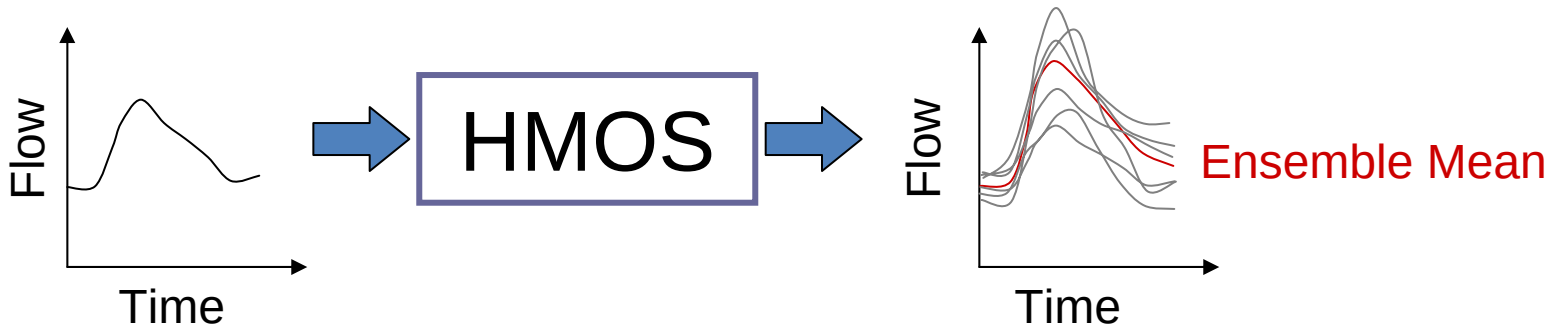
HMOS Verification Exercise

Julie Demargne and James Brown

Data provided by Satish Regonda

HMOS Verification

- HMOS ingests operational single-valued flow forecasts to generate flow ensembles accounting for all forecast uncertainties



Comparison of:

- 6-hr single-valued flow forecasts (HMOS inputs)
- 6-hr ensemble mean flow forecasts and ensemble forecasts (HMOS outputs)

Results from HMOS prototype for QUAO2 basin in ABRFC from July 1997 to Oct. 2008 (w/ missing periods) for 5 lead days

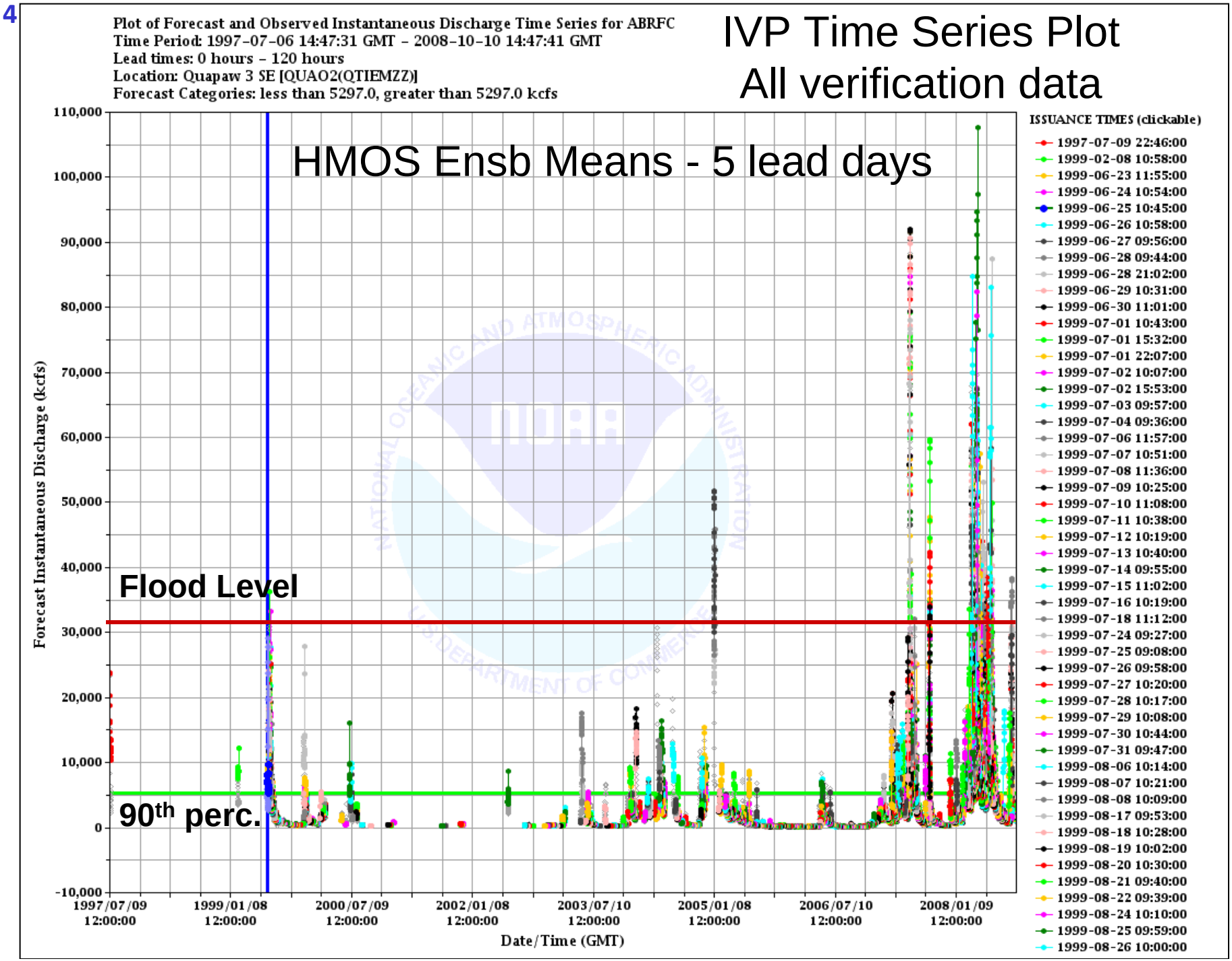
HMOS Verification

- IVP verification:
  - Single-valued flow forecasts
  - Ensemble mean flow forecasts
  - Persistence forecasts

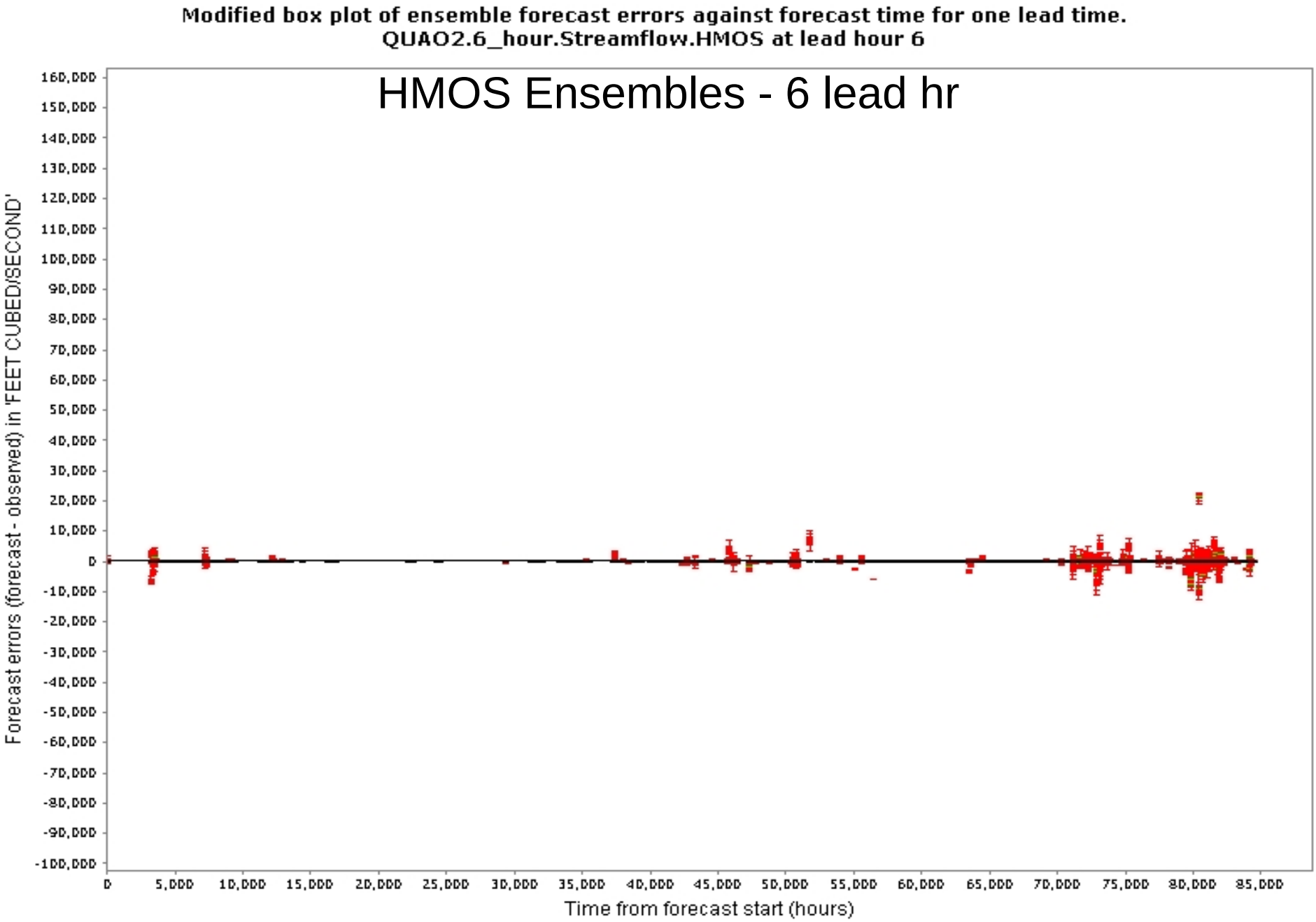
- EVS verification:
  - Ensemble flow forecasts
  - Ensemble mean flow forecasts

- Conditional statistics using 2 thresholds:
  - Flood level: 32,100 cfs
  - 90th percentile of observations: 5,297 cfs

IVP Time Series Plot
All verification data

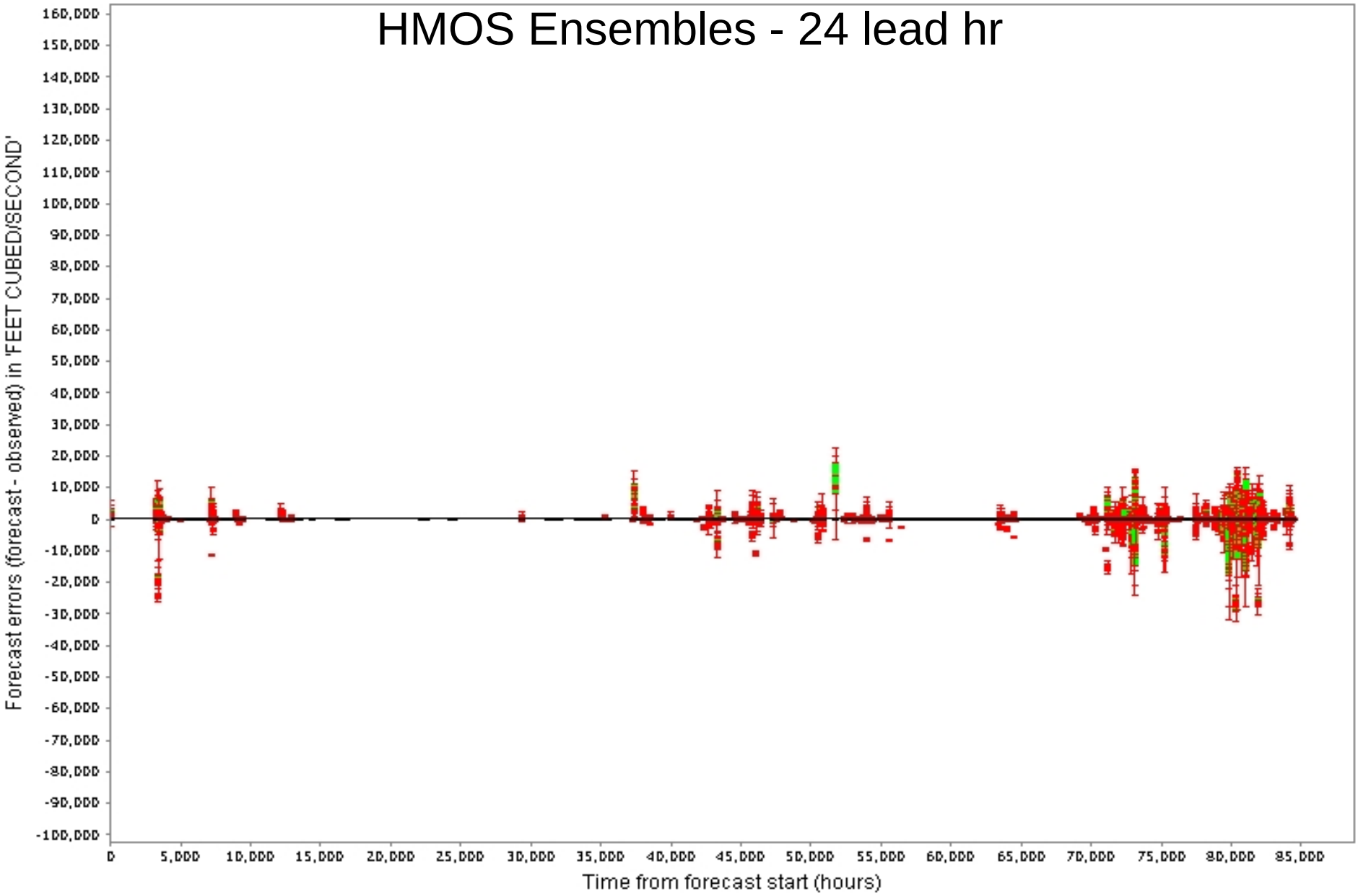


EVS box plots with time



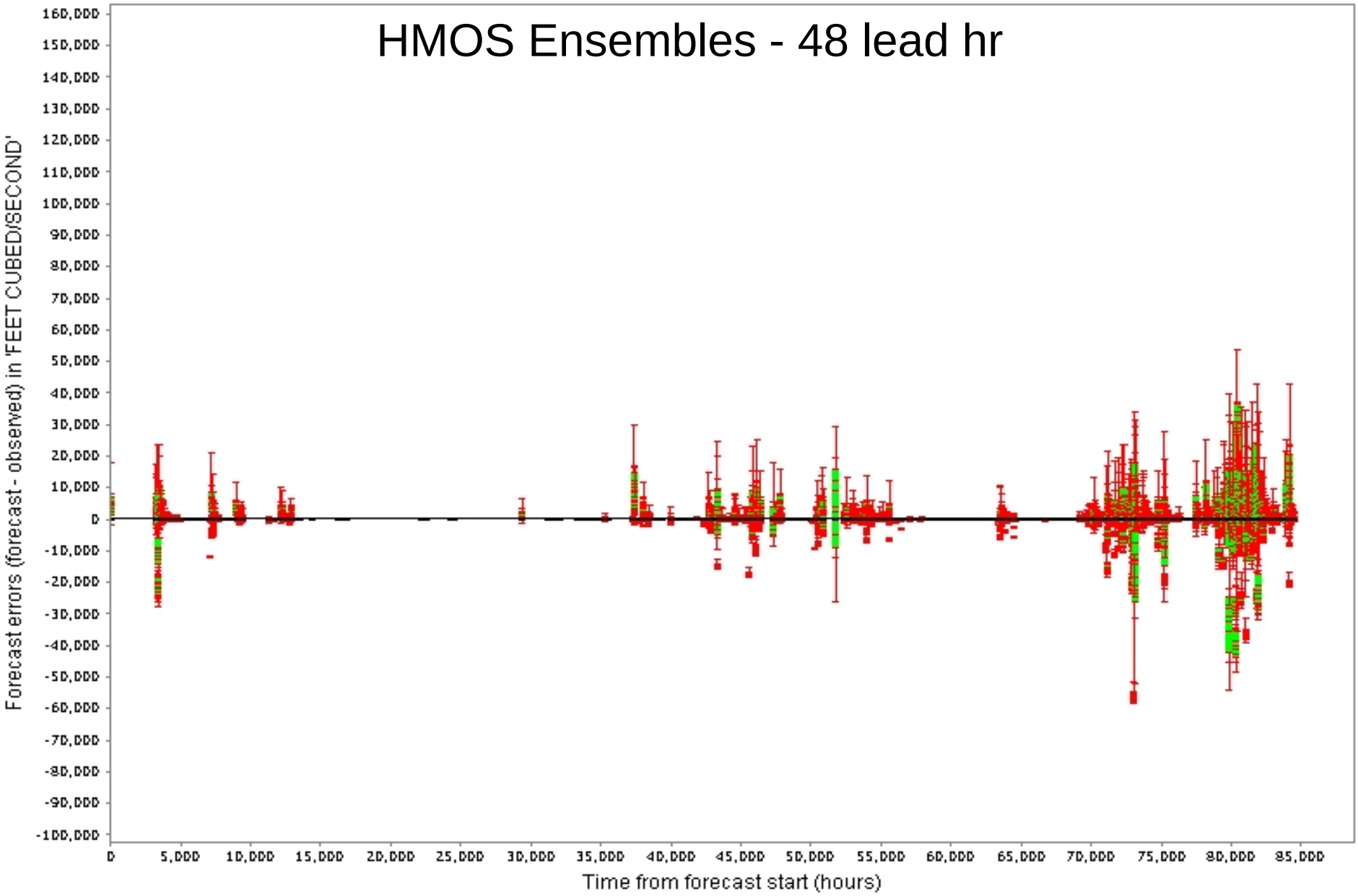
EVS box plots with time

Modified box plot of ensemble forecast errors against forecast time for one lead time.
QUAO2.6_hour.Streamflow.HMOS at lead hour 24



