



New Year's 2006 Flood Event - Russian and Truckee River

CNRFC National Verification Team Case Study

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California-Nevada River Forecast Center

June 24, 2008



Expand on 2006 New Year's Flood event on the Truckee River presented to the Western Region Verification team:

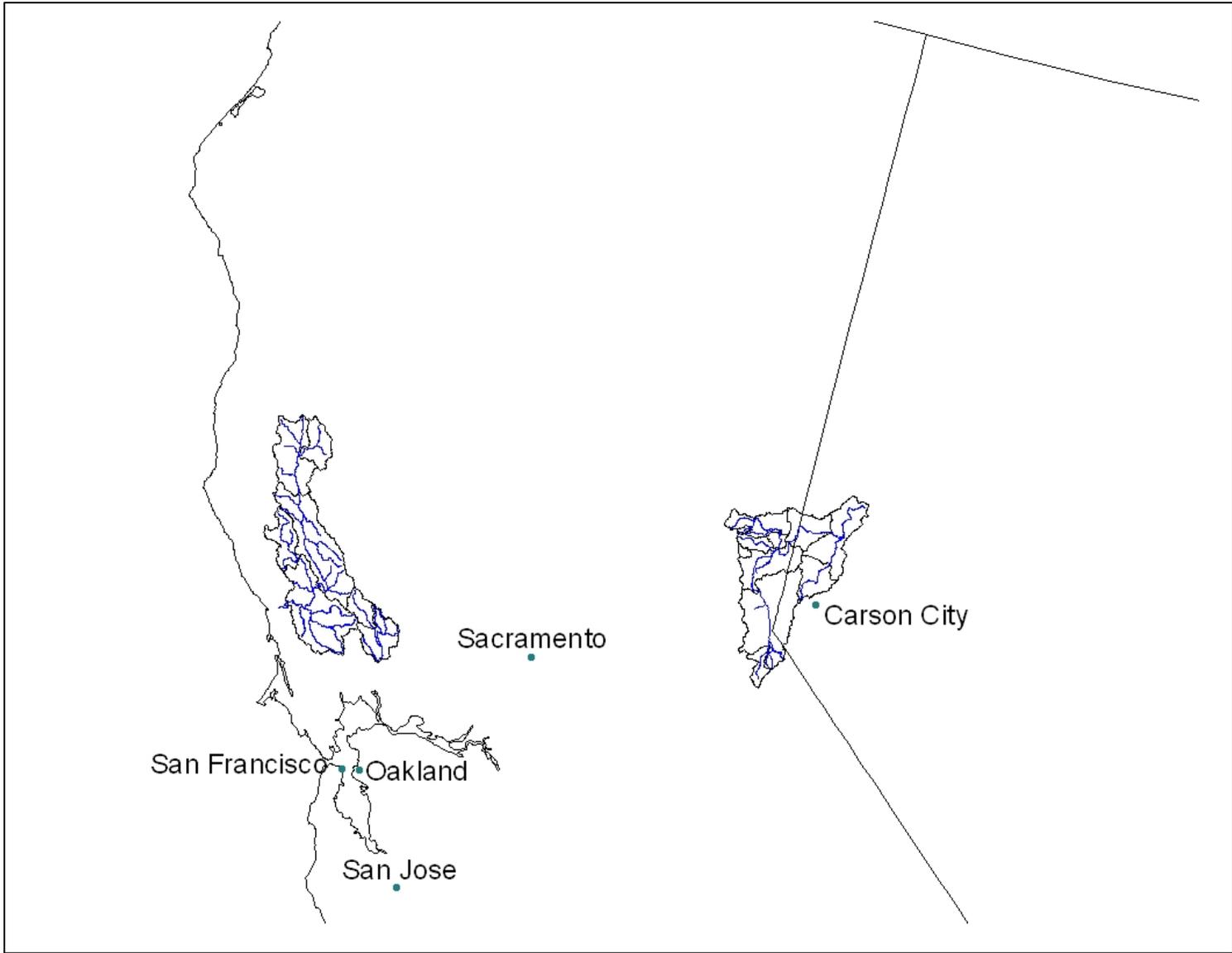
Already done some verification for stage, MAP and MAT using IVP.

Verify for flow.

Add persistence verification statistics.

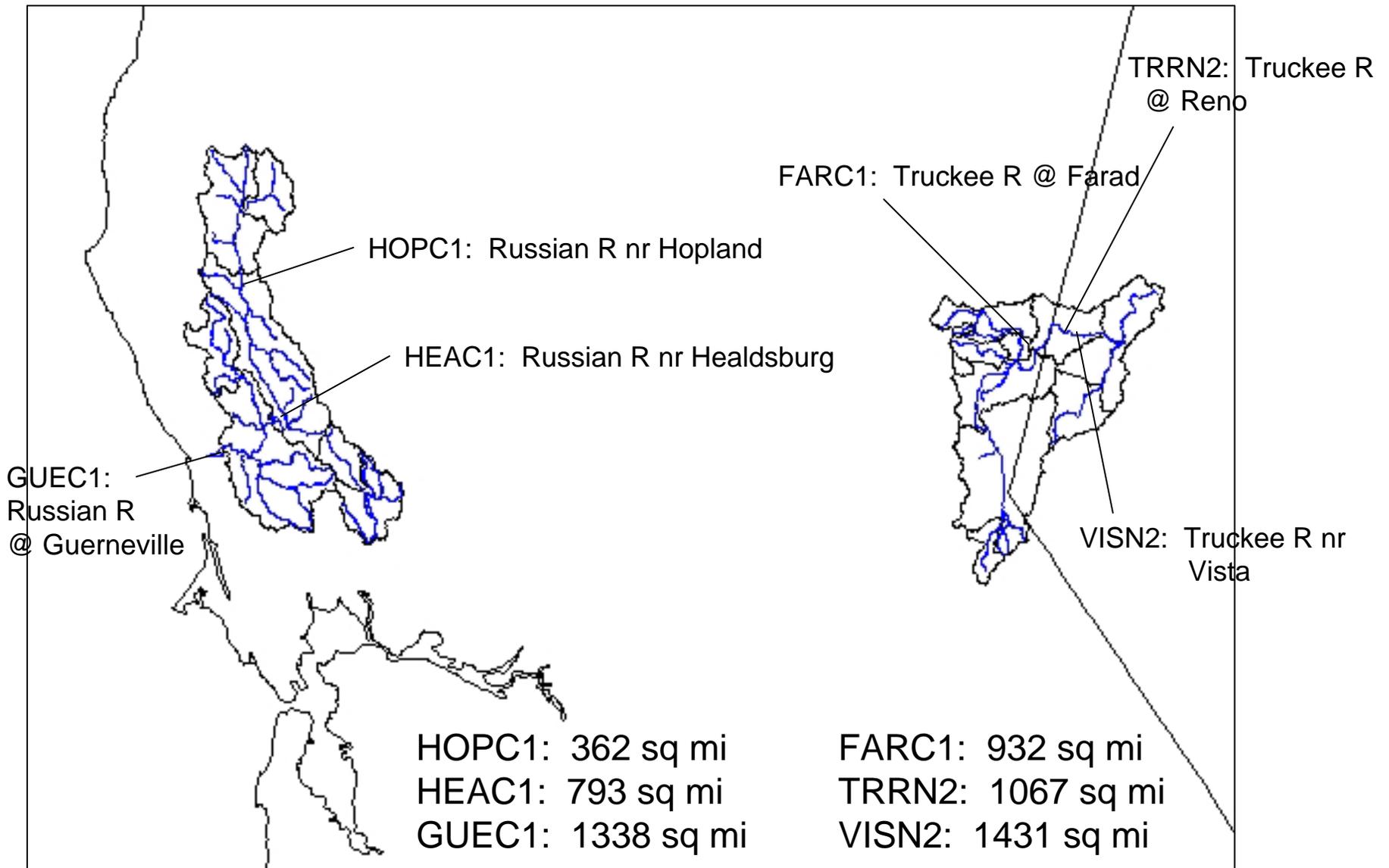
There is a limited amount of data stored in the CNRFC archive database. More or less complete forecast data is available from 2004 to the present. Originally, I wanted to do verification on a similar event for the basin in the past. I found that I would need to go back to February 1986 to find a event comparable as what happened on the Truckee in 2006.

Since forecast data is unavailable for February 1986, I propose to verify forecasts for the Russian River Basin in central California; which also experienced flooding during New Year 2006.



