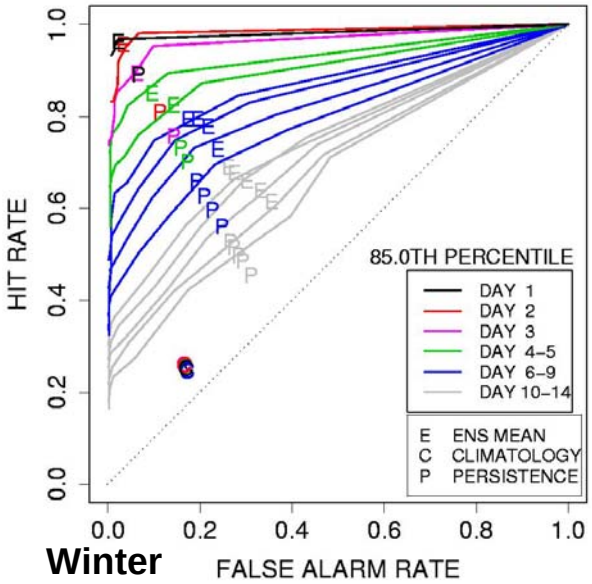
Fall

Perfect scores:
HR = 1 and FAR = 0

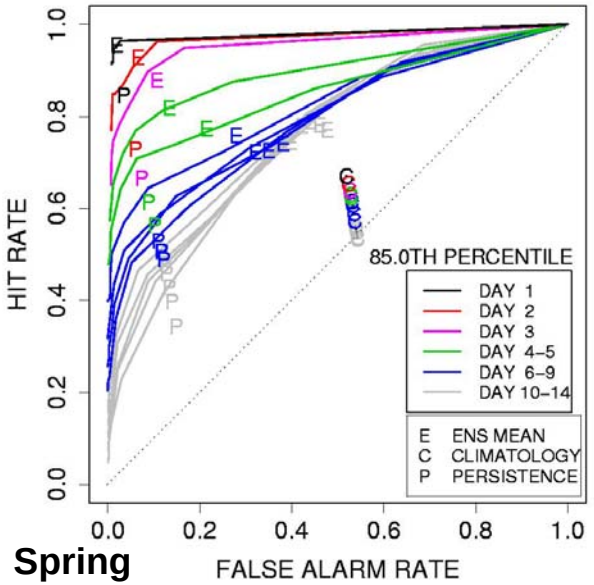
Reference flow: simulated

ROC Statistics

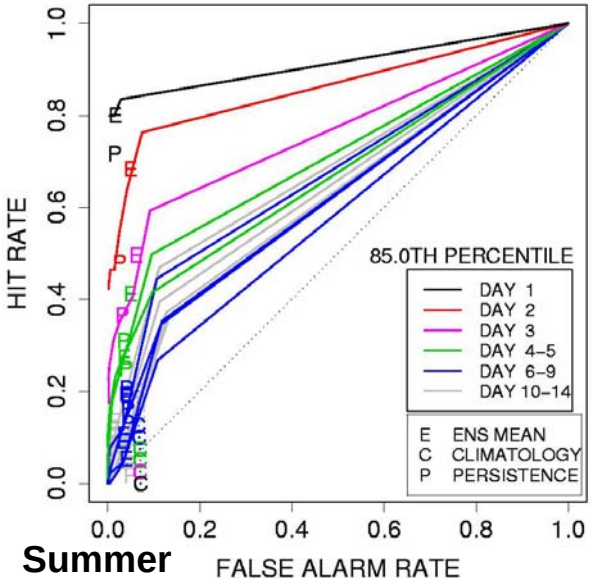
ROC
(ability of forecast to discriminate between events & non-events) for a range of threshold percentiles for the 24-hr seasonal flow