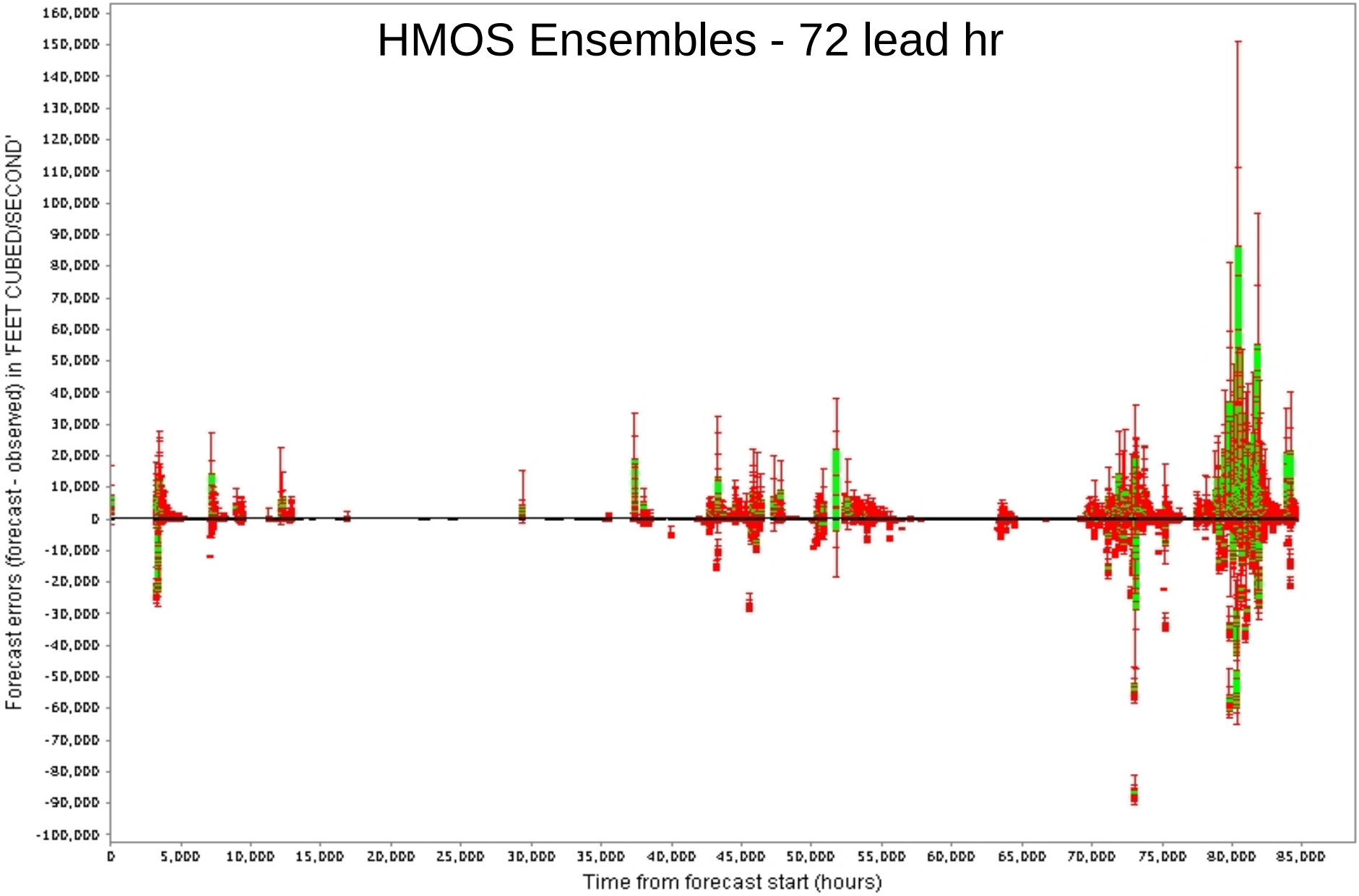
EVS box plots with time

Modified box plot of ensemble forecast errors against forecast time for one lead time.
QUAO2.6_hour.Streamflow.HMOS at lead hour 48



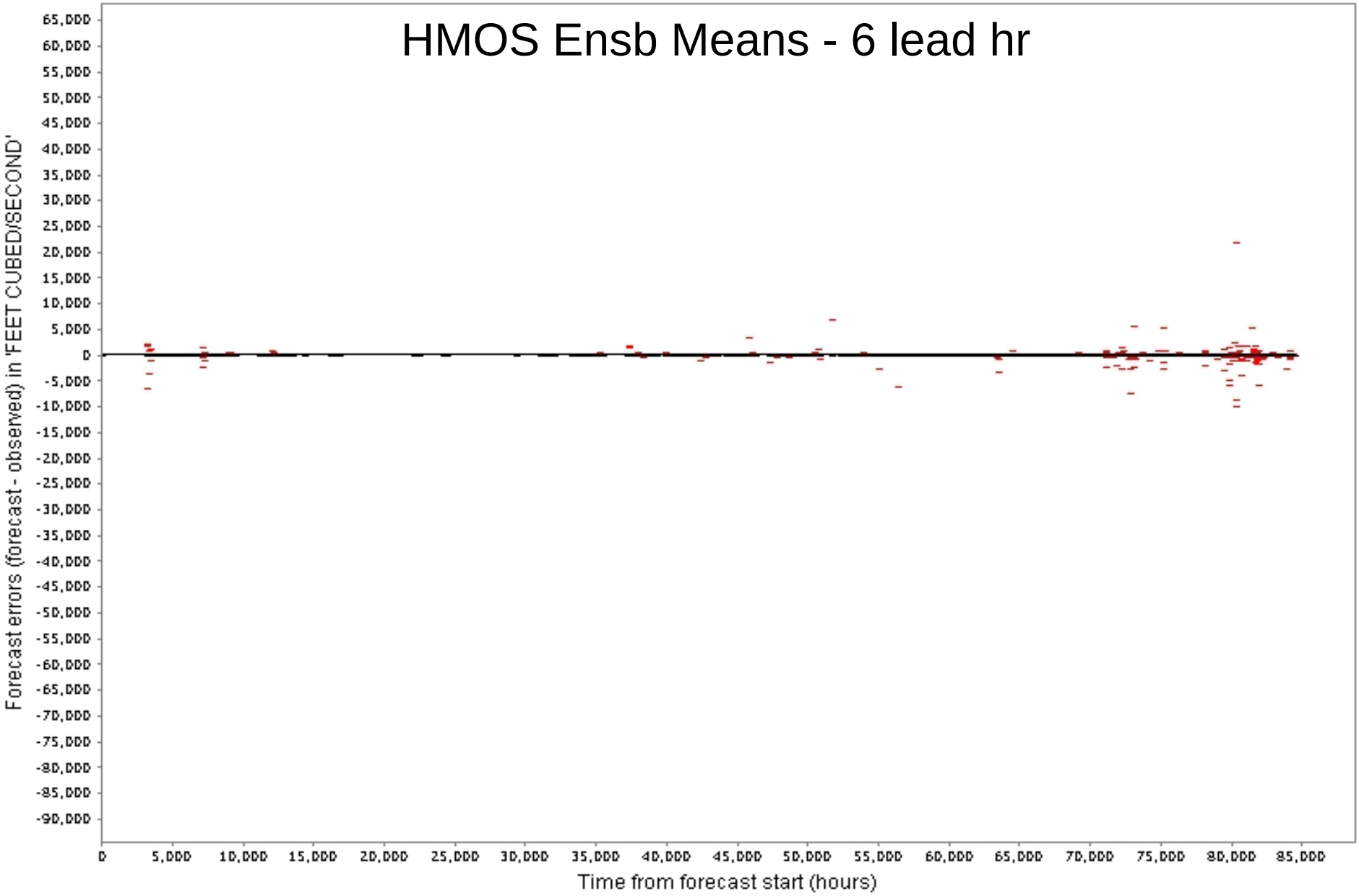
EVS box plots with time

Modified box plot of ensemble forecast errors against forecast time for one lead time.
QUAO2.6_hour.Streamflow.HMOS at lead hour 72



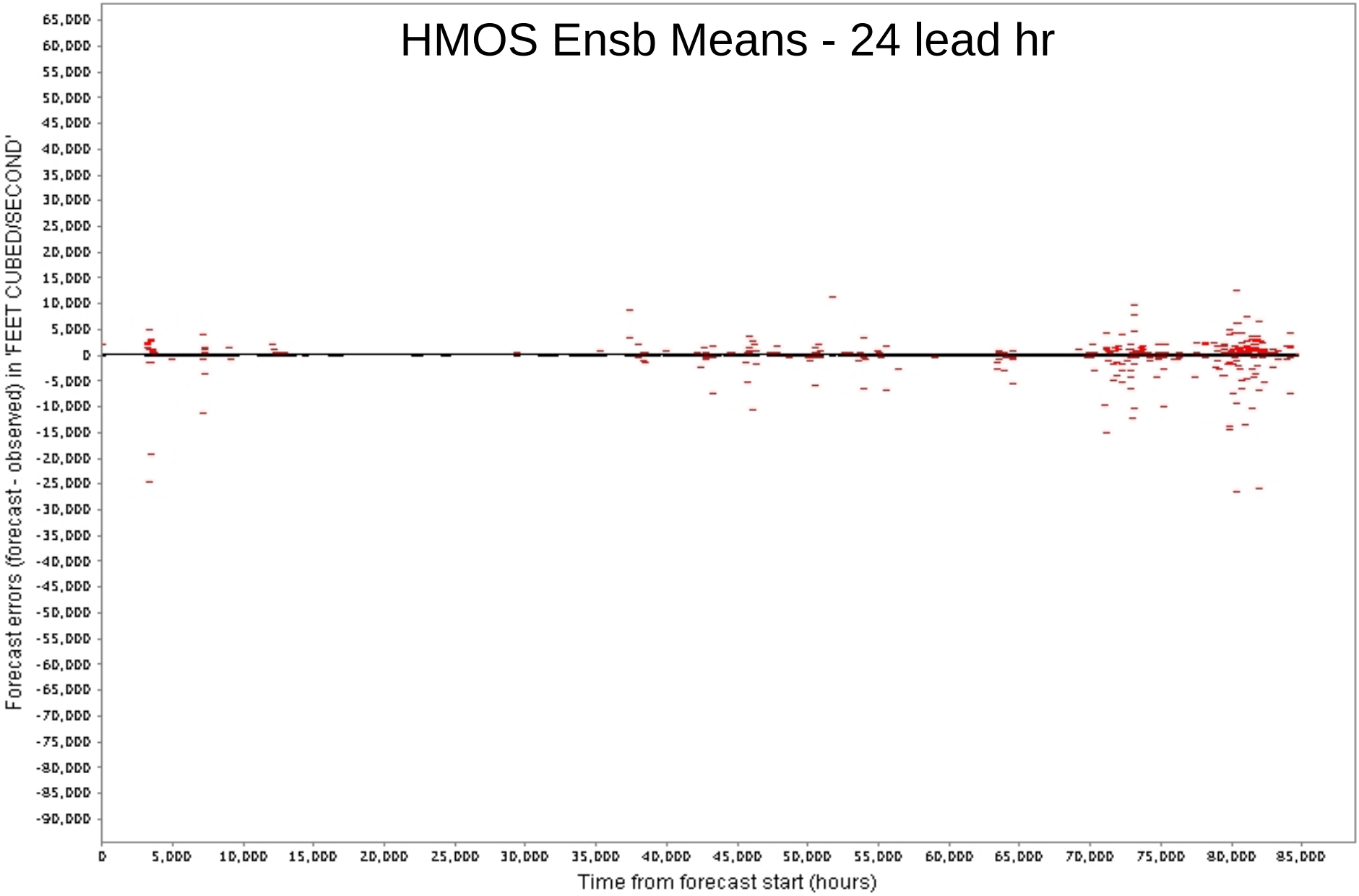
EVS box plots with time

Modified box plot of ensemble forecast errors against forecast time for one lead time.
QUAO2.6_hour.Streamflow.HMOS_mean at lead hour 6

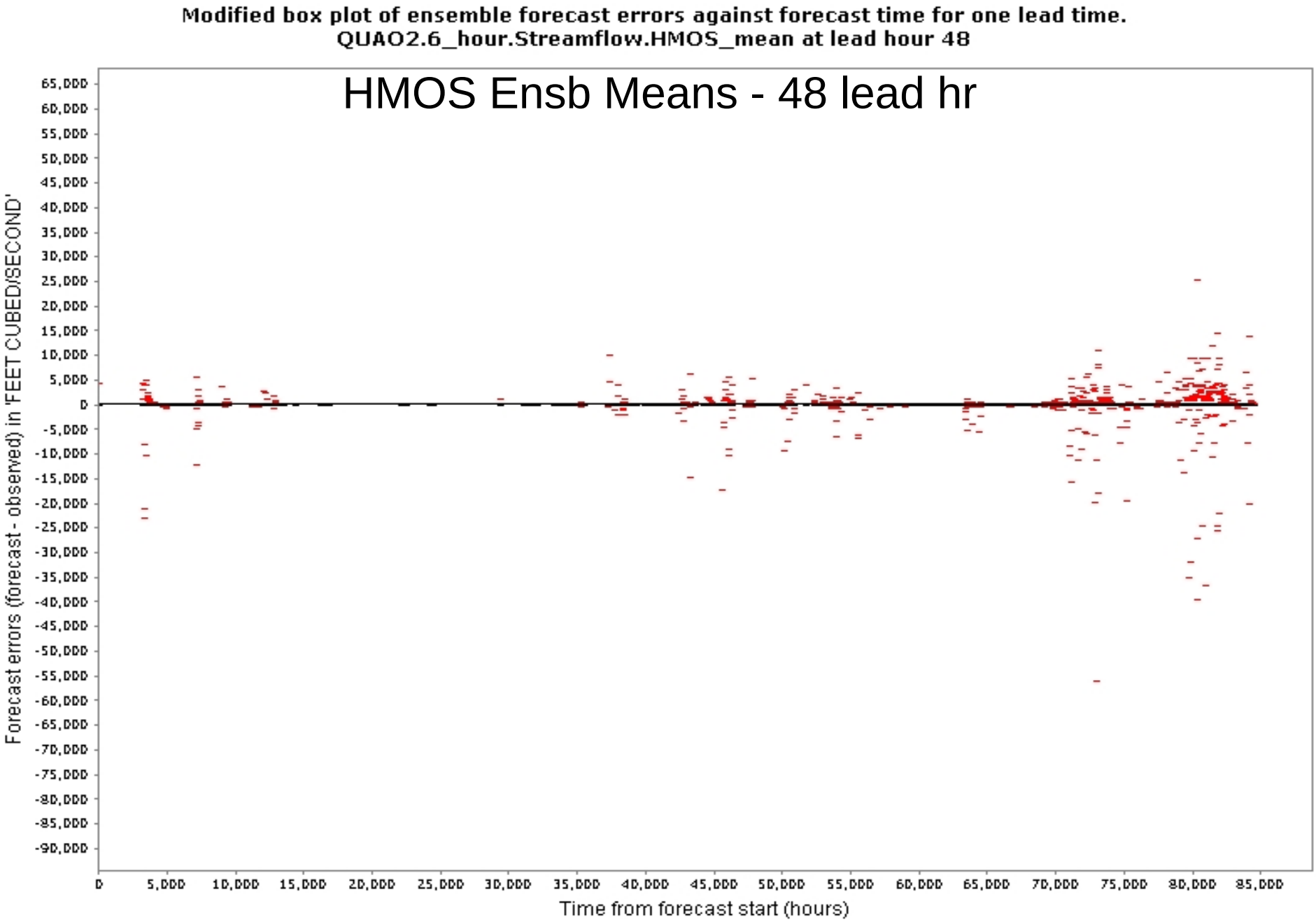


EVS box plots with time

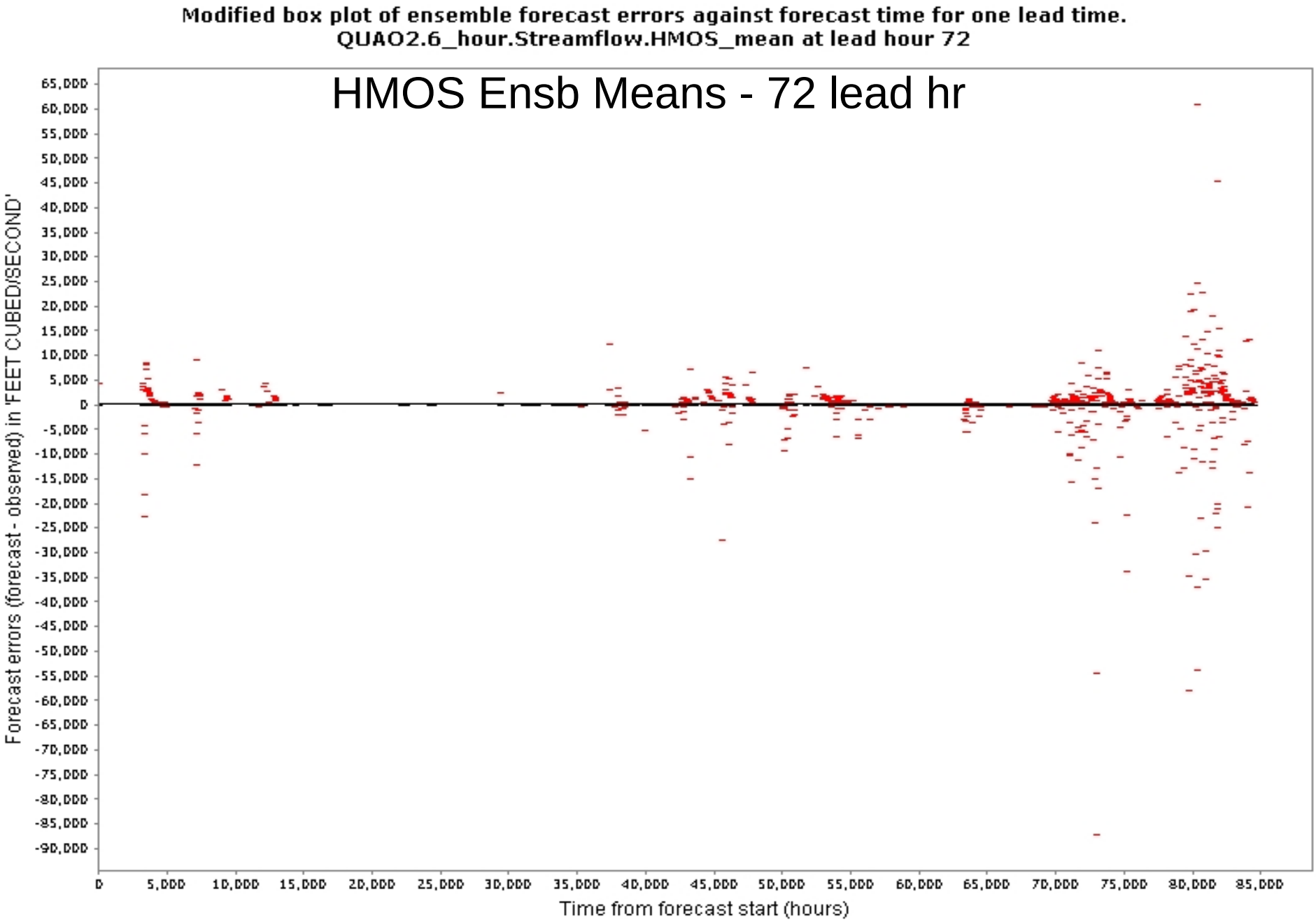
Modified box plot of ensemble forecast errors against forecast time for one lead time.
QUAO2.6_hour.Streamflow.HMOS_mean at lead hour 24