HOPC1: 362 sq mi
HEAC1: 793 sq mi
GUEC1: 1338 sq mi

FARC1: 932 sq mi
TRRN2: 1067 sq mi
VISN2: 1431 sq mi





2 Water-Quality Data for the Lower Russian River Basin, Sonoma County, California, 2003–2004

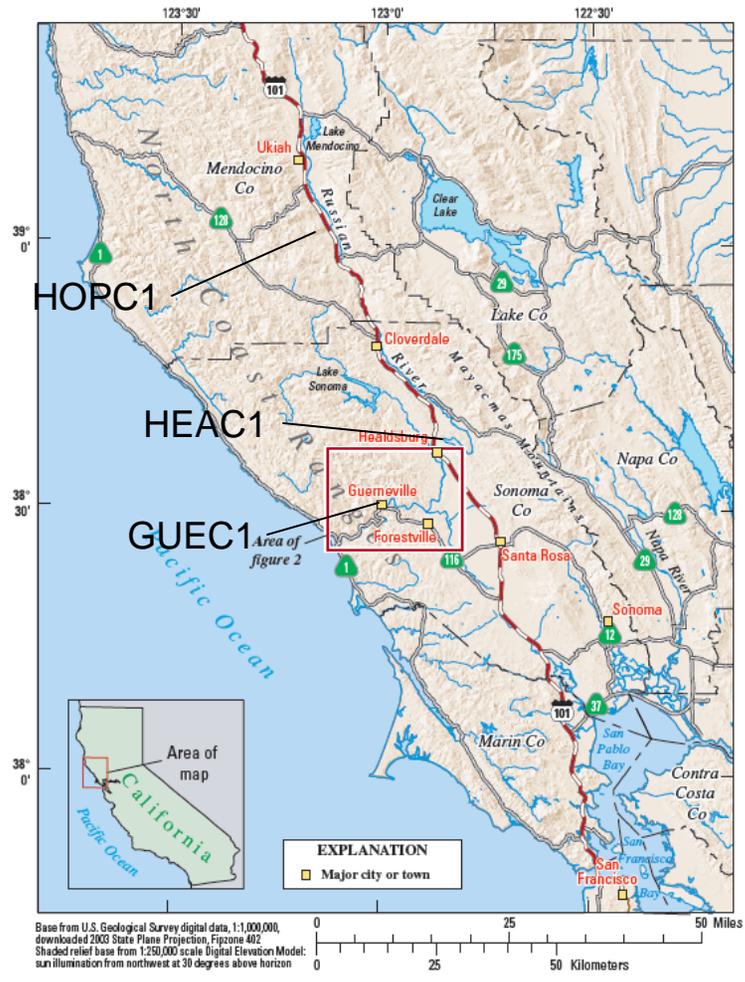
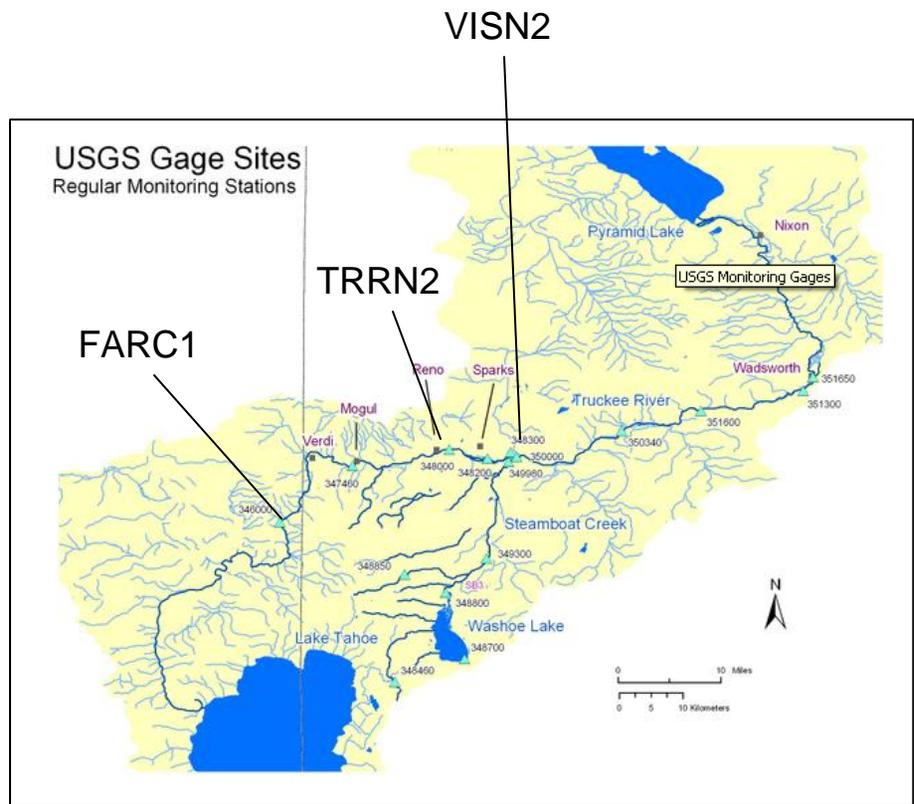


Figure 1. Location of the Russian River in Mendocino and Sonoma Counties, California.

Russian River Basin



Truckee River Basin



Questions



The Russian River at Guerneville crested over 9 feet above flood stage on January 1, 2006.

Compare the Russian River forecast performance with the Truckee River during the 2006 New Year's flood event.



Event Summary



Russian River: Precipitation Begins: Dec 27, 2005 12Z
Precipitation Ends: Jan 03, 2006 18Z

Santa Rosa Airport received about 5.40 inches of rain in a 48-hour period, 12-30-2005 to 01-01-2006, the average amount of precipitation for December is 4.50 inches.

HOPC1: crest 12/31/05 0700 hrs, 26.8 ft, 36,880 cfs, FS 21 feet
HEAC1: crest 12/31/06 2300 hrs, 23.2 ft, 58,650 cfs, FS 19 feet
GUEC1: crest 01/01/06 0400 hrs, 41.7 ft, 73,500 cfs, FS 32 feet



Event Summary



Truckee River: Precipitation Begins: Dec 26, 2005 06Z
Precipitation Ends: Jan 3, 2006 18Z

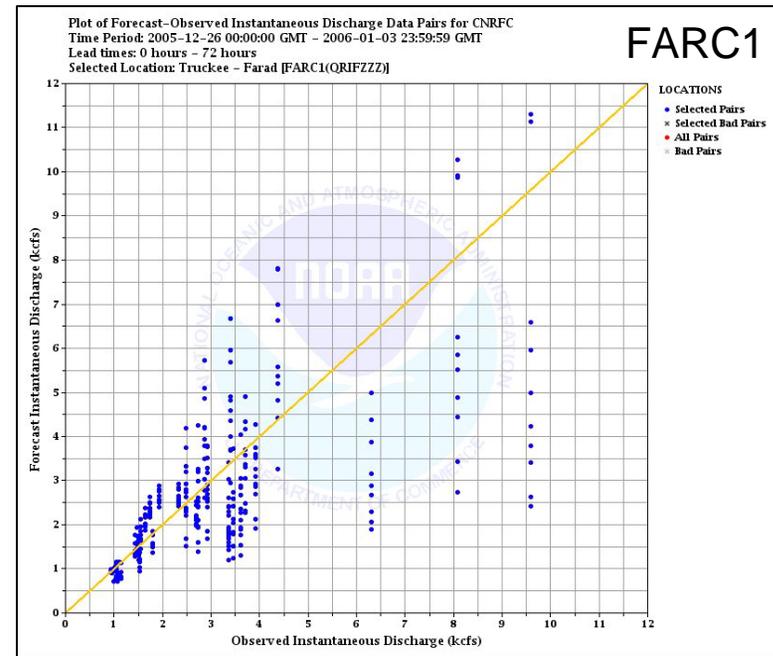
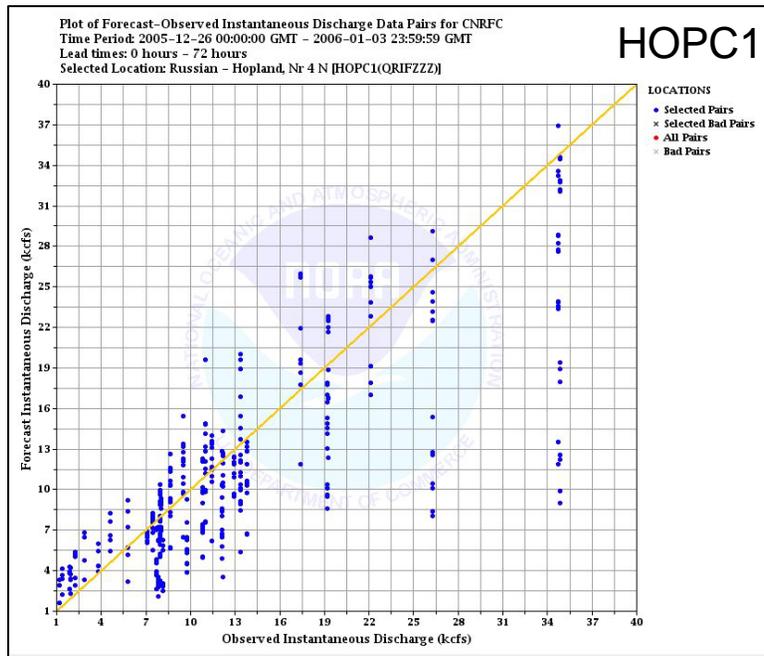
Reno-Tahoe International Airport received about 1.71 inches of rain in a 48-hour period, 12-30-2005 to 01-01-2006, the average amount of precipitation for December is 0.88 inches.