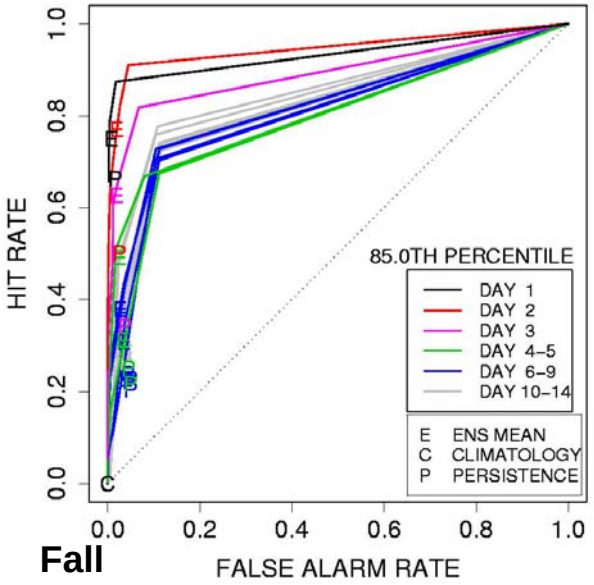
Winter



Spring



Summer



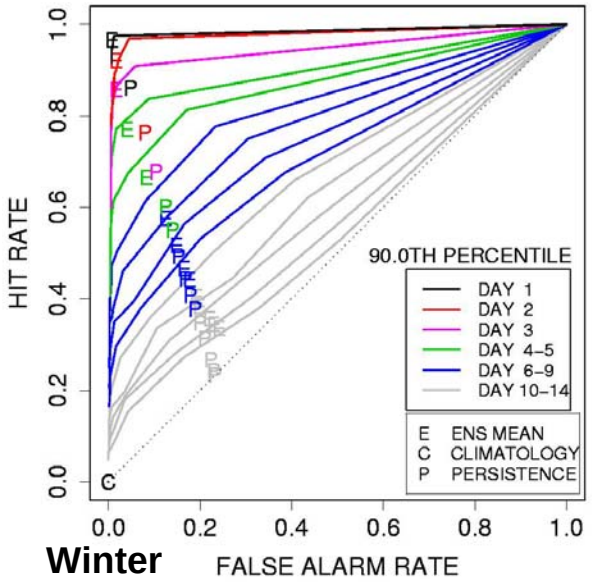
Fall

Perfect scores:
HR = 1 and FAR = 0

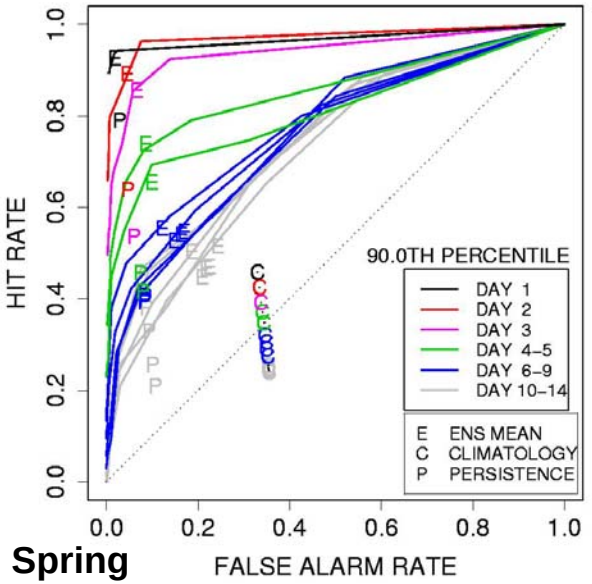
Reference flow: simulated

ROC Statistics

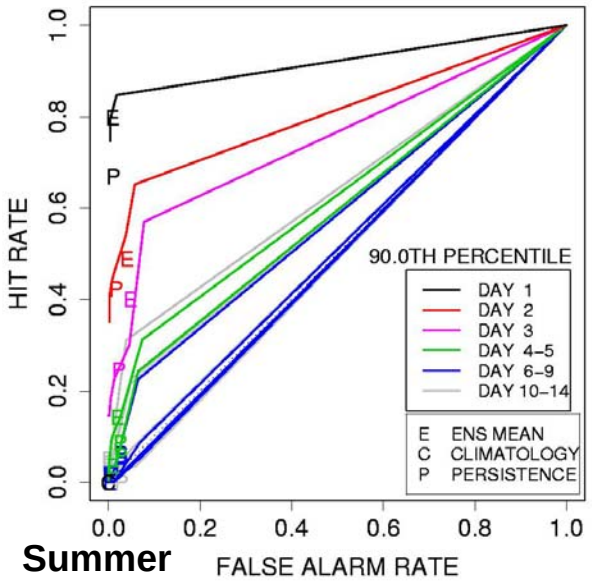
ROC
(ability of forecast to discriminate between events & non-events) for a range of threshold percentiles for the 24-hr seasonal flow