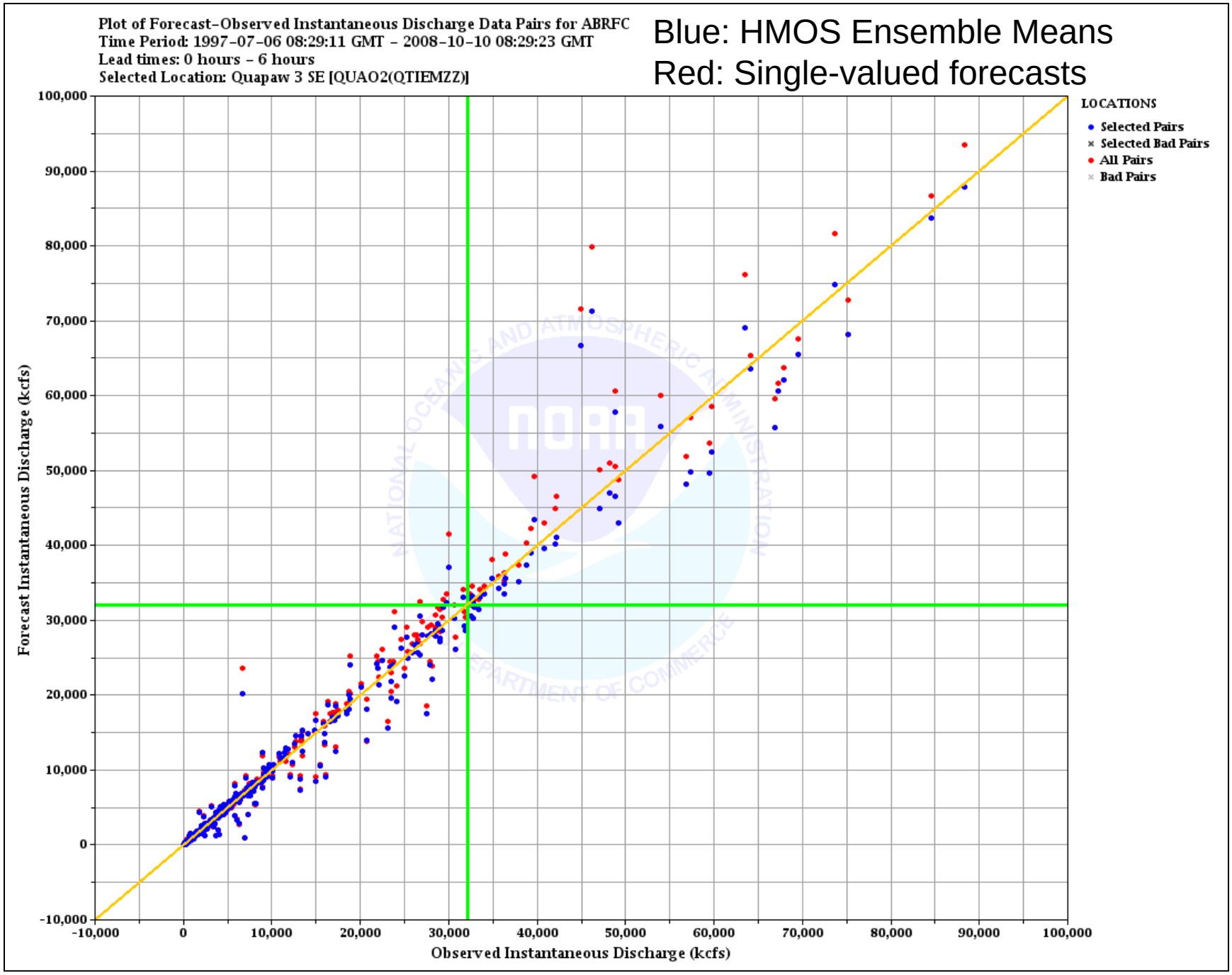
EVS box plots with time



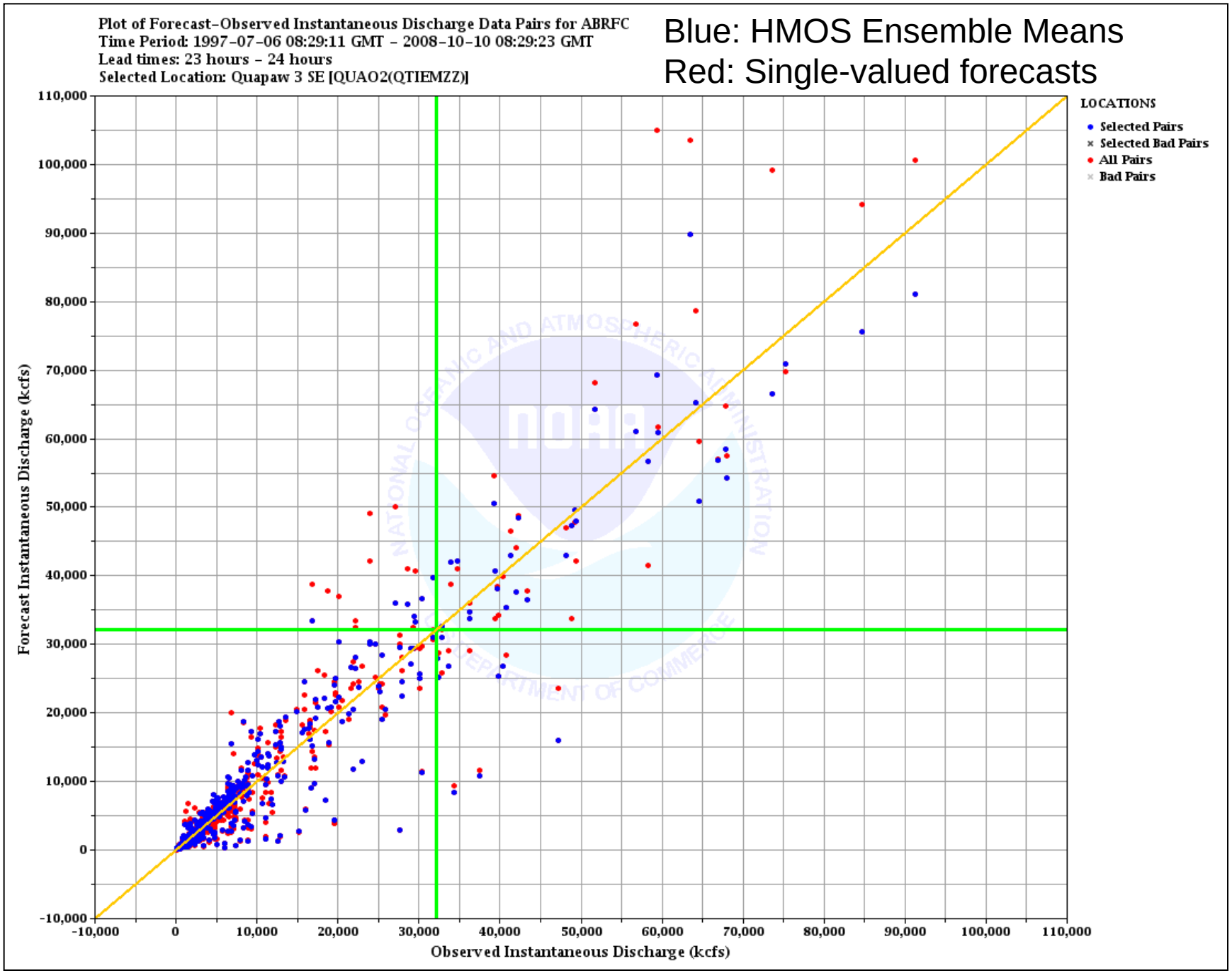
EVS box plots with time



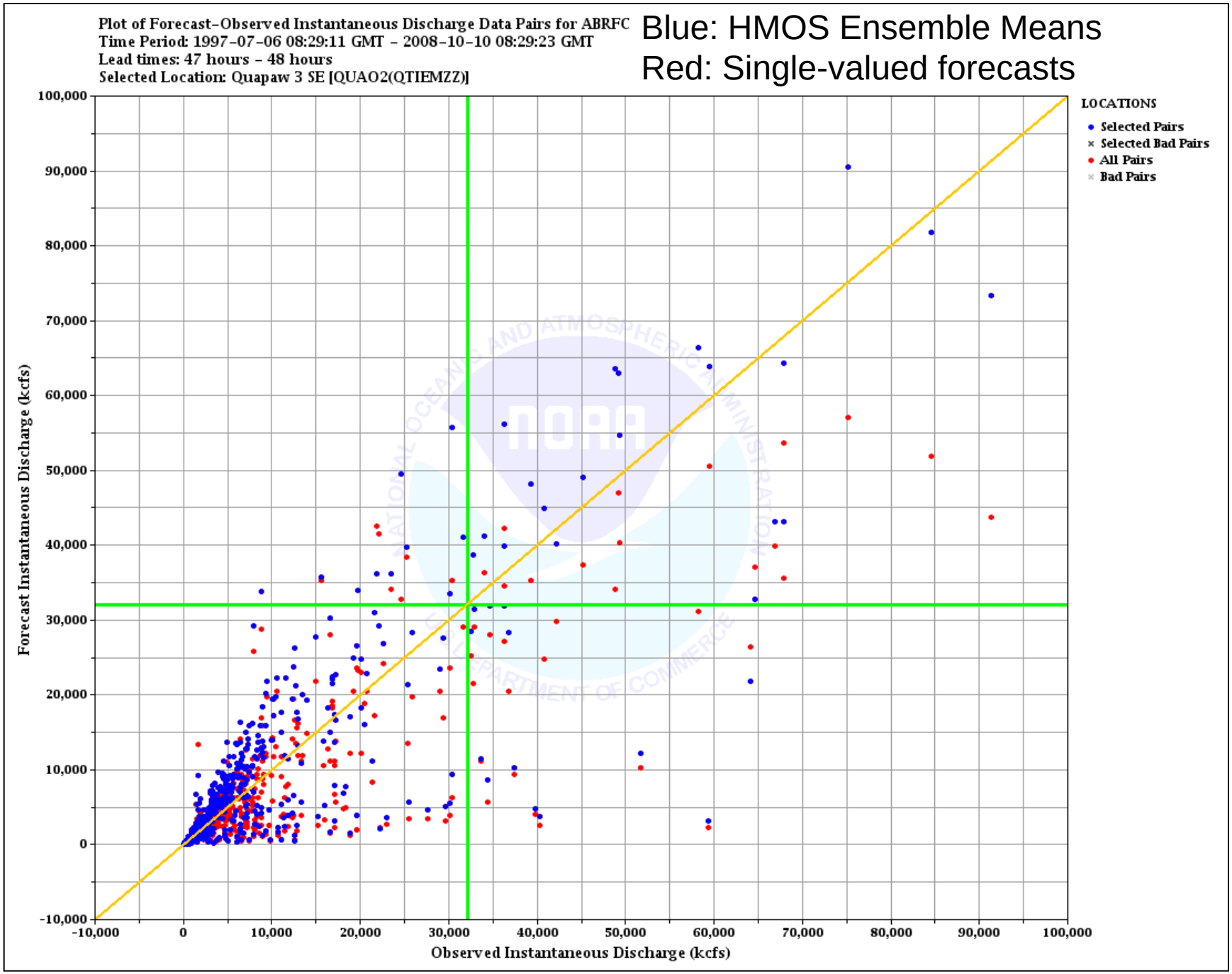
IVP Scatter Plot for 6 hr lead time



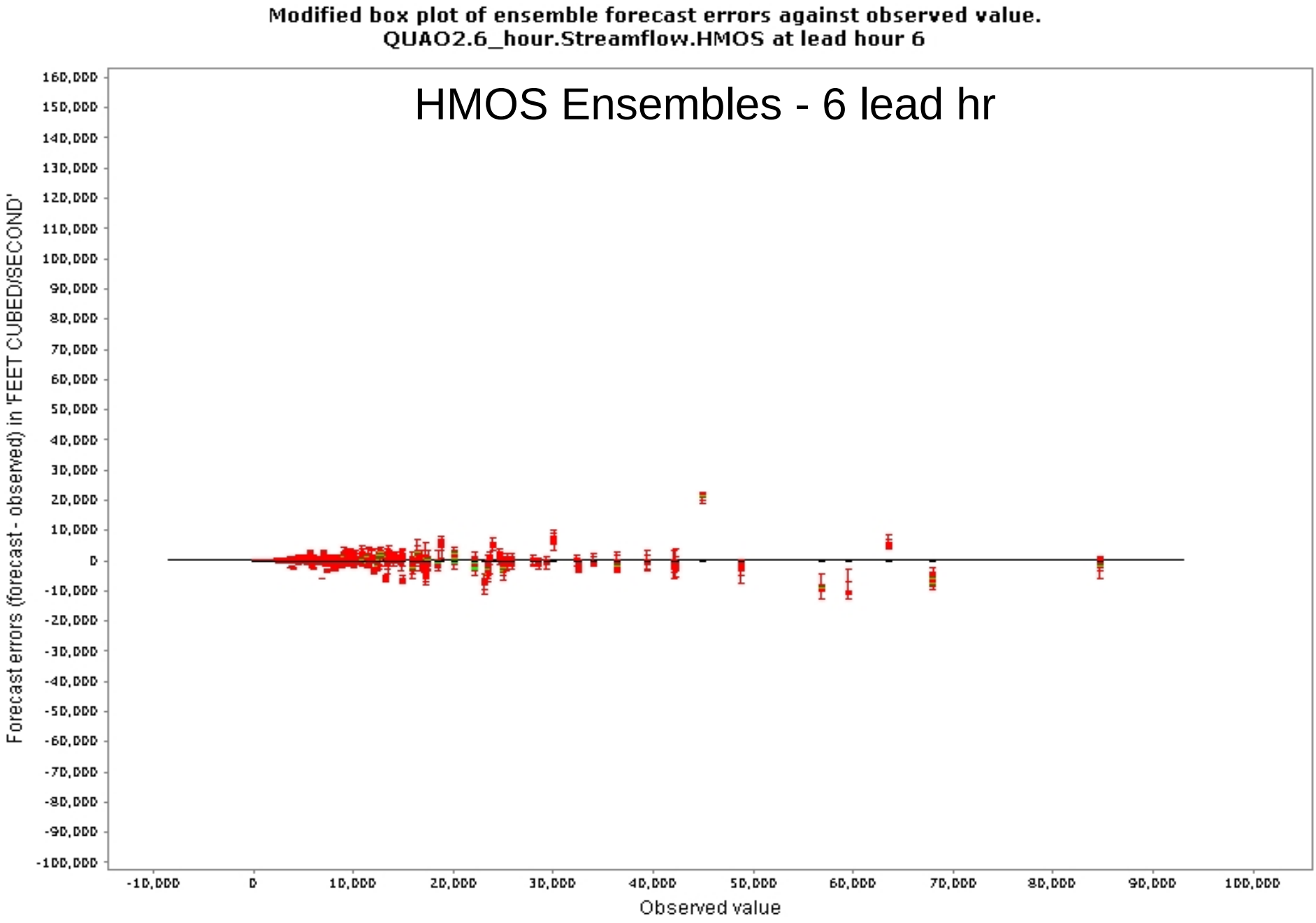
IVP Scatter Plot for 24 hr lead time



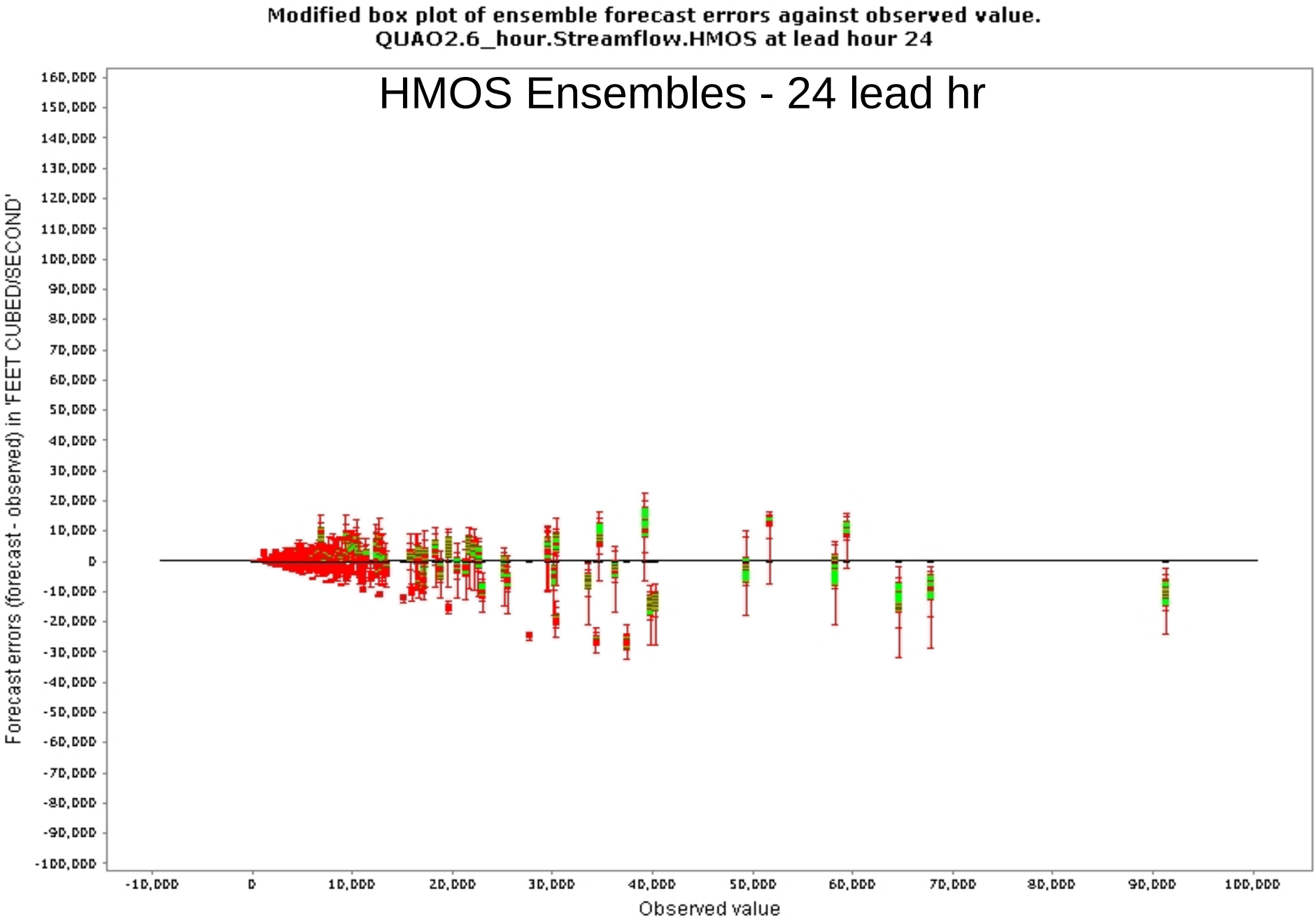
IVP Scatter Plot for 48 hr lead time



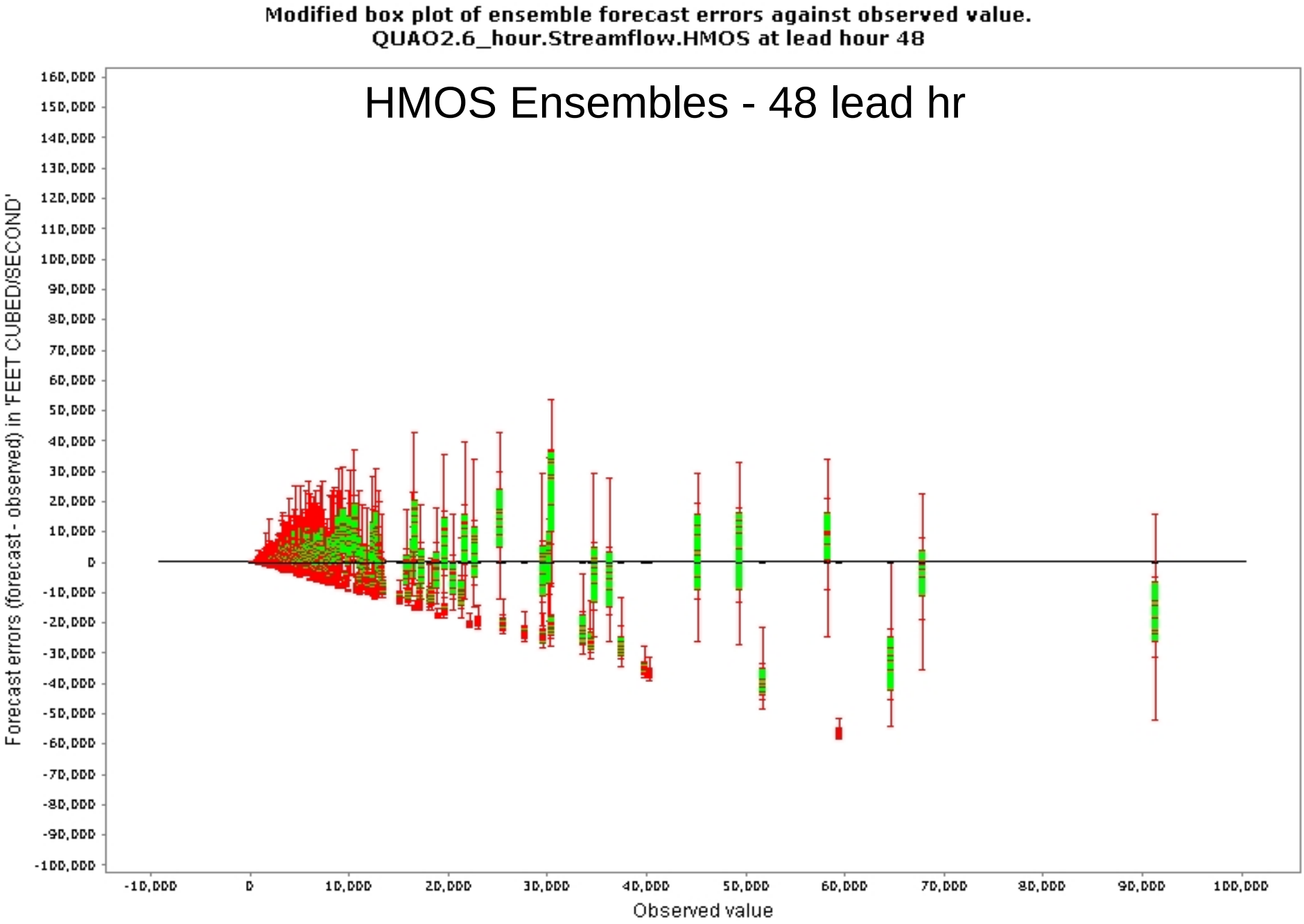