FARC1: crest 12/31 1230 hrs 10.77 ft, 10100 cfs, FS 11 feet
TRRN2: crest 12/31 1600 hrs ~12.5 ft, ~16,400 cfs, FS 11 feet
VISN2: crest 12/31 1930 hrs 20.28 ft, 13,700 cfs, FS 15 feet
Steamboat Creek: crest 12/31 1215 hrs 8.5 ft, 3600 cfs

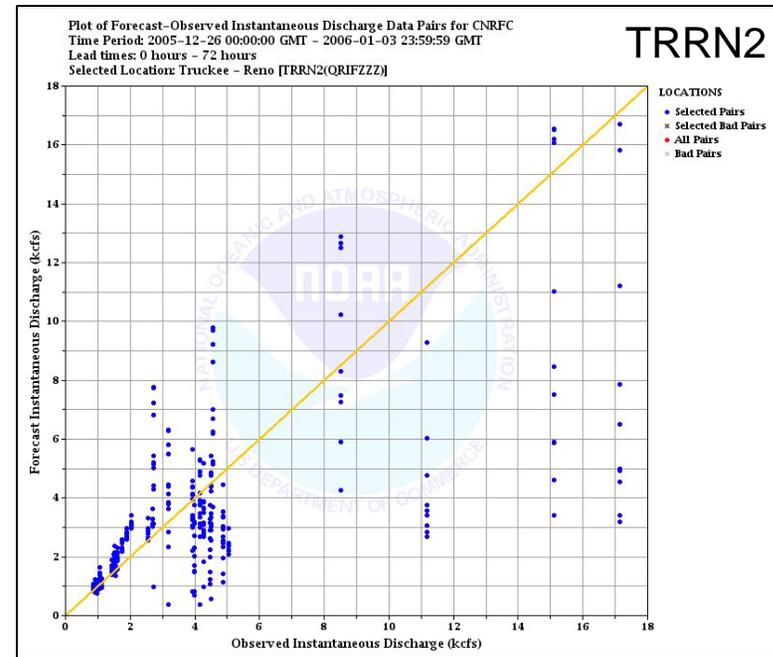
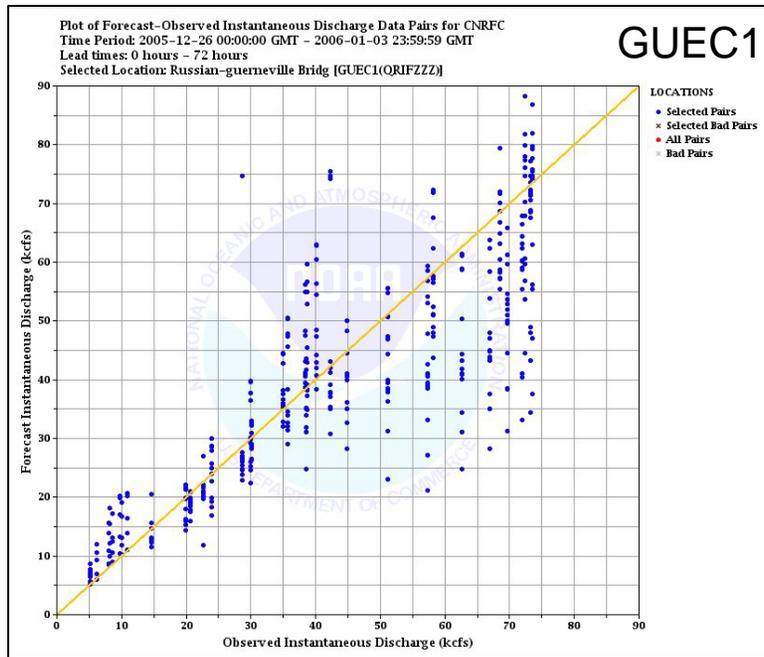
Russian

Scatterplots - Flow

Truckee

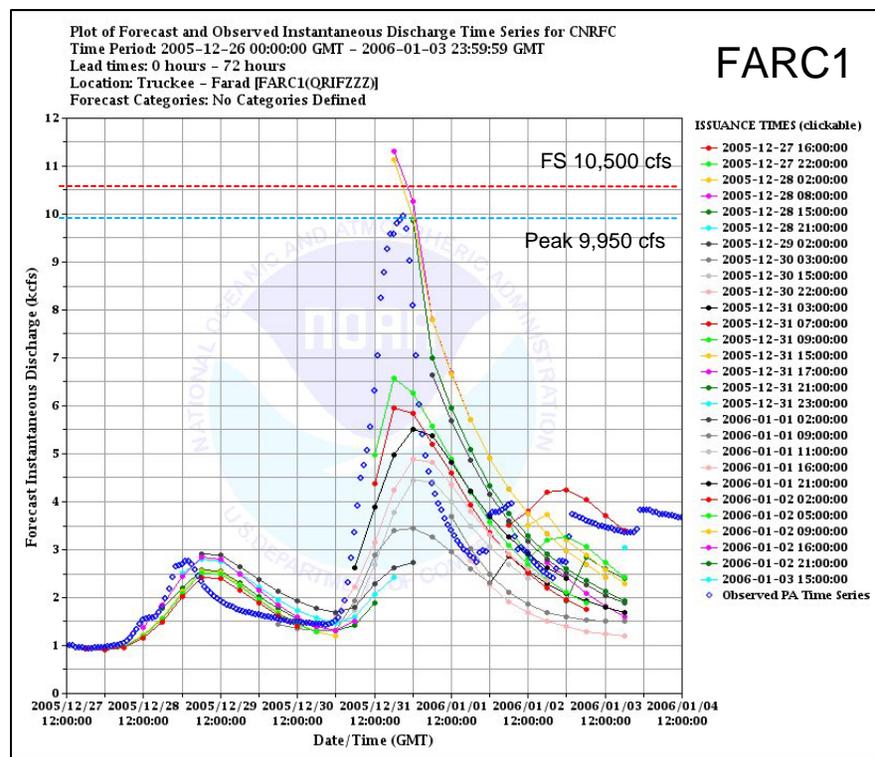
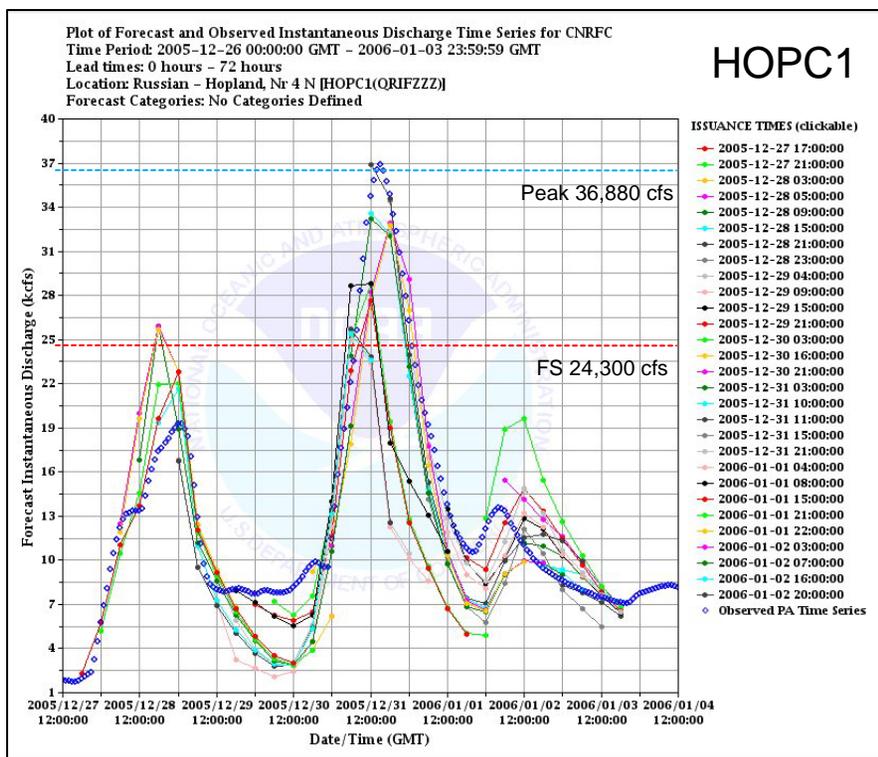