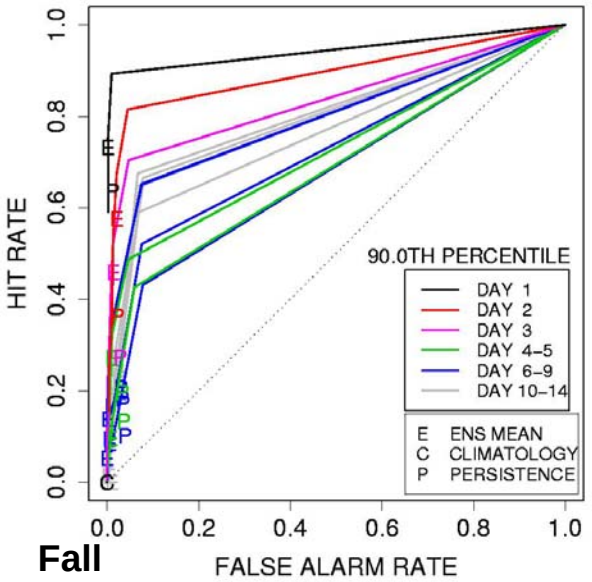
Winter



Spring



Summer



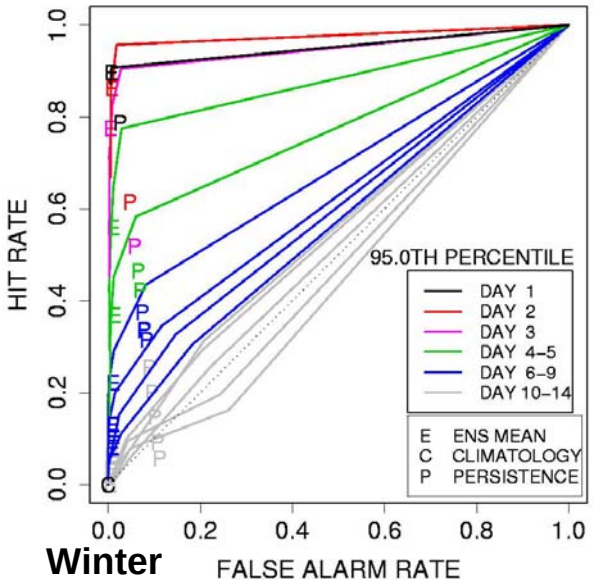
Fall

Perfect scores:
HR = 1 and FAR = 0

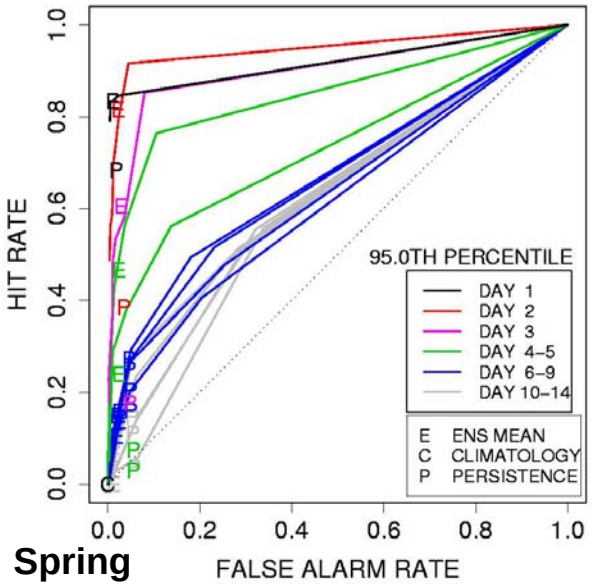
Reference flow: simulated

ROC Statistics

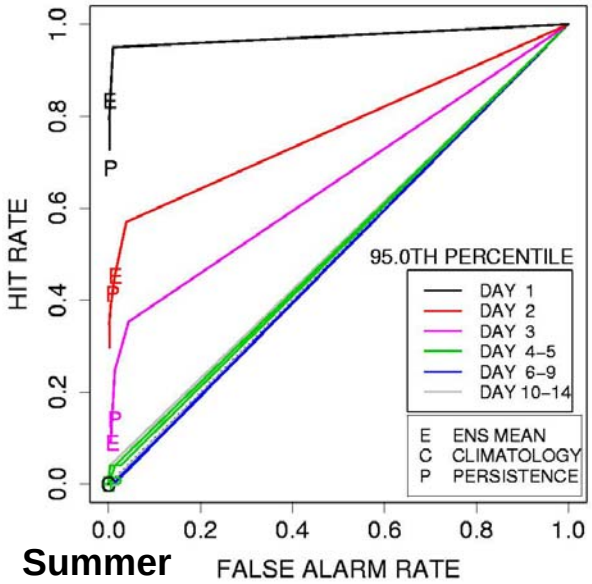
ROC
(ability of forecast to discriminate between events & non-events) for a range of threshold percentiles for the 24-hr seasonal flow



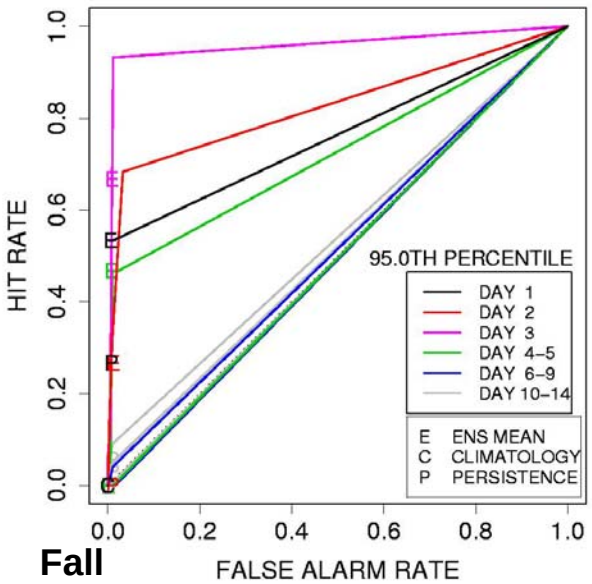
Winter



Spring



Summer



Fall

Perfect scores:
HR = 1 and FAR = 0

Reference flow: simulated