EVS box plots with observed value



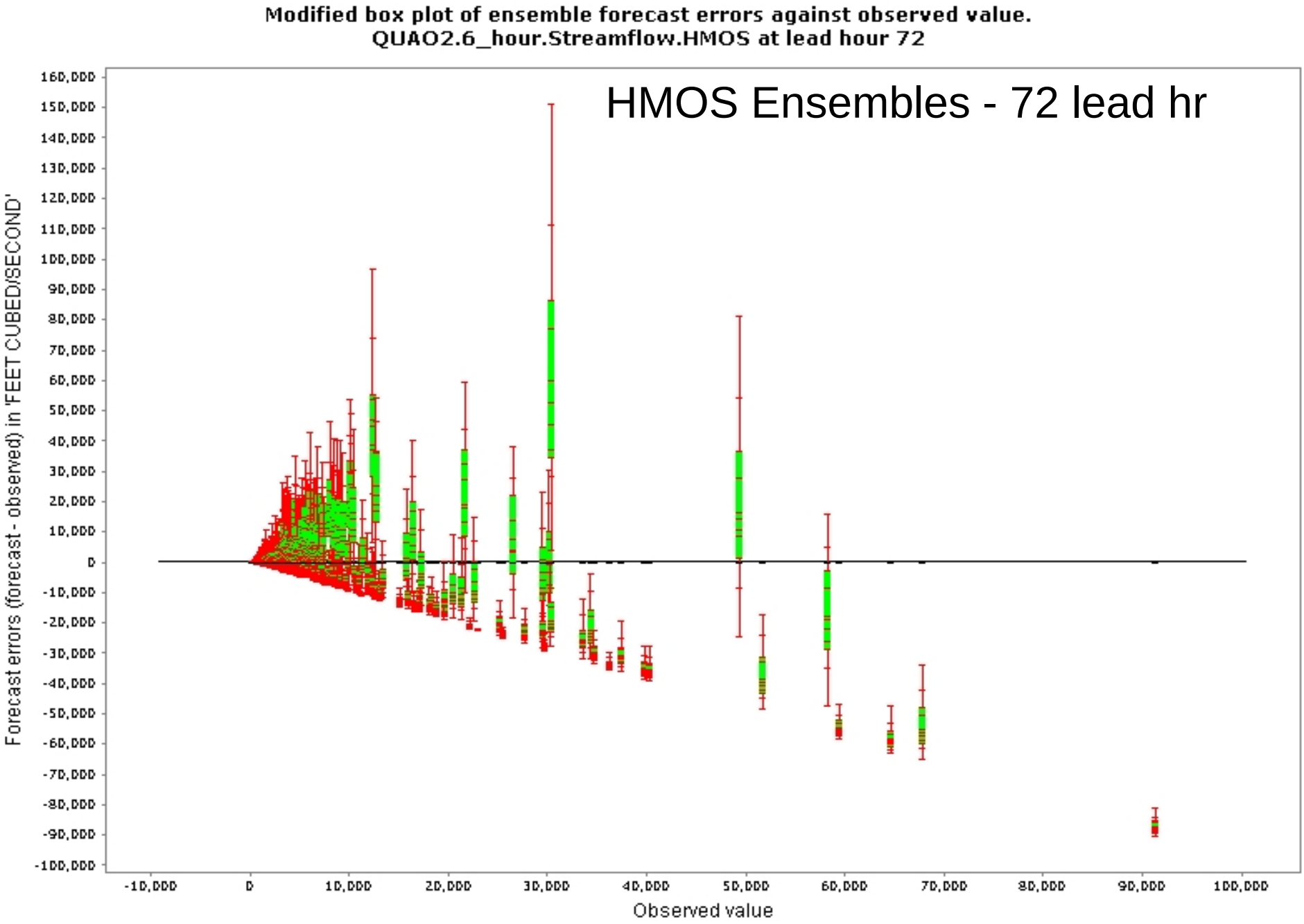
EVS box plots with observed value



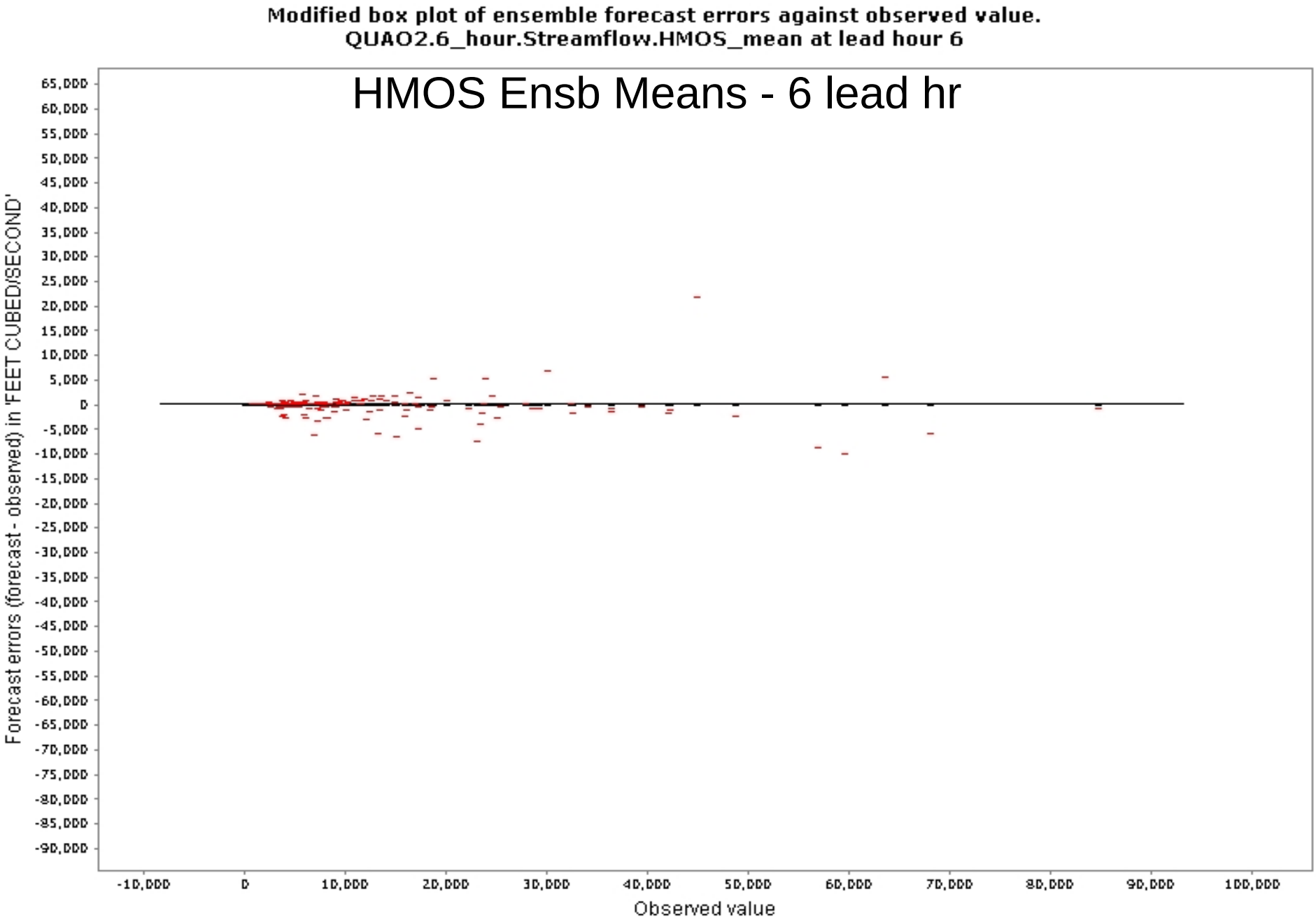
EVS box plots with observed value



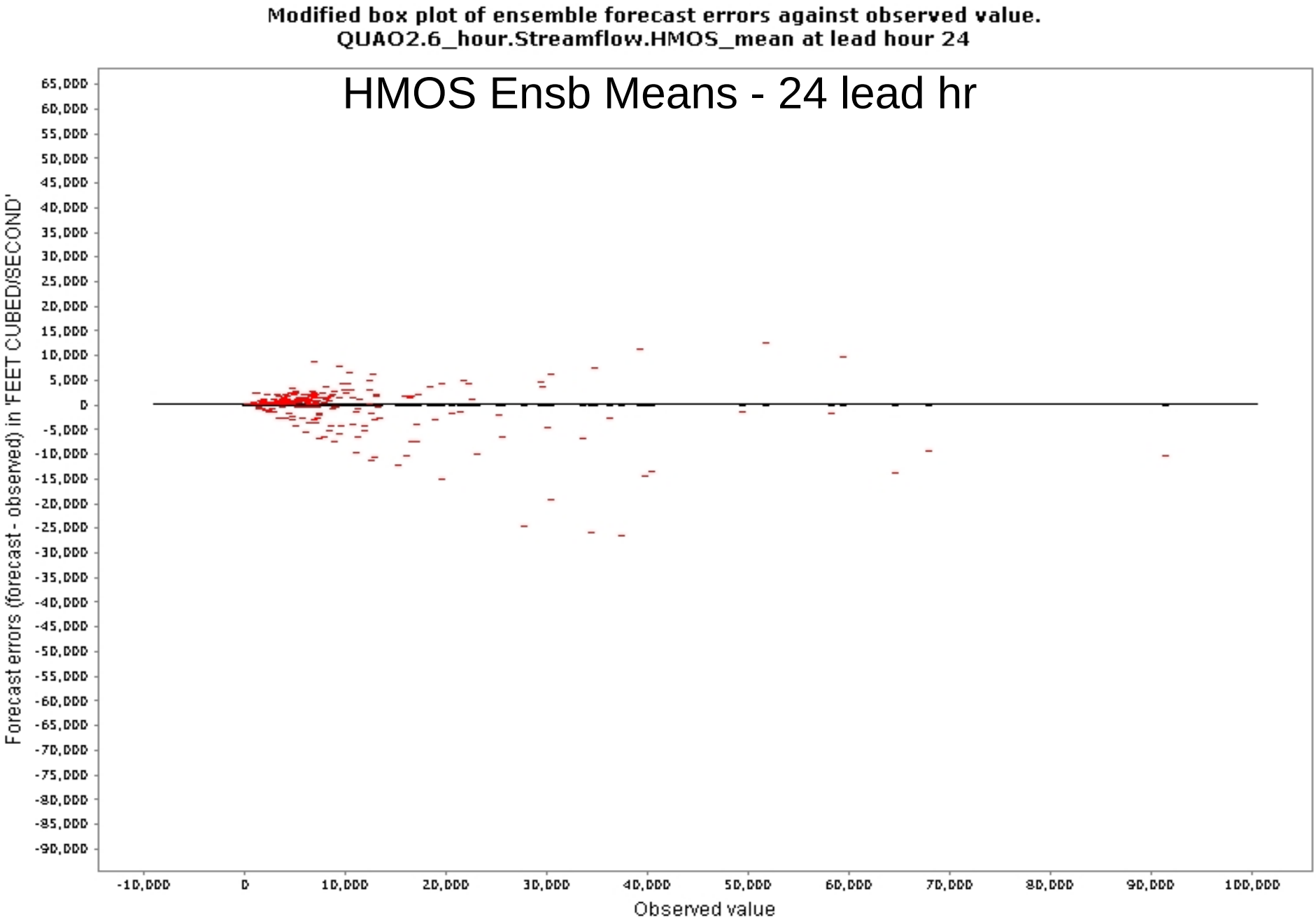
EVS box plots with observed value



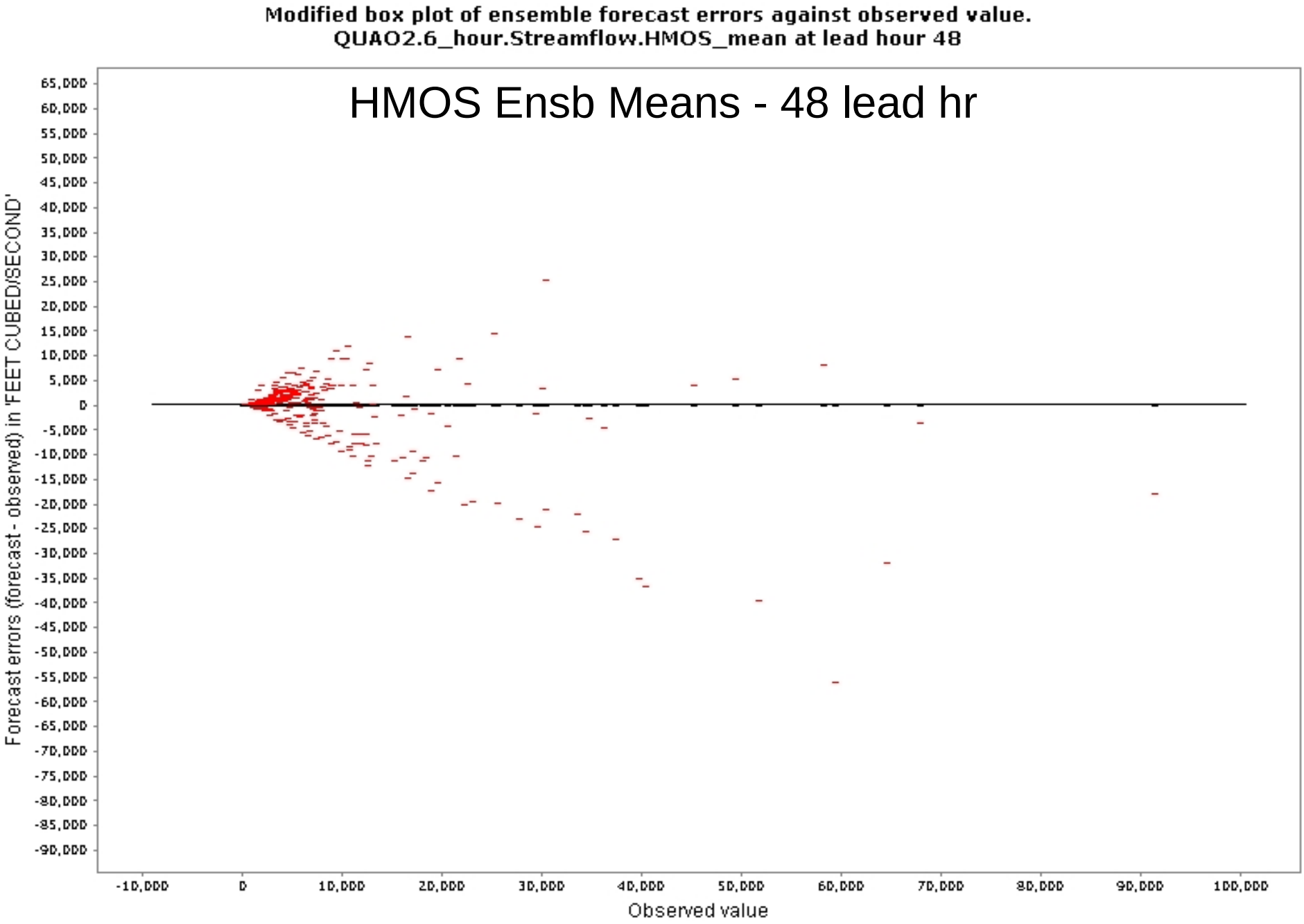
EVS box plots with observed value



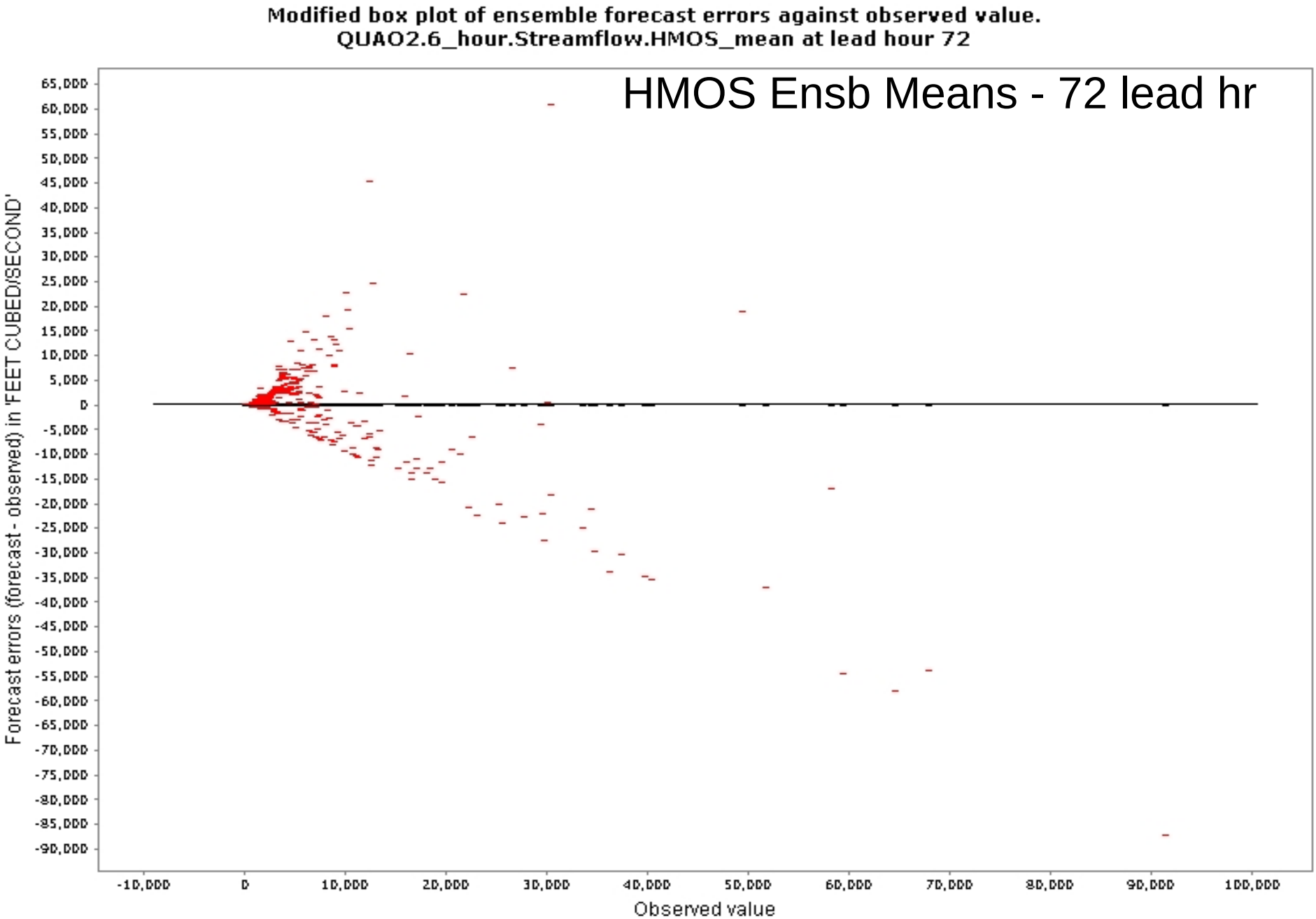
EVS box plots with observed value



EVS box plots with observed value