Upstream

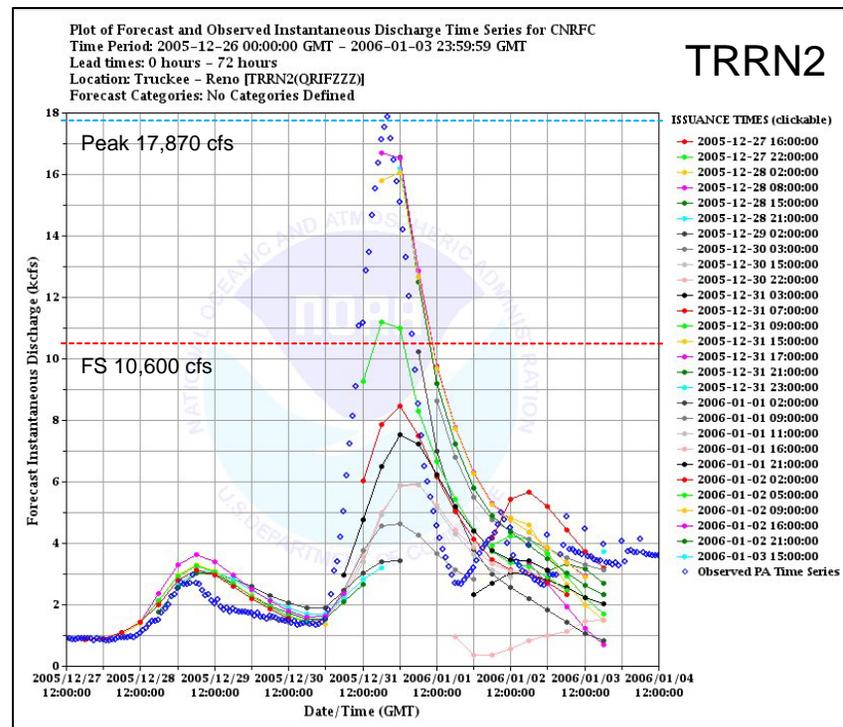
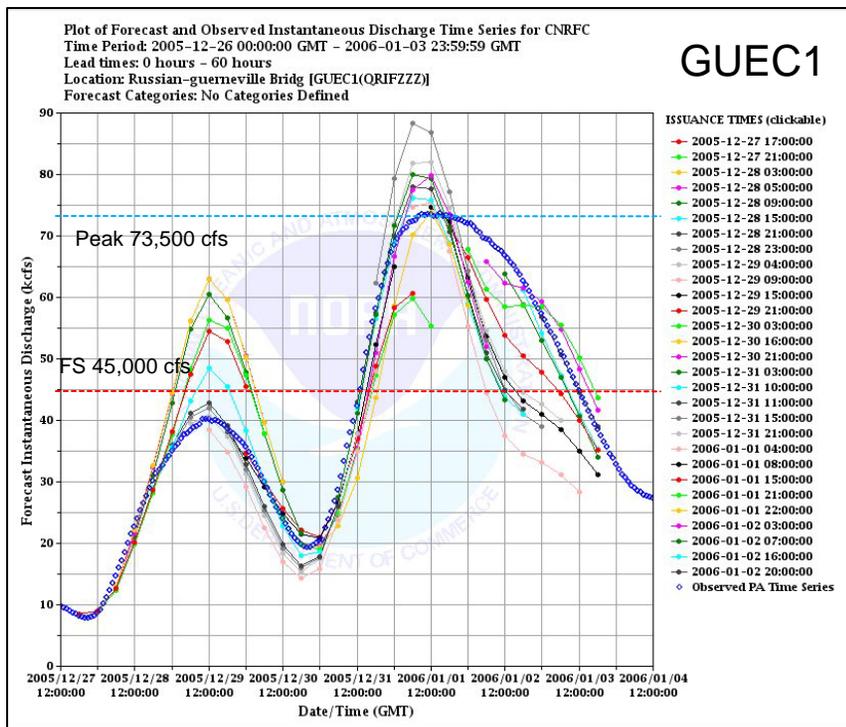


Downstream

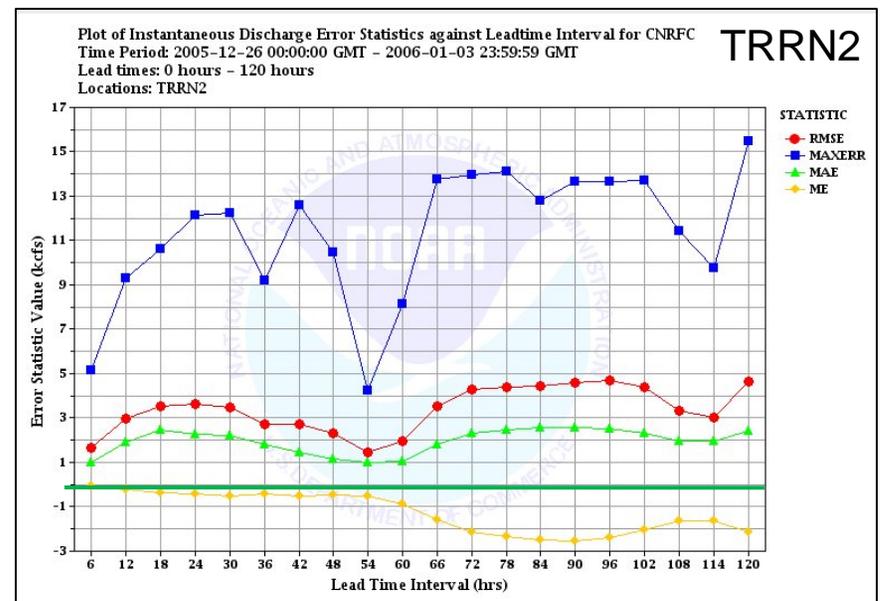
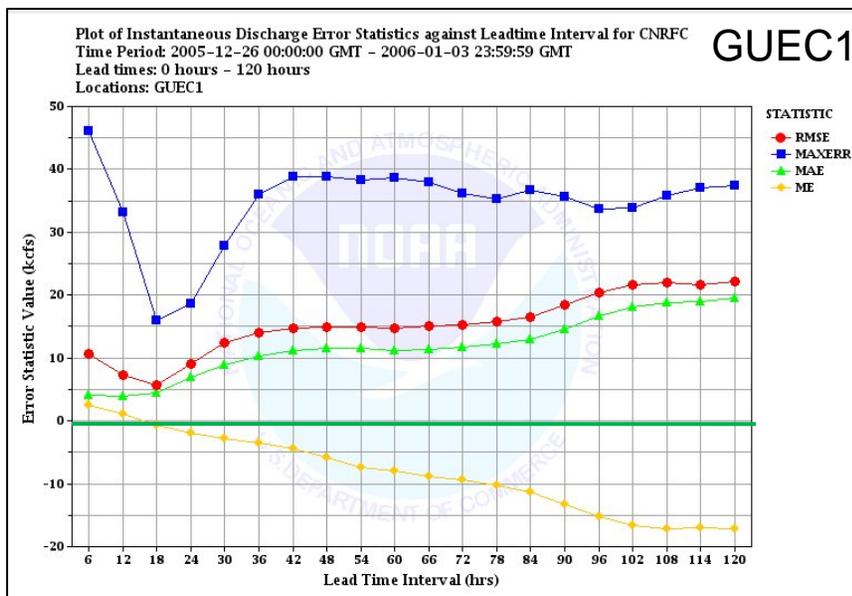
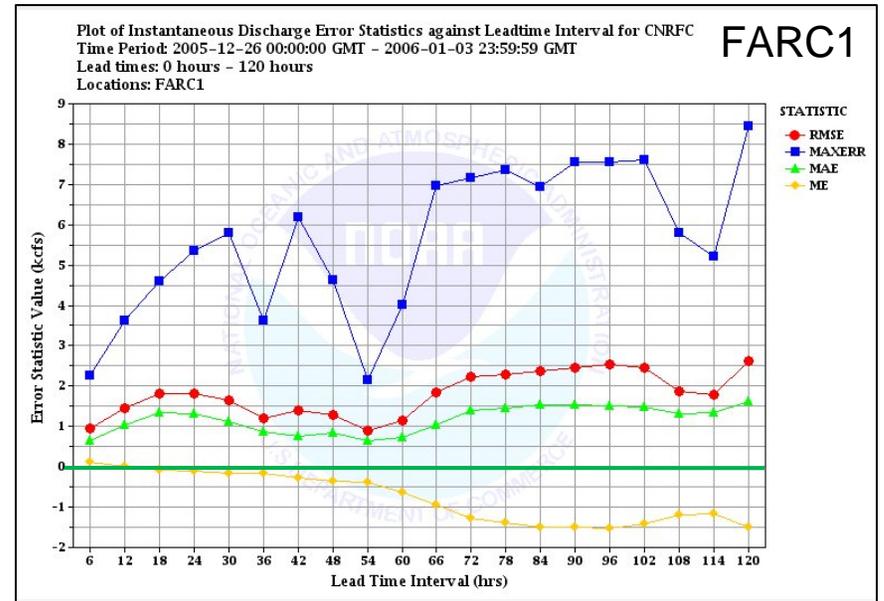
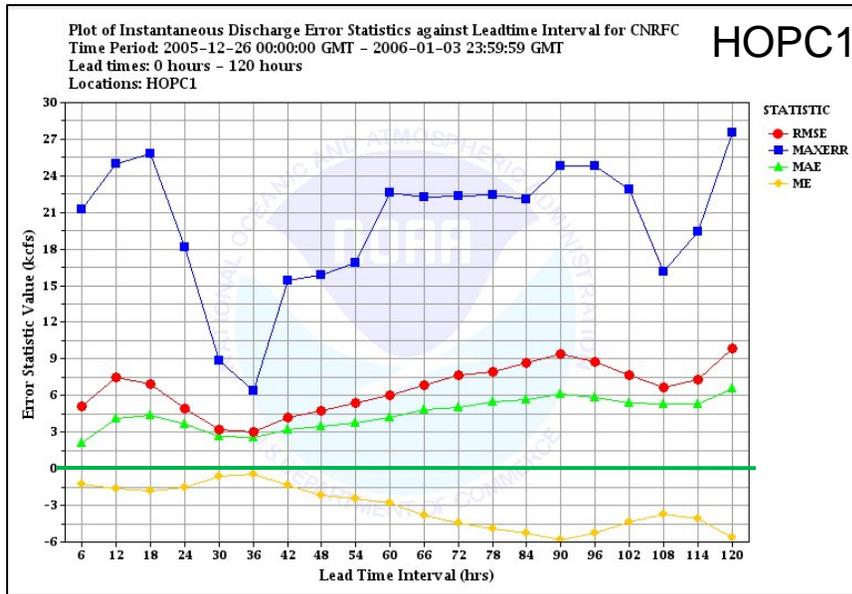
Time Series - Flow