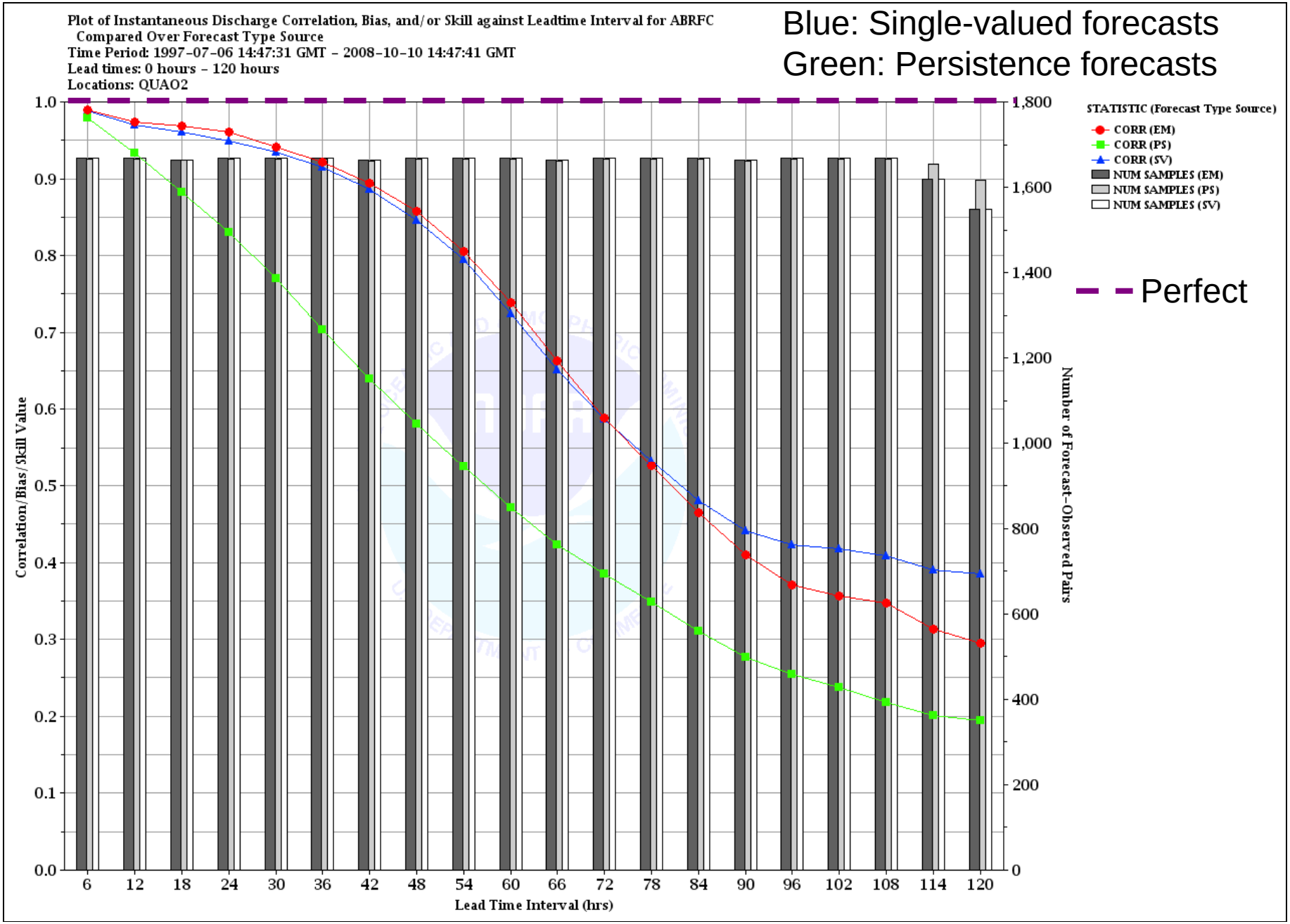


EVS box plots with observed value

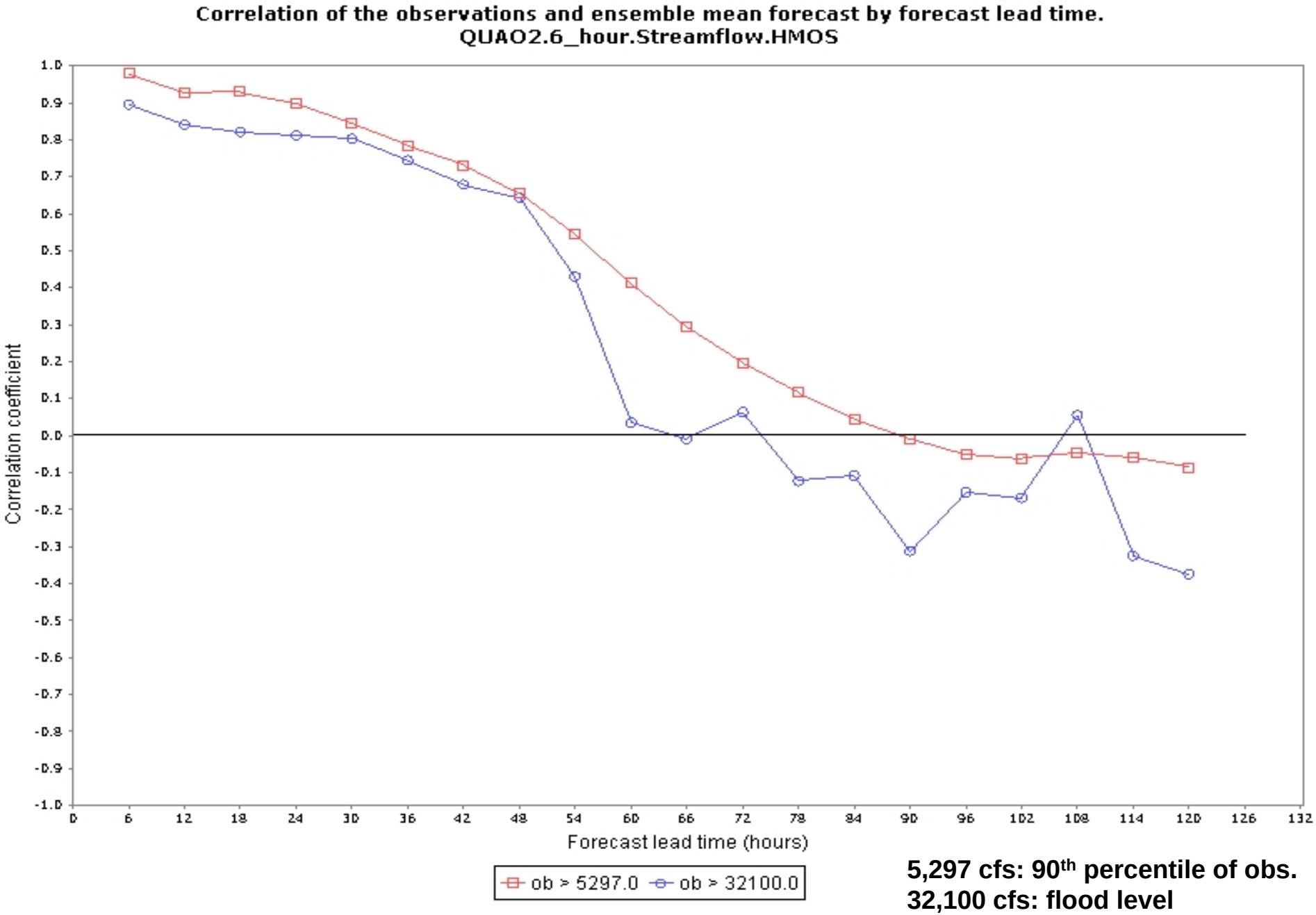


IVP Statistics by lead time - Correlation

Red: HMOS Ensemble Means
Blue: Single-valued forecasts
Green: Persistence forecasts

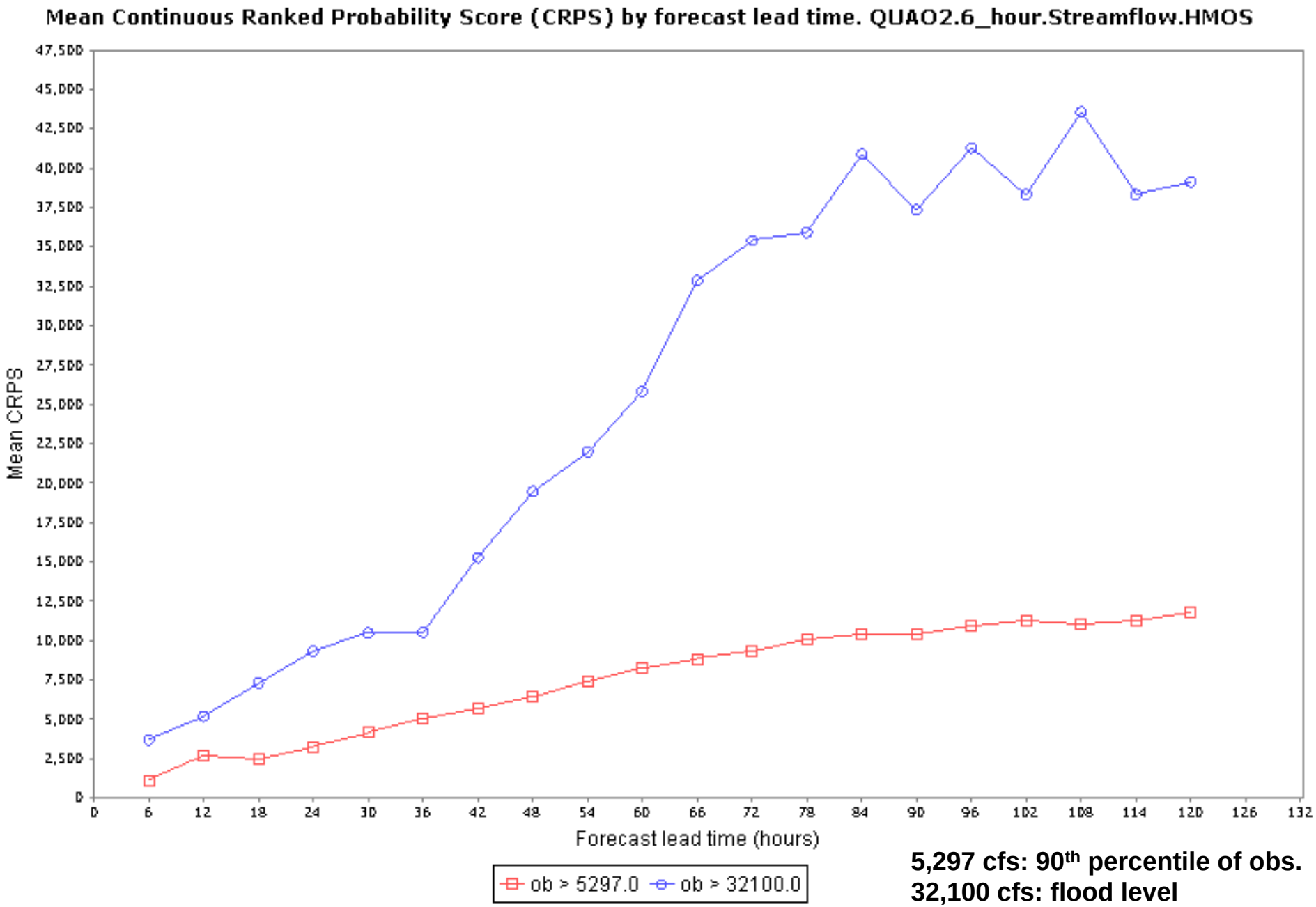


Correlation for HMOS Ensb Means



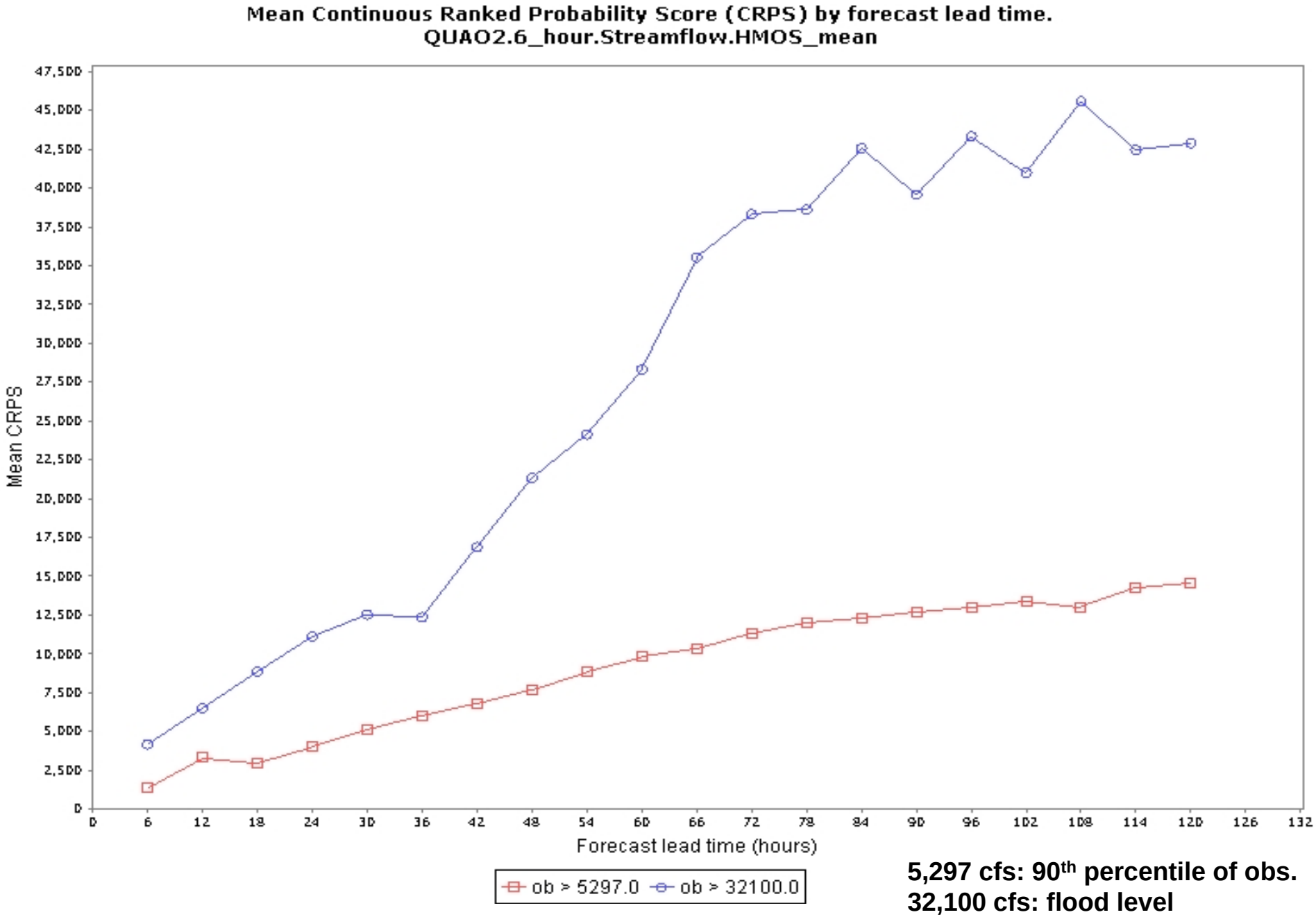
5,297 cfs: 90th percentile of obs.
32,100 cfs: flood level

MCRPS for HMOS Ensembles



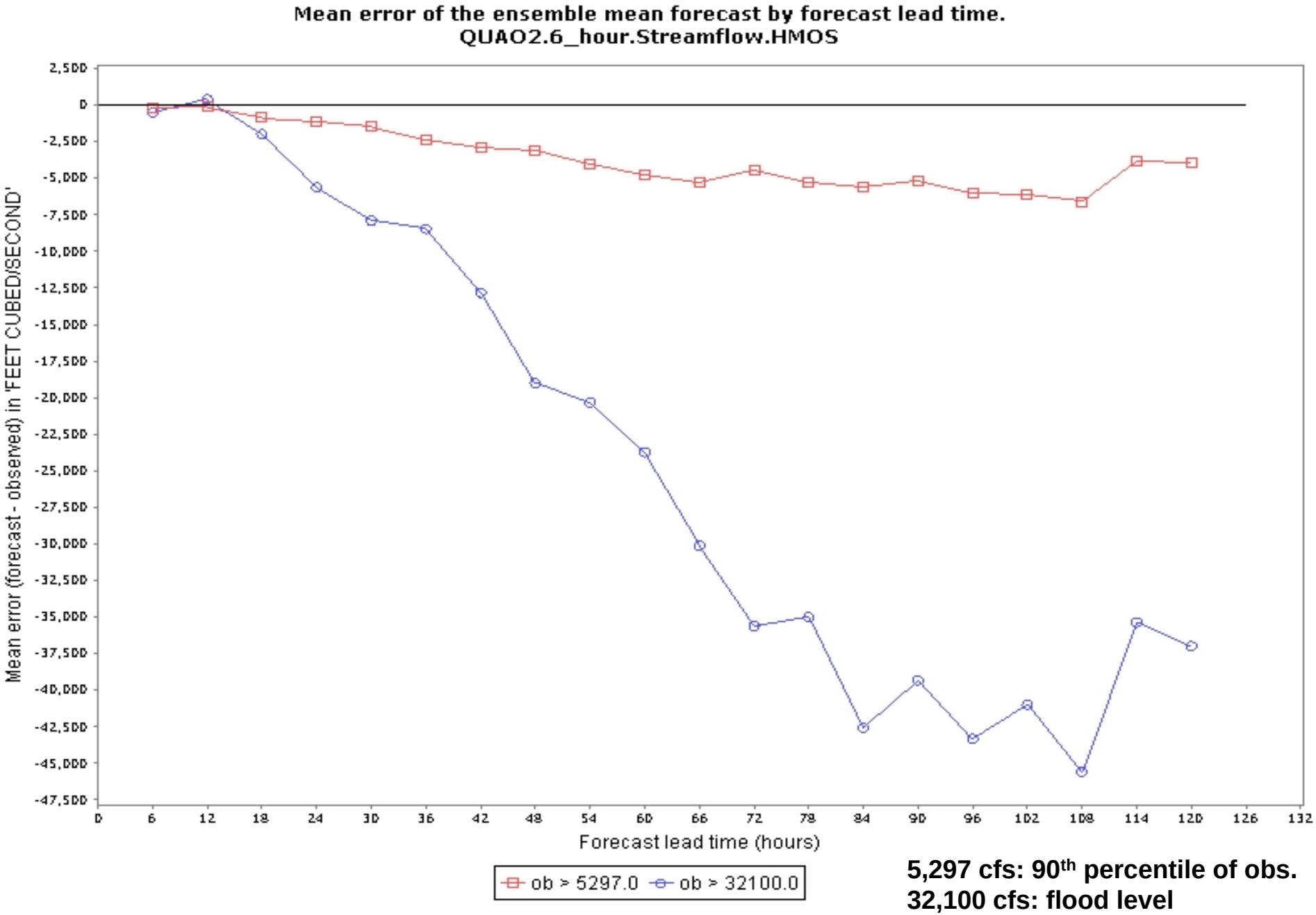
5,297 cfs: 90th percentile of obs.
32,100 cfs: flood level

MCRPS (= MAE) for HMOS Ensb Means



5,297 cfs: 90th percentile of obs.
32,100 cfs: flood level

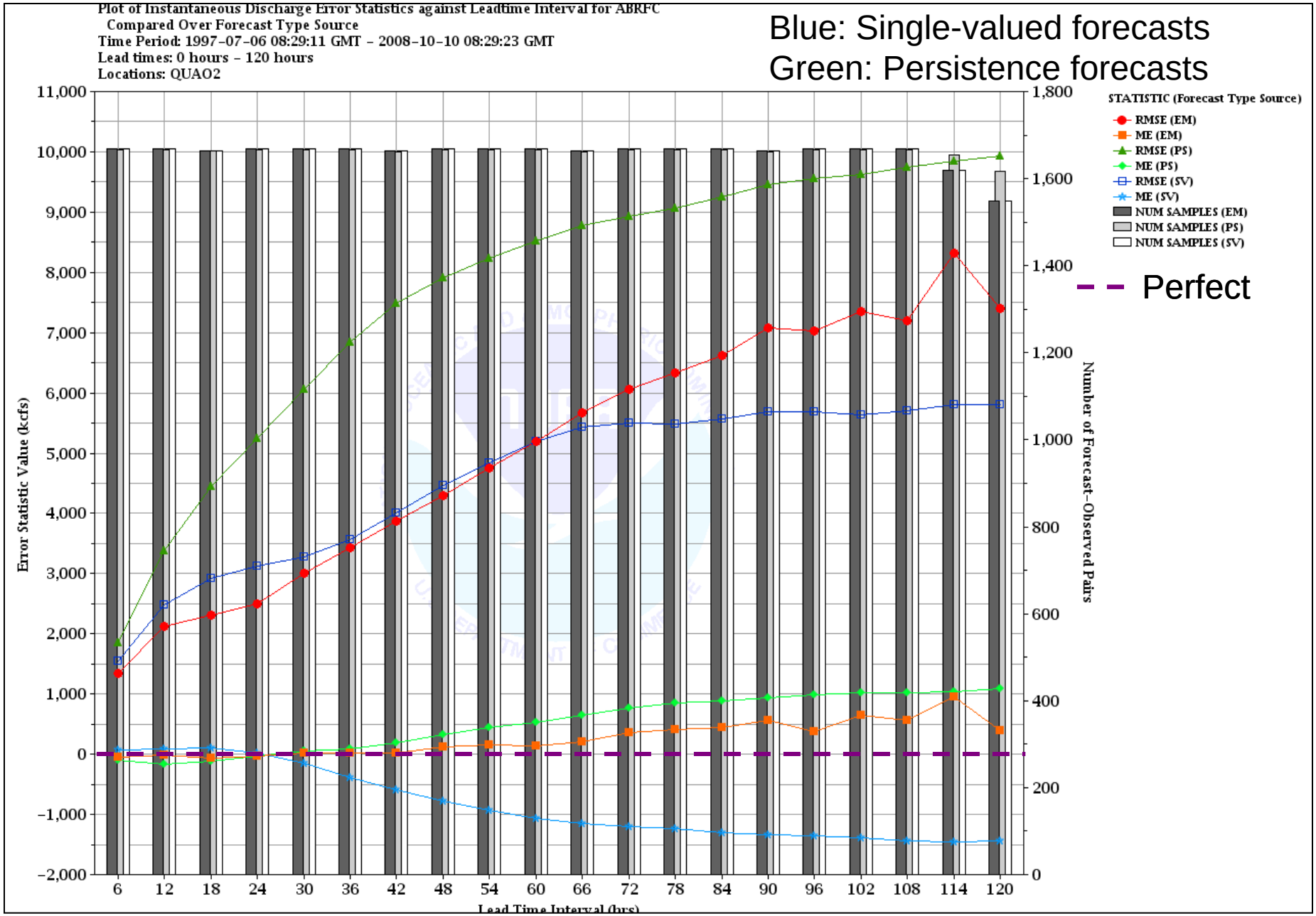
Mean Error for HMOS Ensb Means



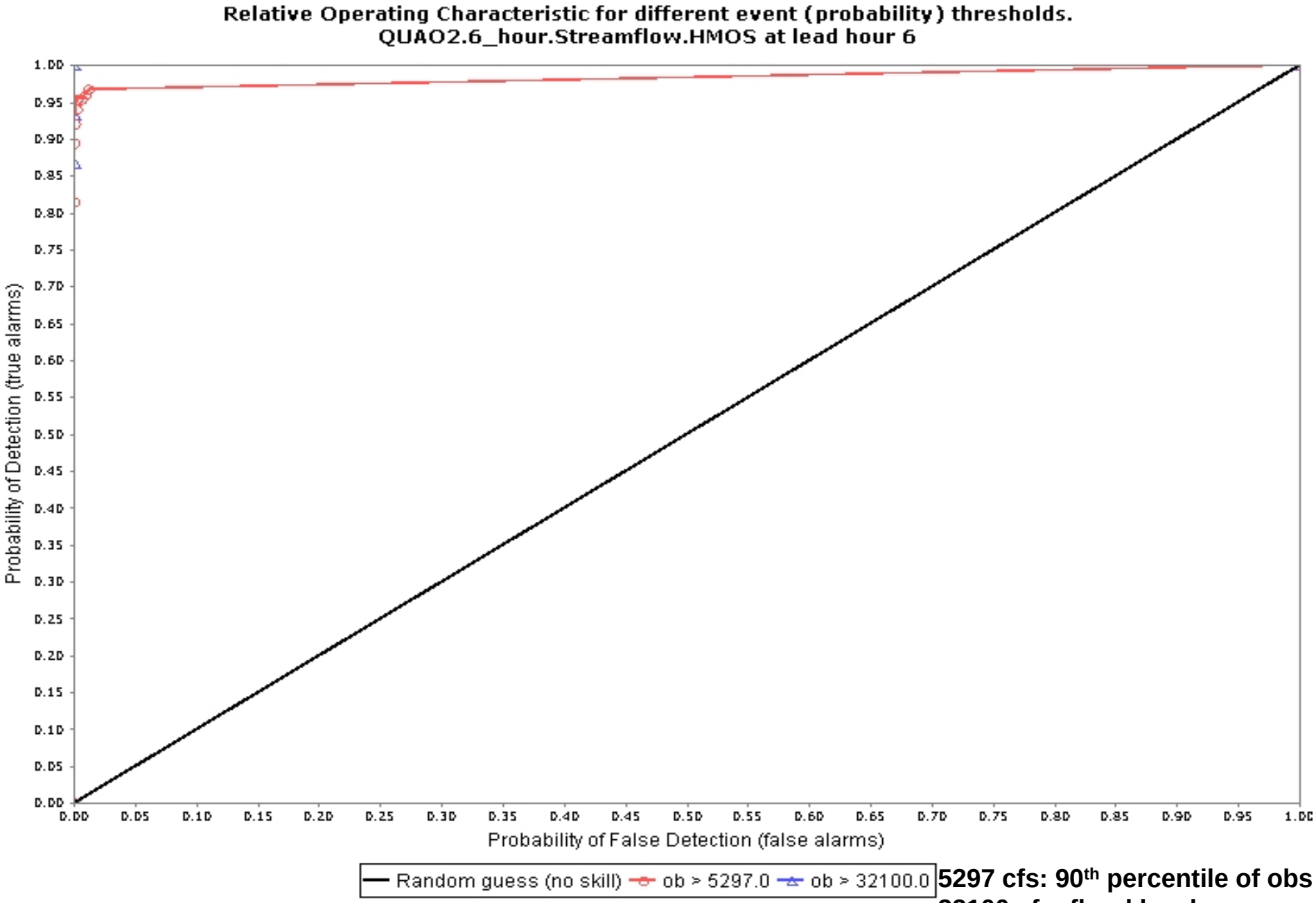
5,297 cfs: 90th percentile of obs.
32,100 cfs: flood level

IVP Statistics by lead time – RMSE and ME

Red: HMOS Ensemble Means
Blue: Single-valued forecasts
Green: Persistence forecasts



ROC for HMOS Ensembles - 6 lead hr



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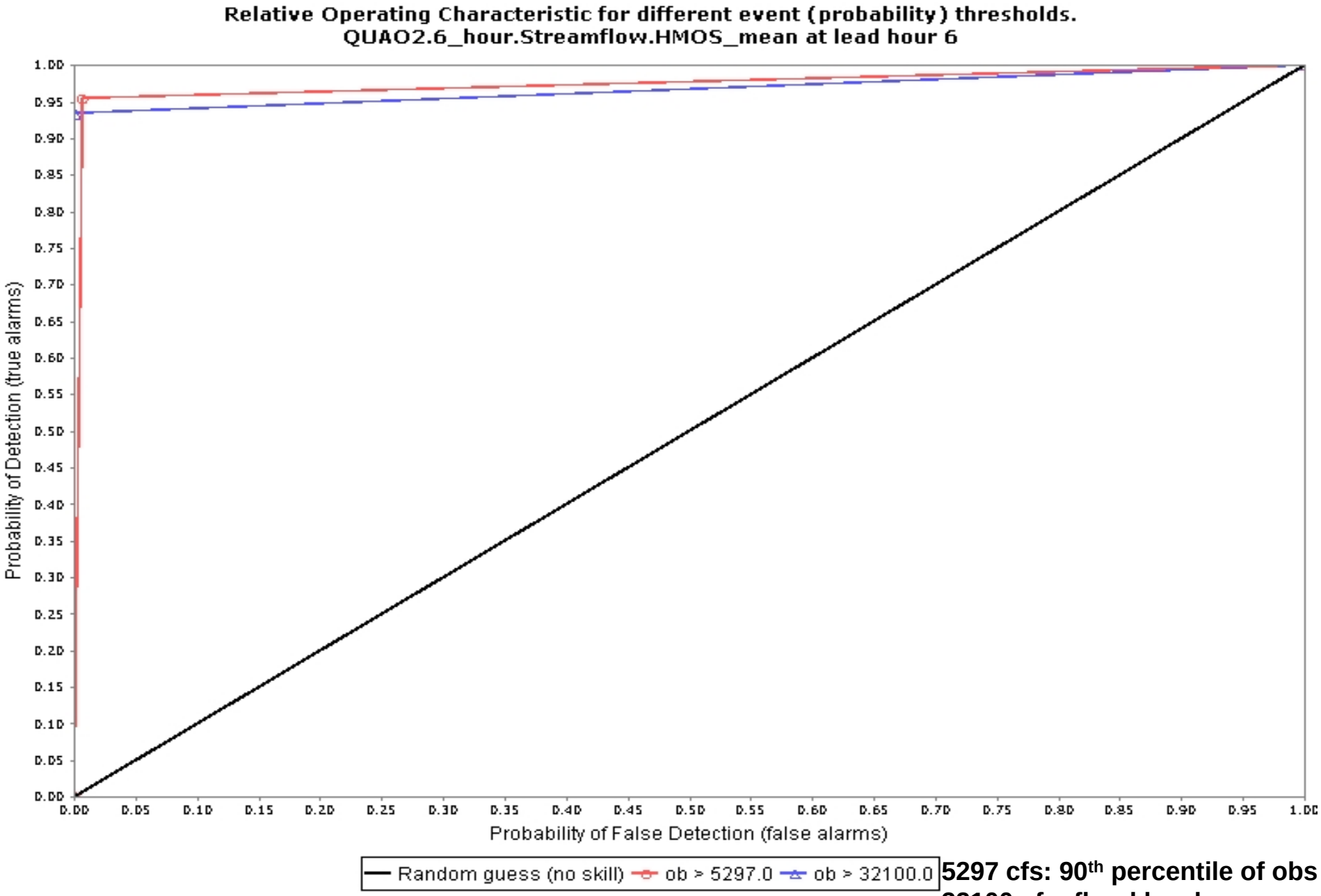
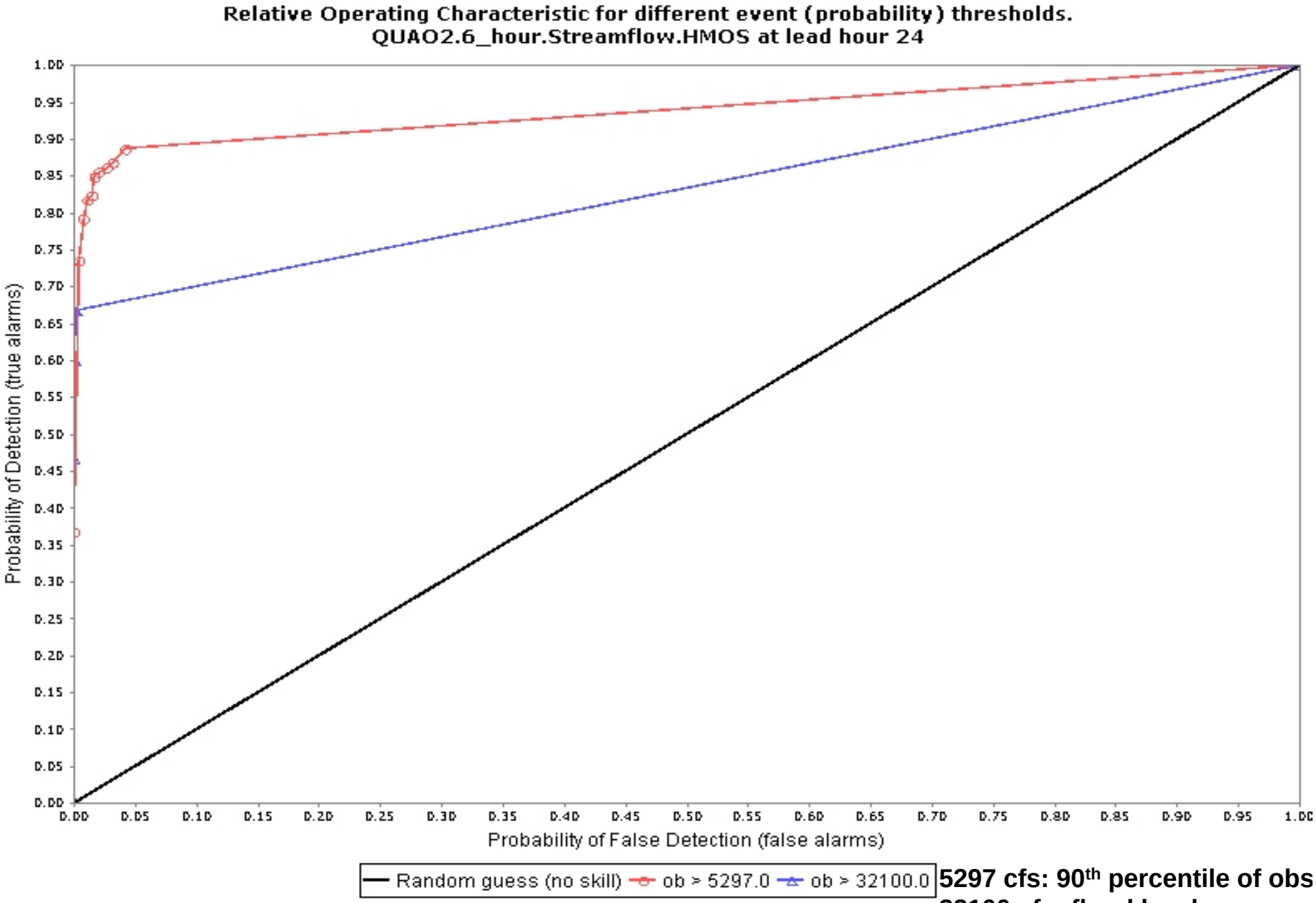
ROC for HMOS Ensb Means - 6 lead hr