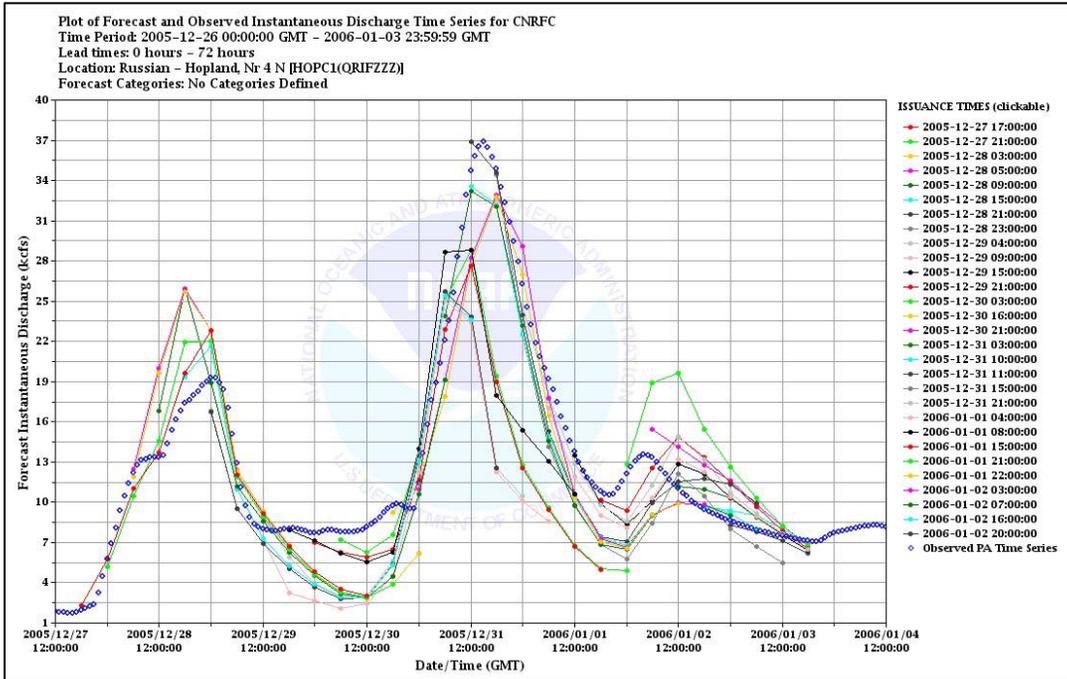
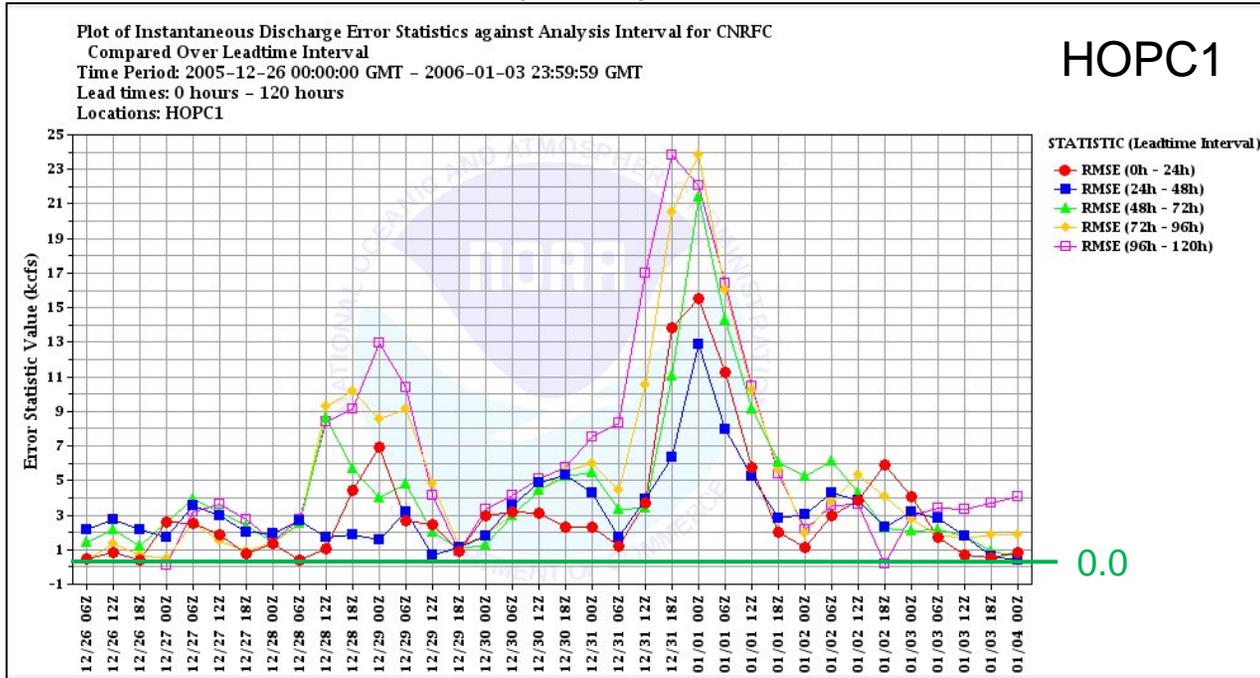
Time Series - Flow