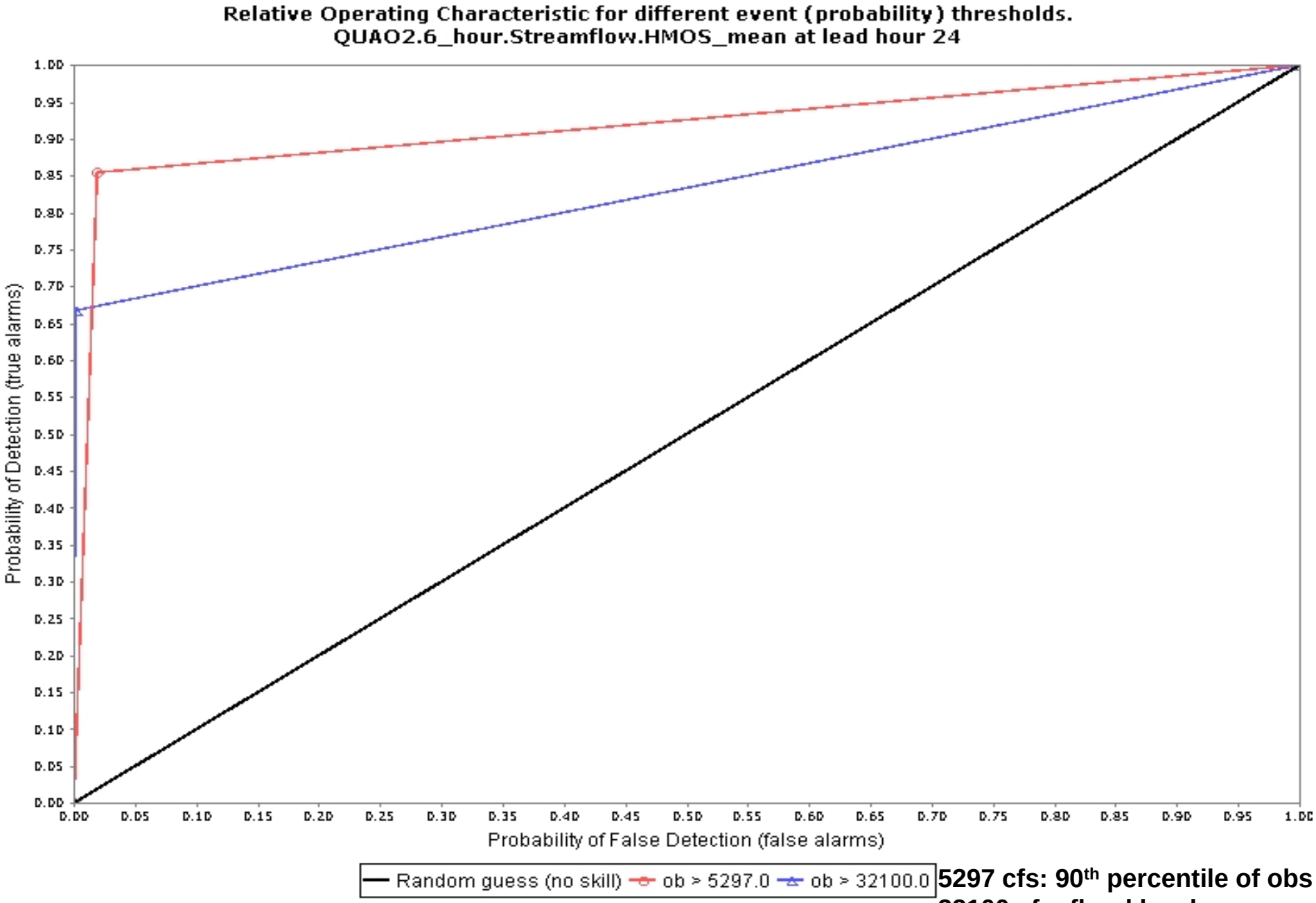
5297 cfs: 90th percentile of obs
32100 cfs: flood level

ROC for HMOS Ensembles - 24 lead hr



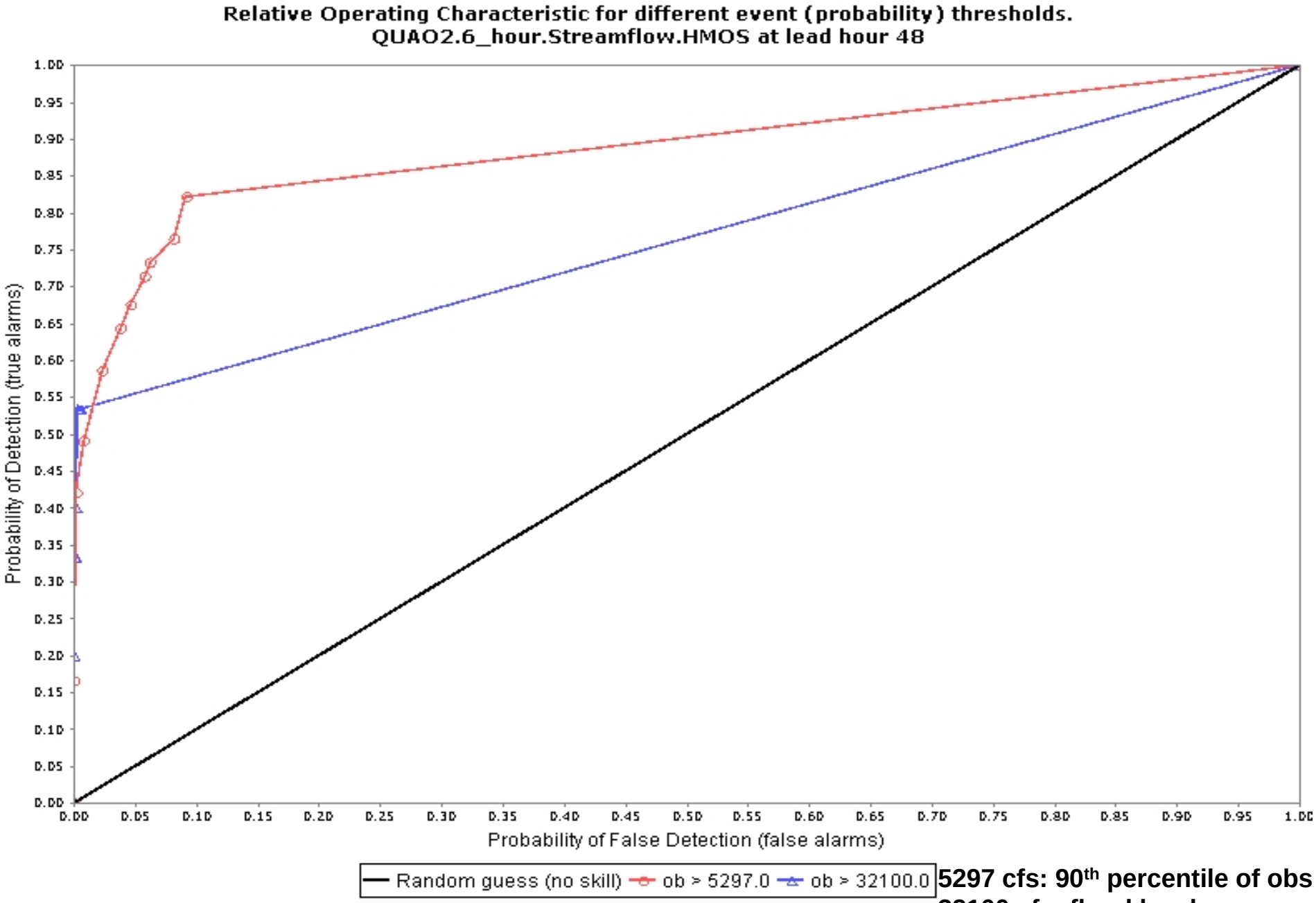
5297 cfs: 90th percentile of obs
32100 cfs: flood level

ROC for HMOS Ensb Means - 24 lead hr



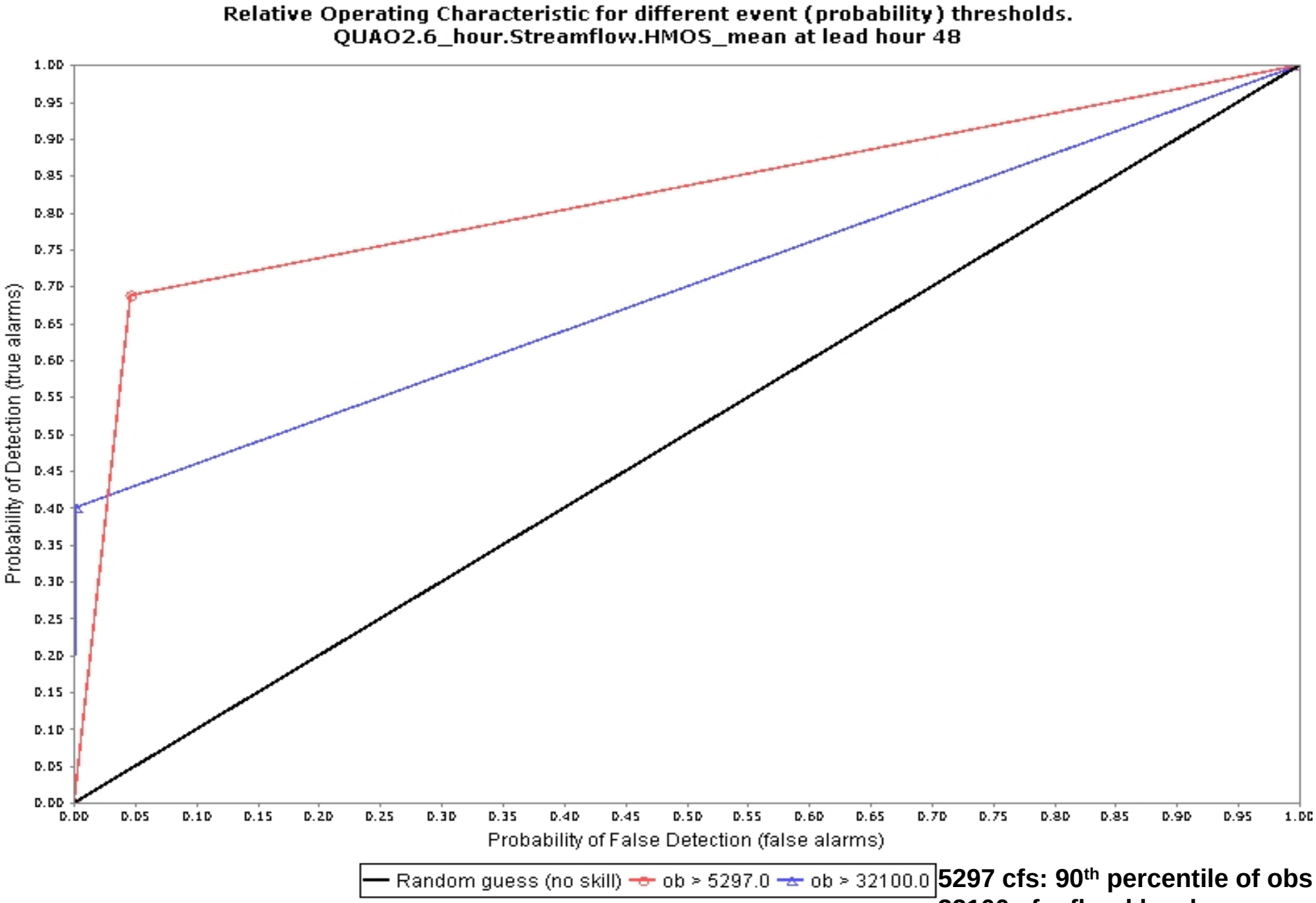
5297 cfs: 90th percentile of obs
32100 cfs: flood level

ROC for HMOS Ensembles - 48 lead hr



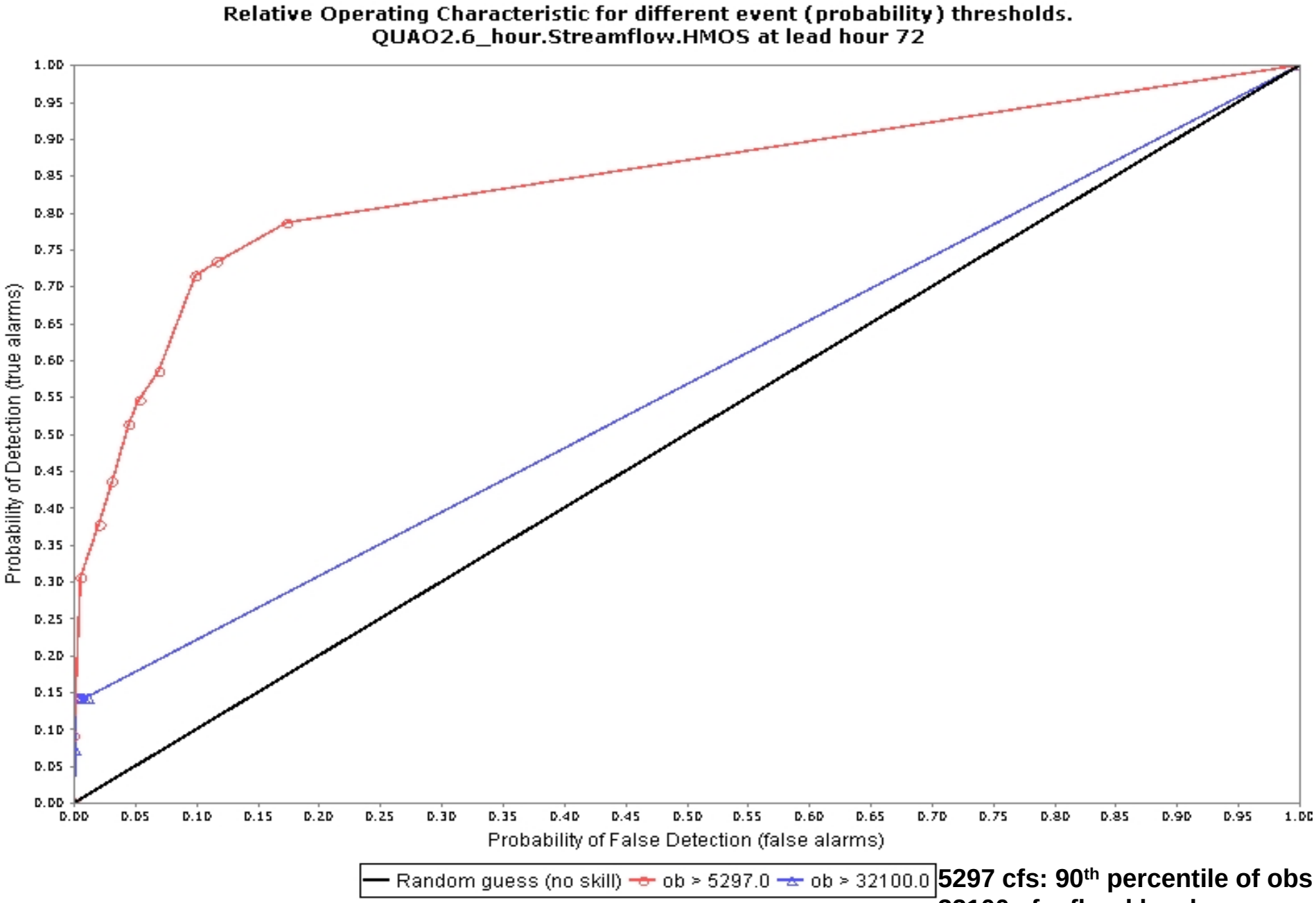
5297 cfs: 90th percentile of obs
32100 cfs: flood level

ROC for HMOS Ensb Means - 48 lead hr



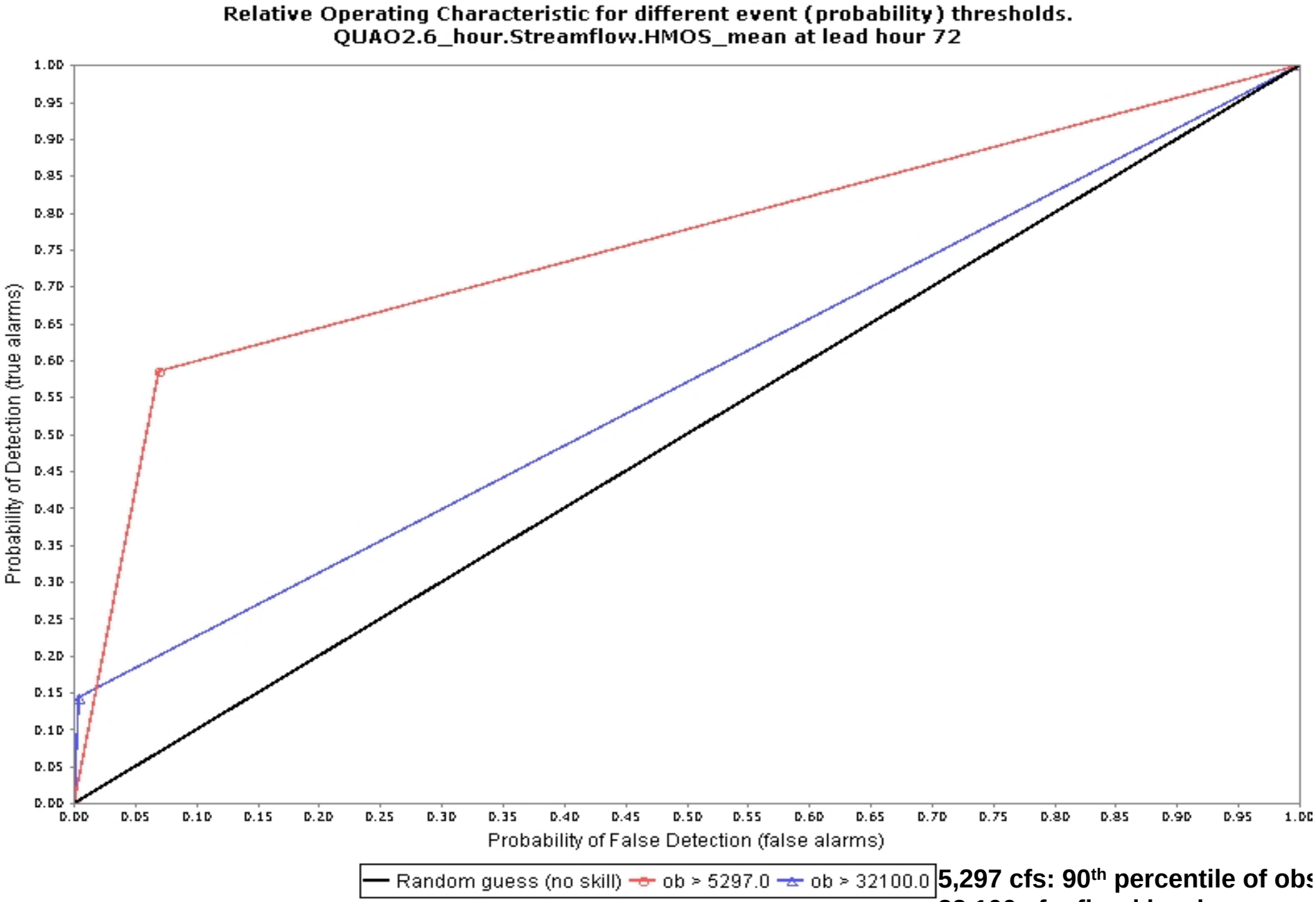
5297 cfs: 90th percentile of obs
32100 cfs: flood level

ROC for HMOS Ensembles - 72 lead hr



5297 cfs: 90th percentile of obs
32100 cfs: flood level

ROC for HMOS Ensb Means - 72 lead hr



5,297 cfs: 90th percentile of obs
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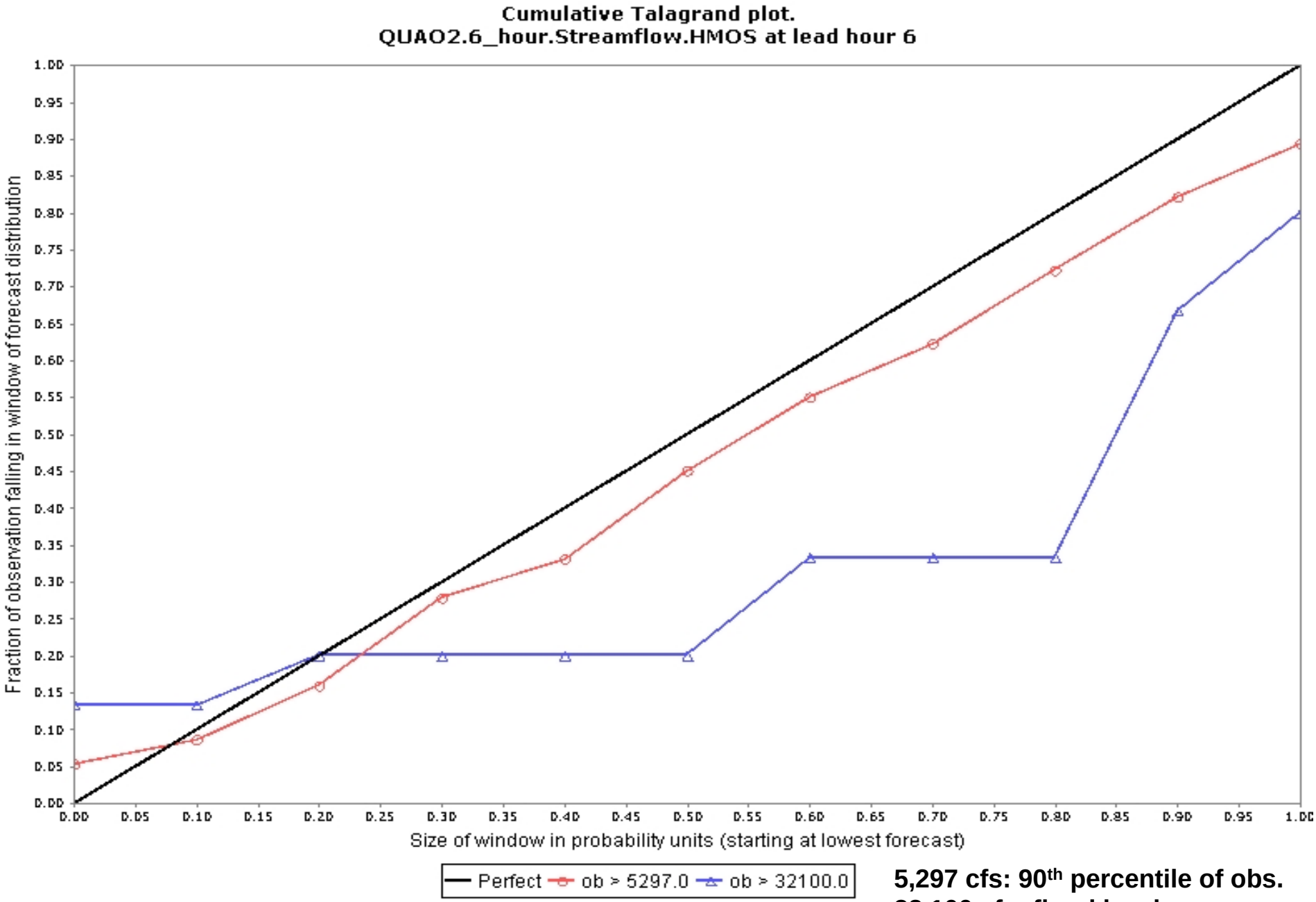
Cumulative Talagrand for HMOS Ensembles – 6 lead hr



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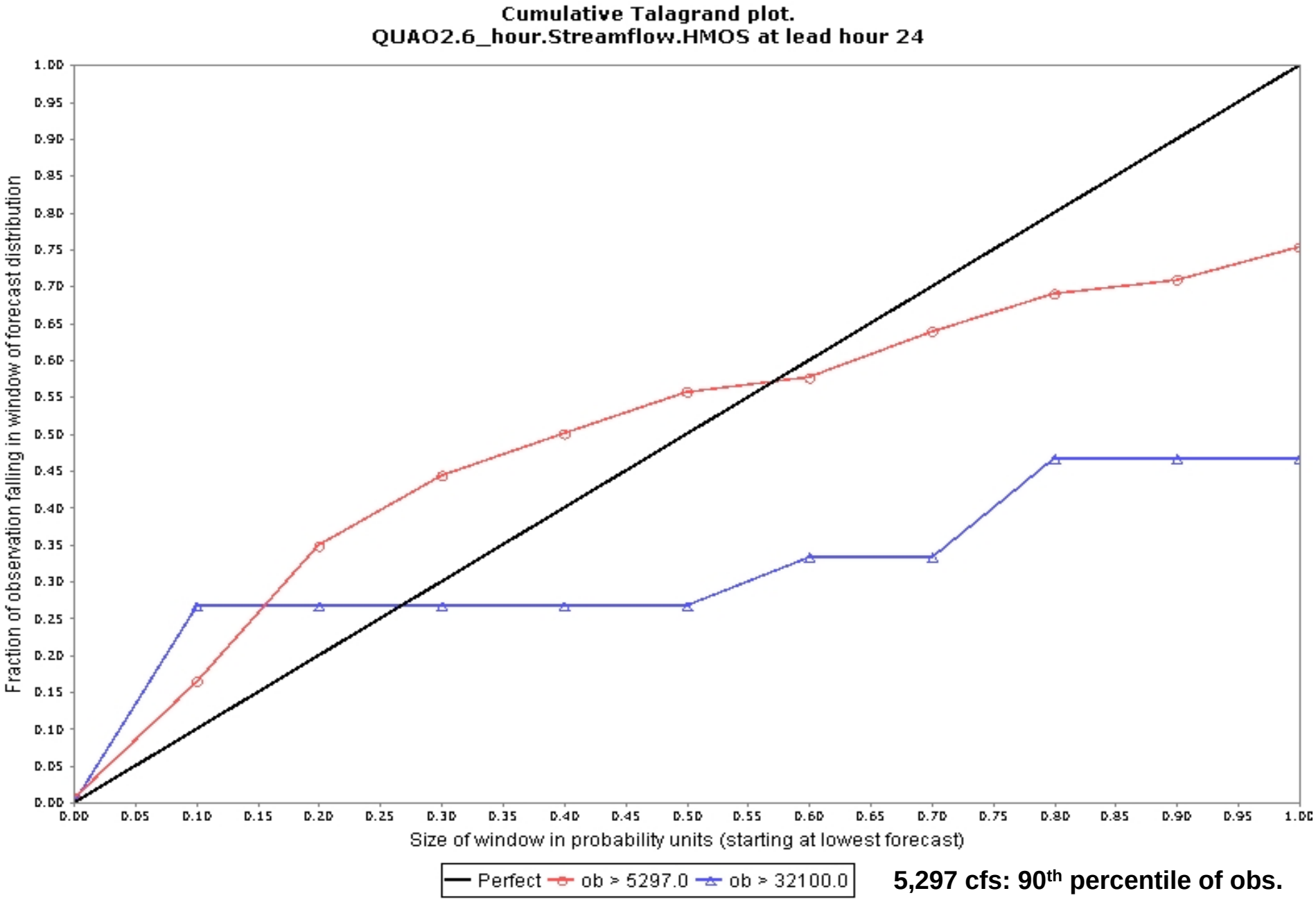
Cumulative Talagrand for HMOS Ensembles – 24 lead hr



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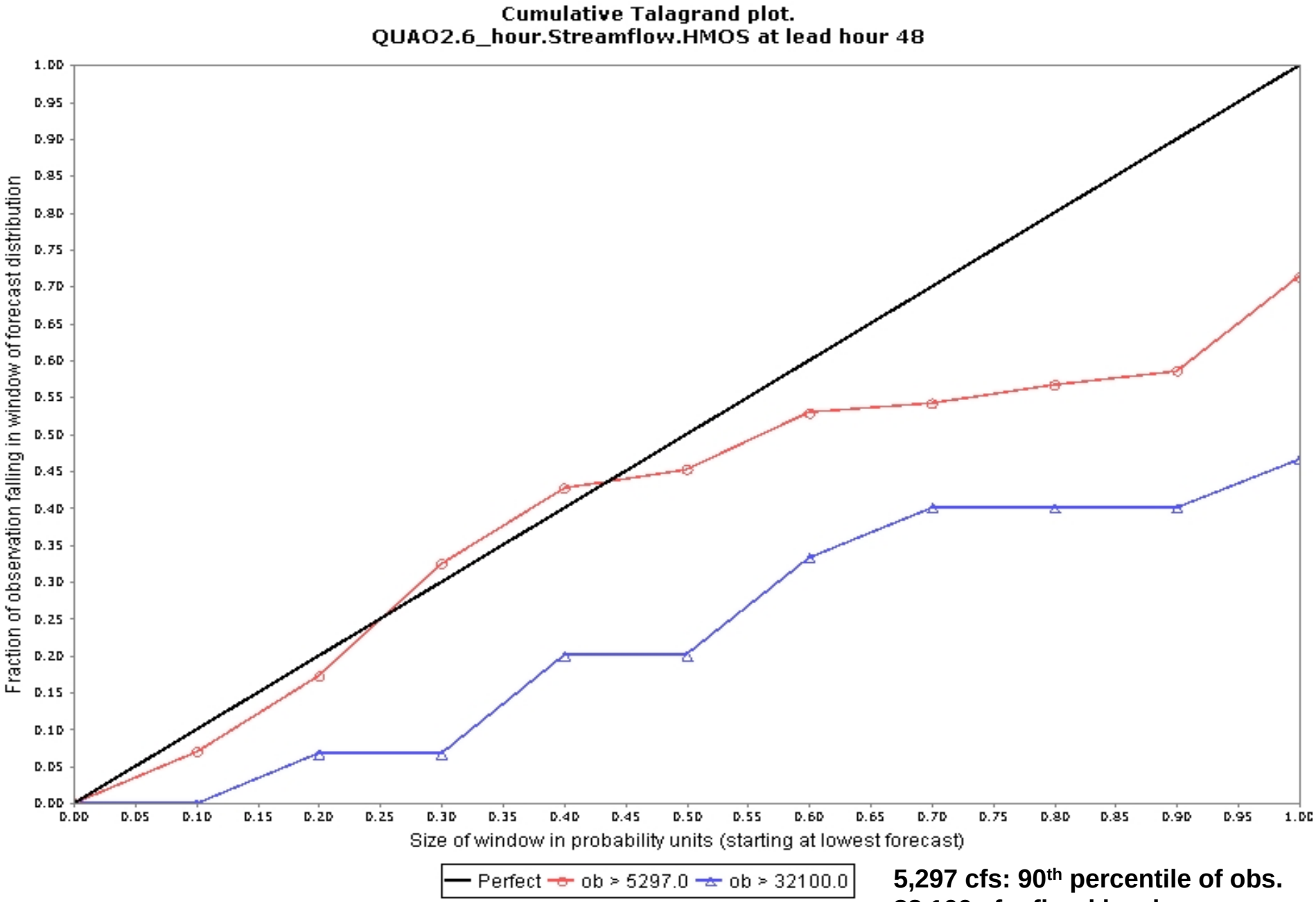
Cumulative Talagrand for HMOS Ensembles – 48 lead hr



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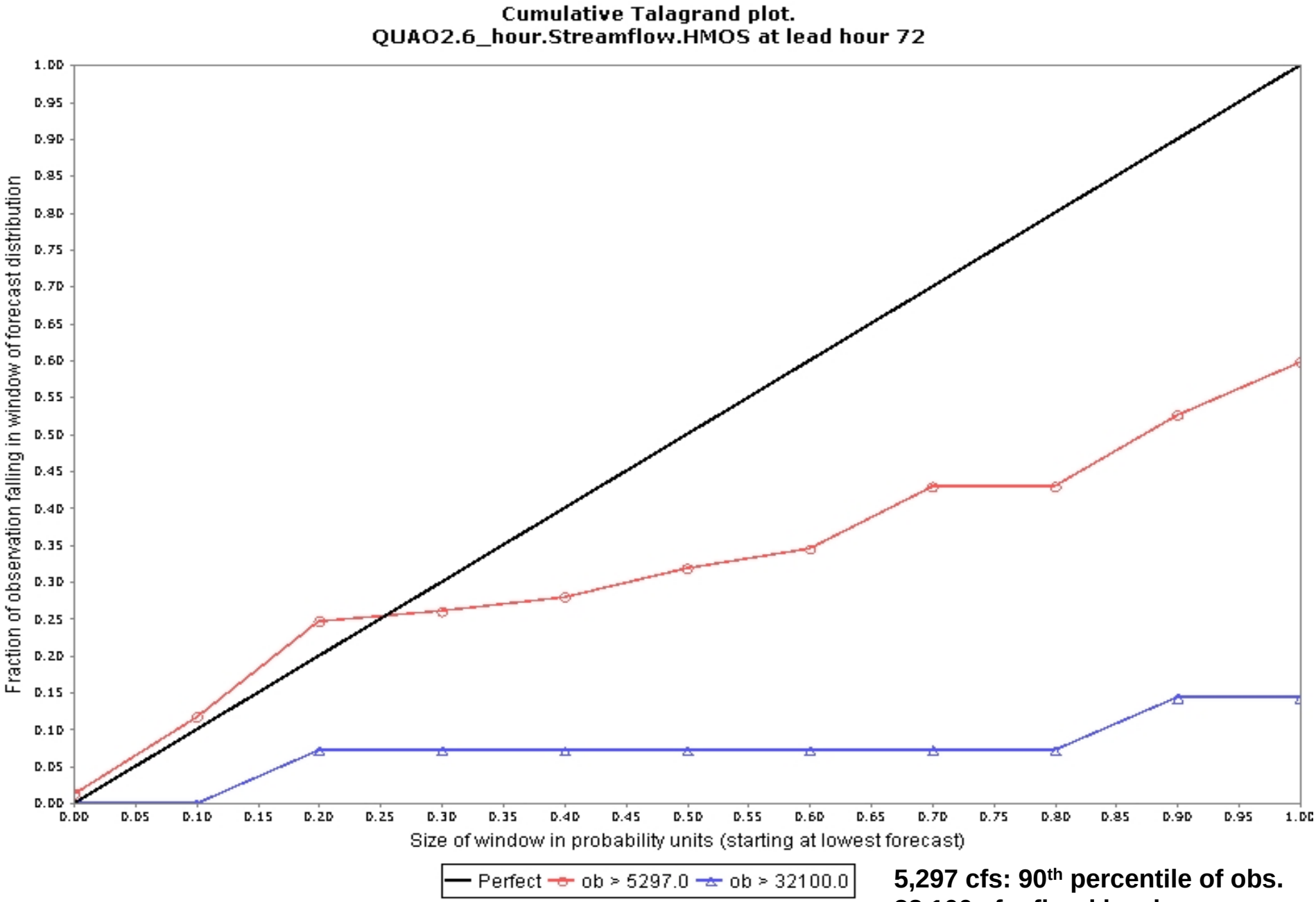
Cumulative Talagrand for HMOS Ensembles – 72 lead hr



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