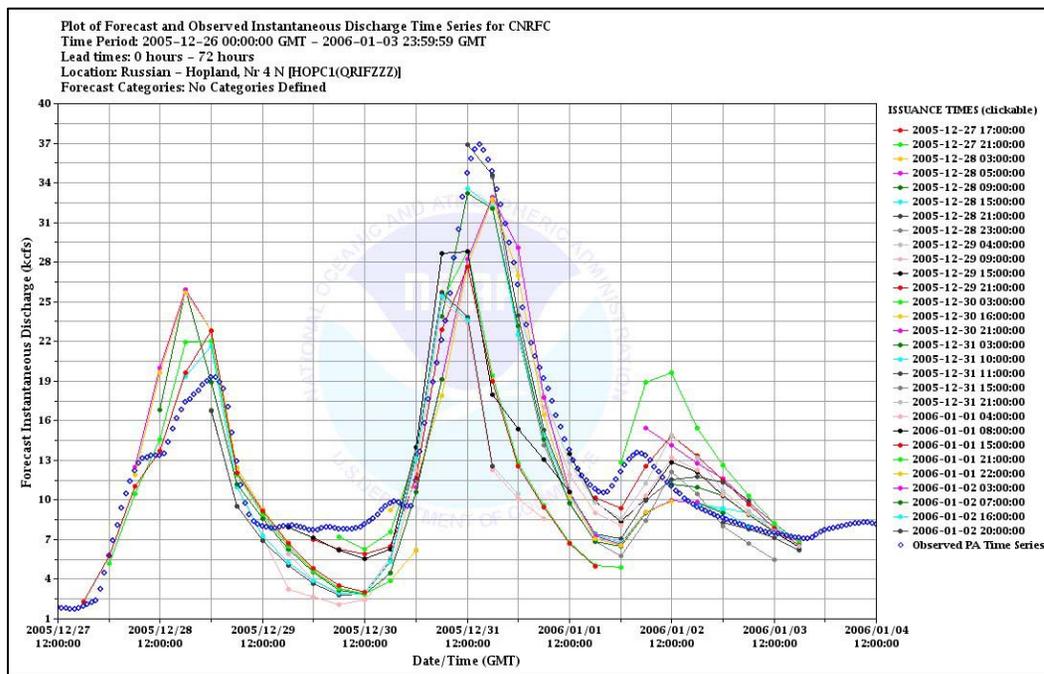
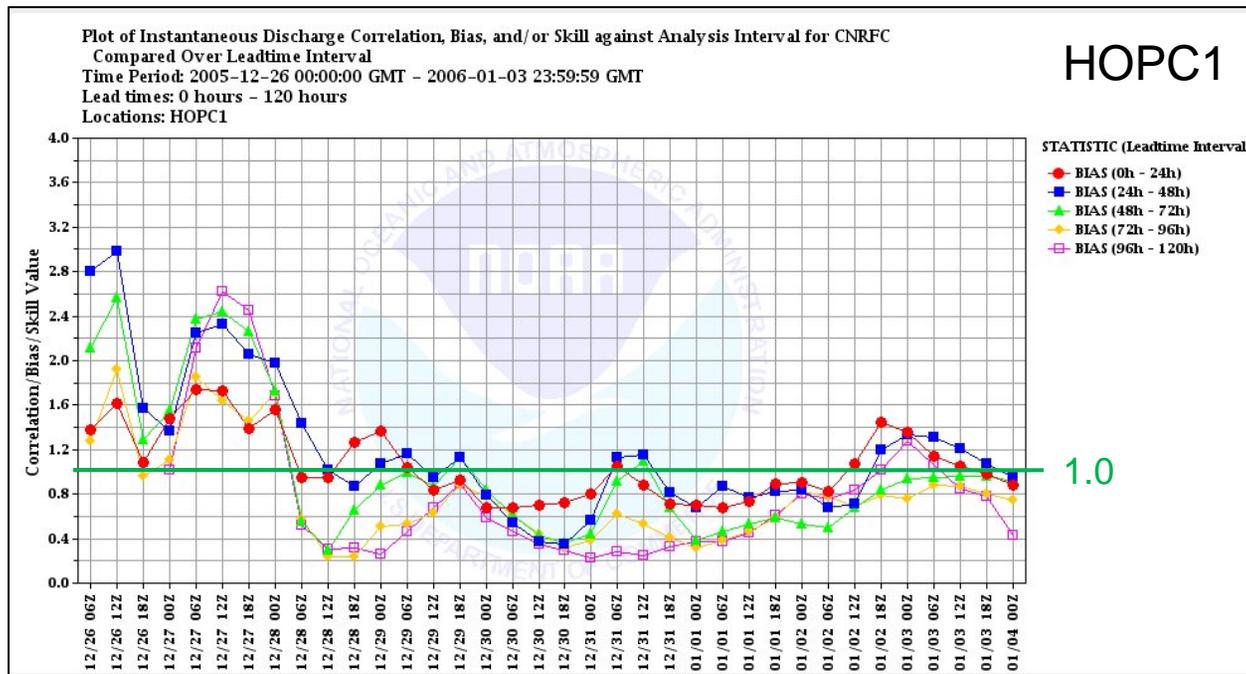
Flow Forecast Statistics by Lead Time – Full Time Series



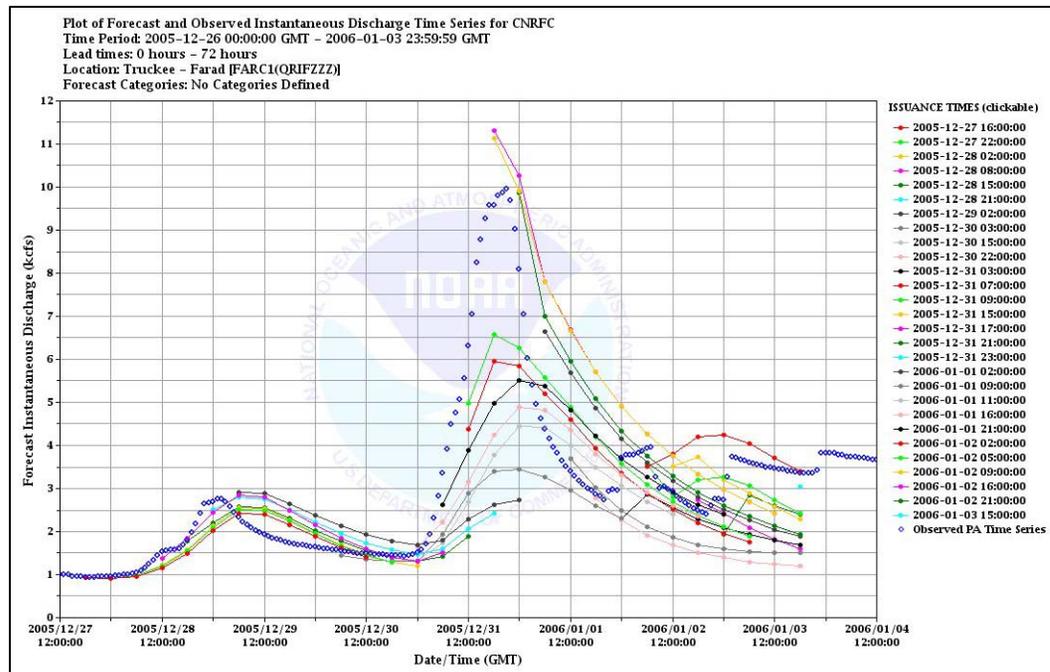
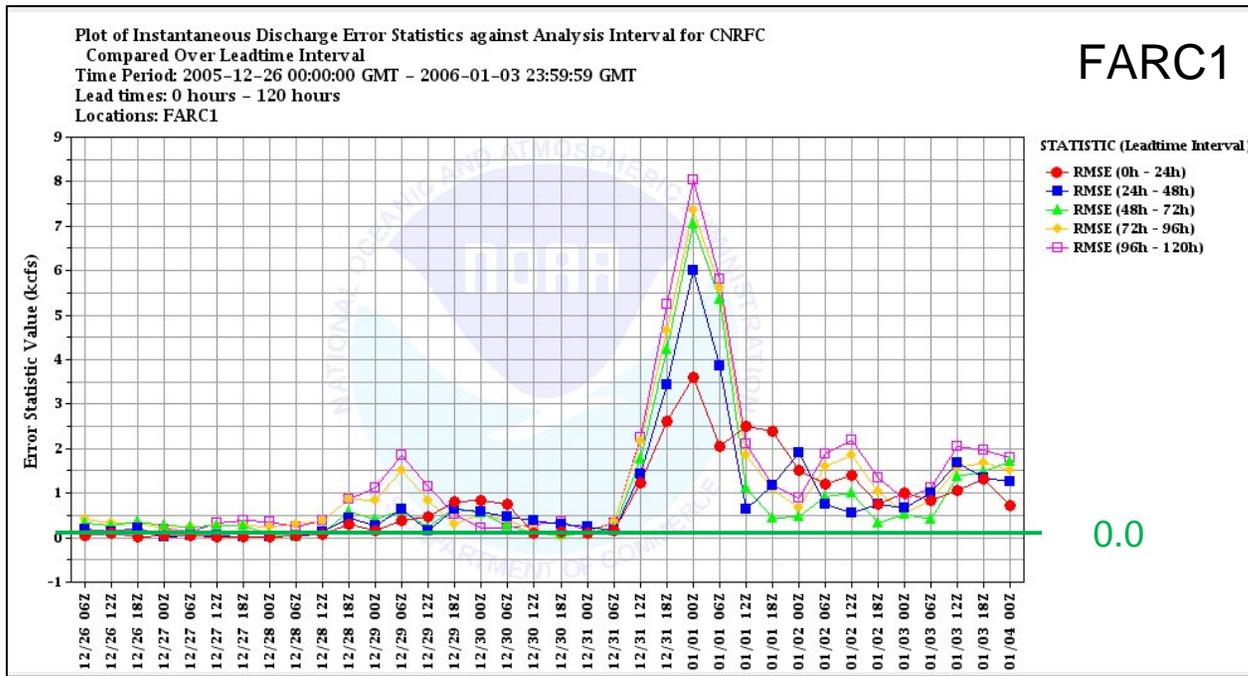
RMSE by Analysis Interval for Flow



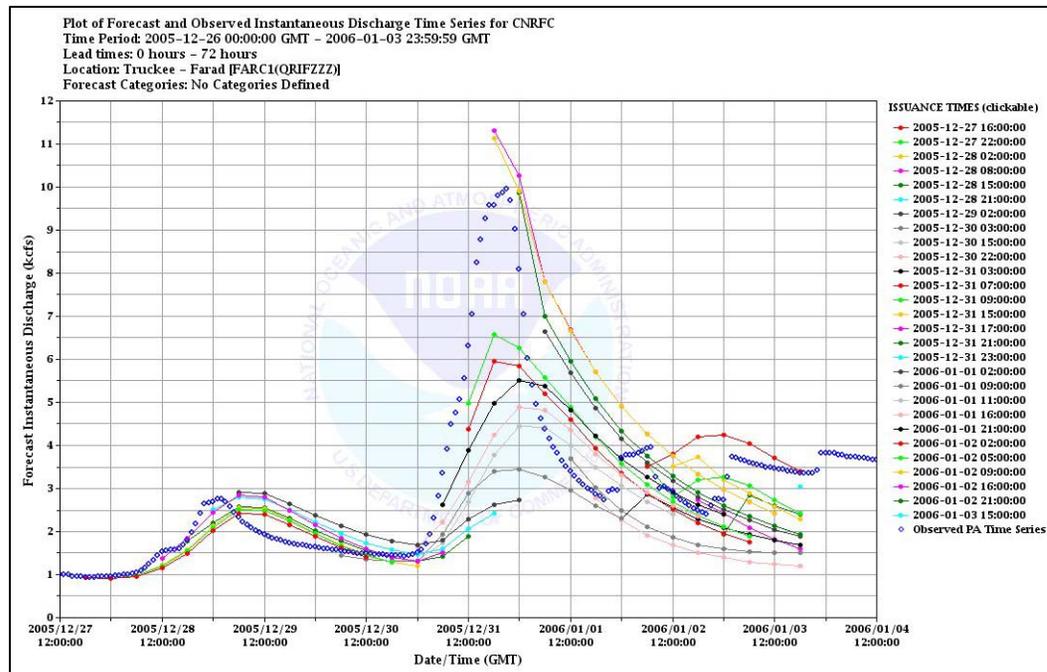
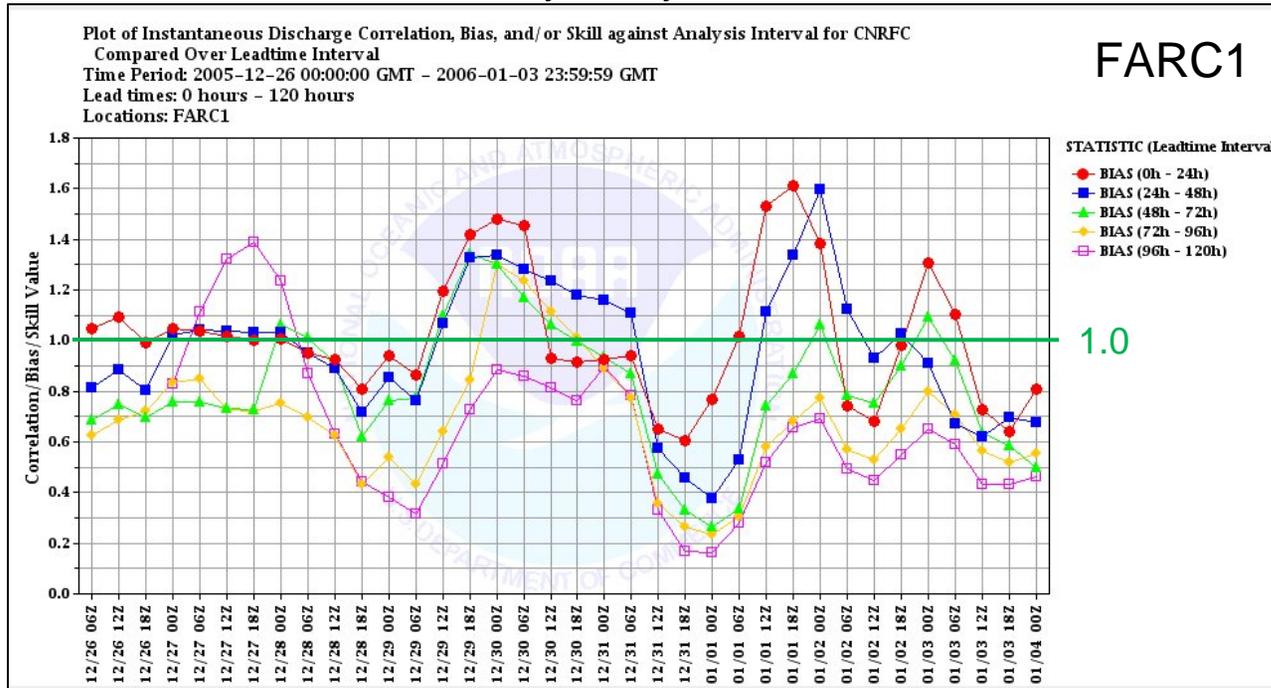
Bias by Analysis Interval for Flow



RMSE by Analysis Interval for Flow



Bias by Analysis Interval for Flow



QPFs are issued by the HAS unit. The CNRFC HAS is a dedicated unit, 3 CNRFC and 1 CADWR meteorologists.

The HAS unit issues 0-72 hour 6-hourly QPF and snow level.

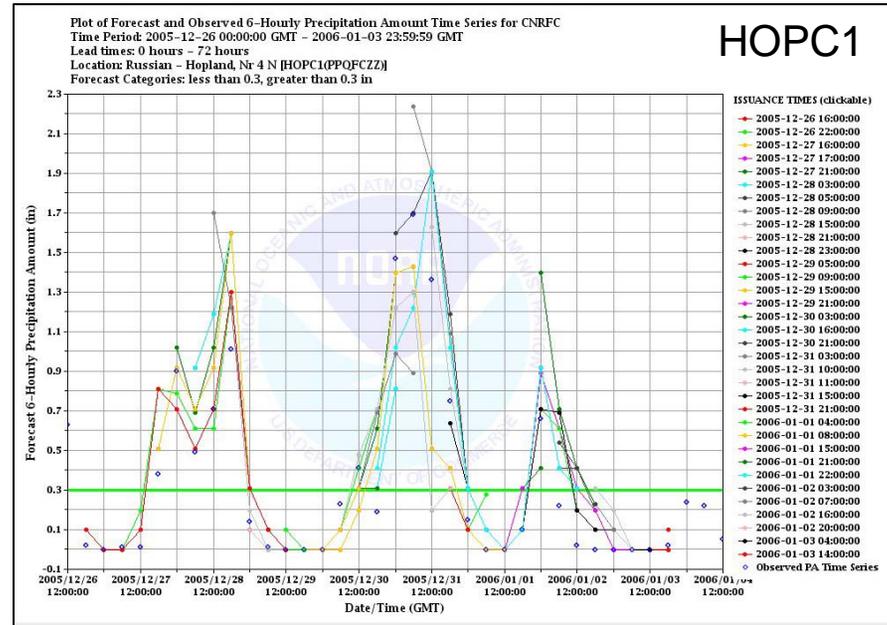
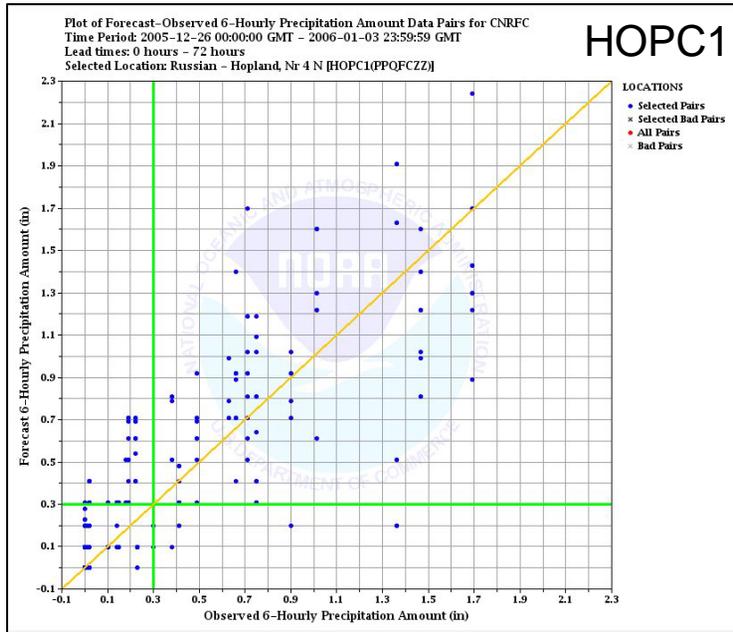
Also issued are 72-120 hour 6-hourly QPF using Owen Rhea's orographic aid based on GFS gridded output. The Rhea orographic aid is not verified for this case study.

HAS unit coverage: 12-hour coverage M/F
16-24 hour during floods (24 hours during this event)

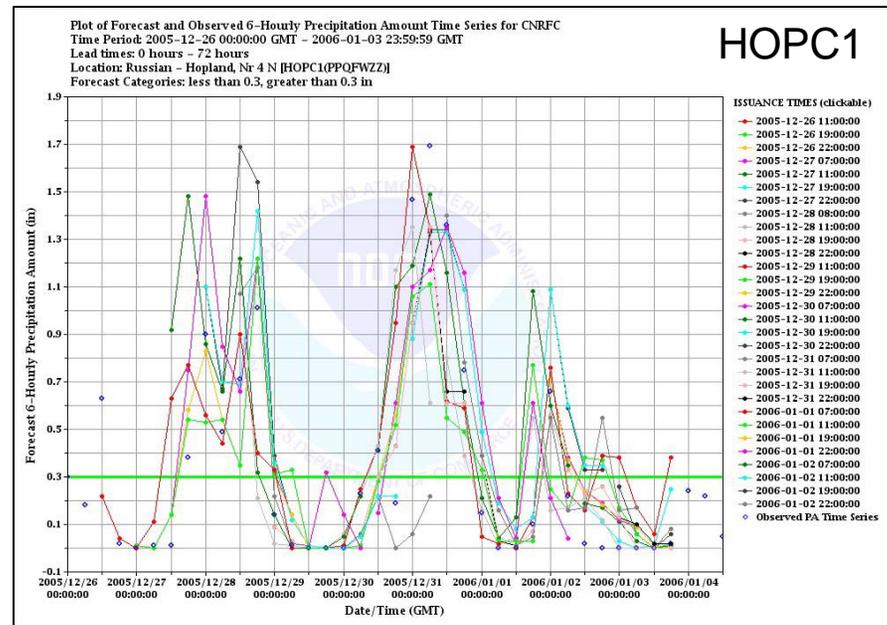
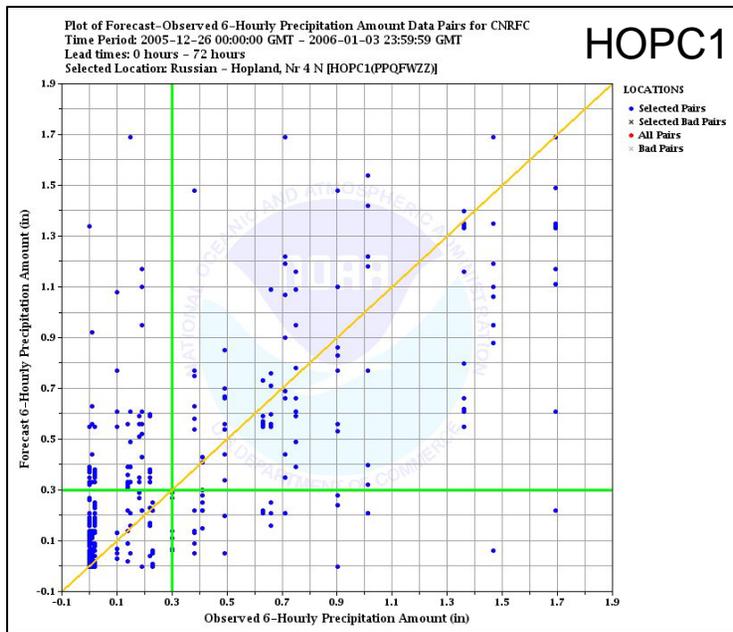
Temperature forecasts: use MOS max/min guidance from GFS model.
Ran temperature verification only for the Truckee River in this case study.



Scatterplot and Time Series for MAP

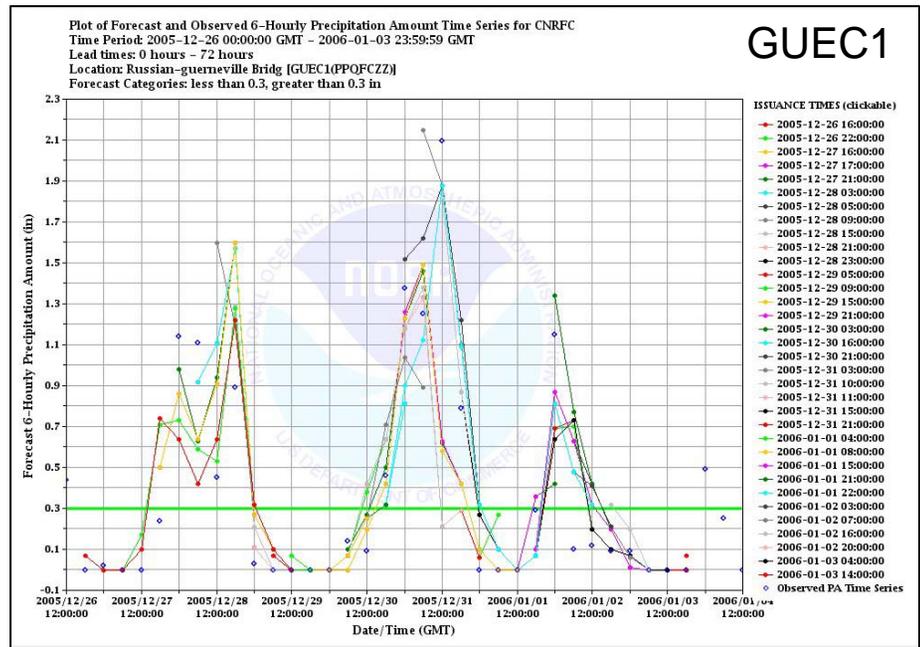
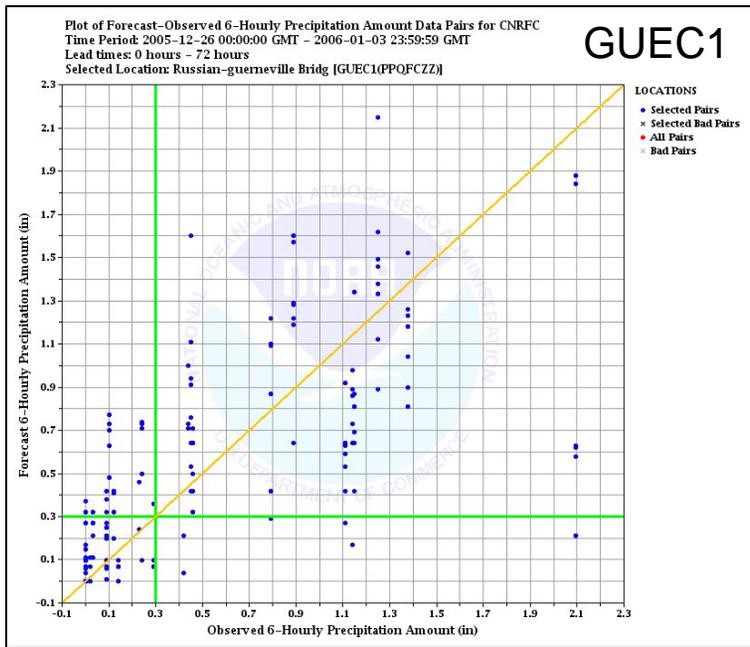


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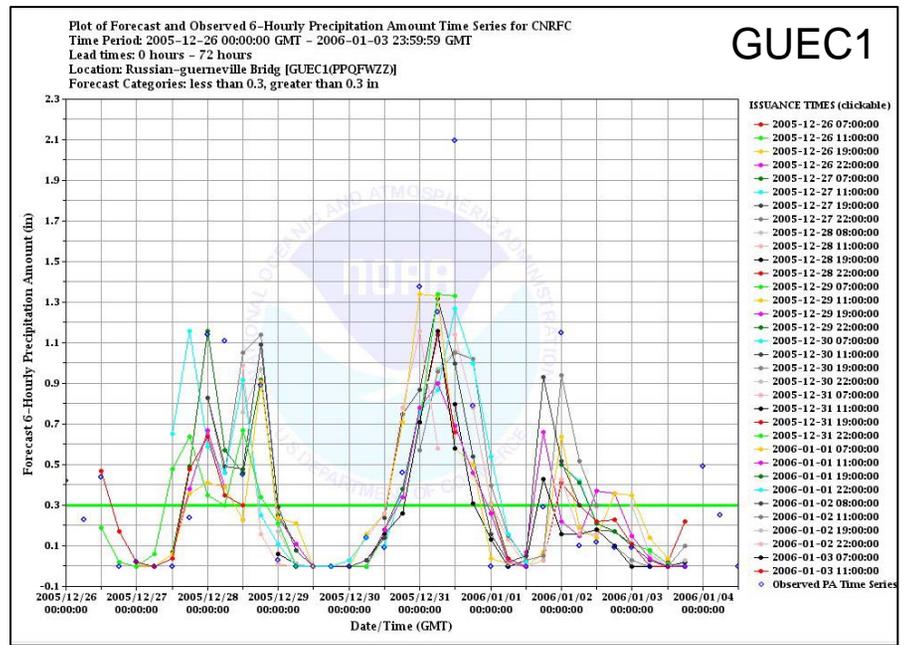
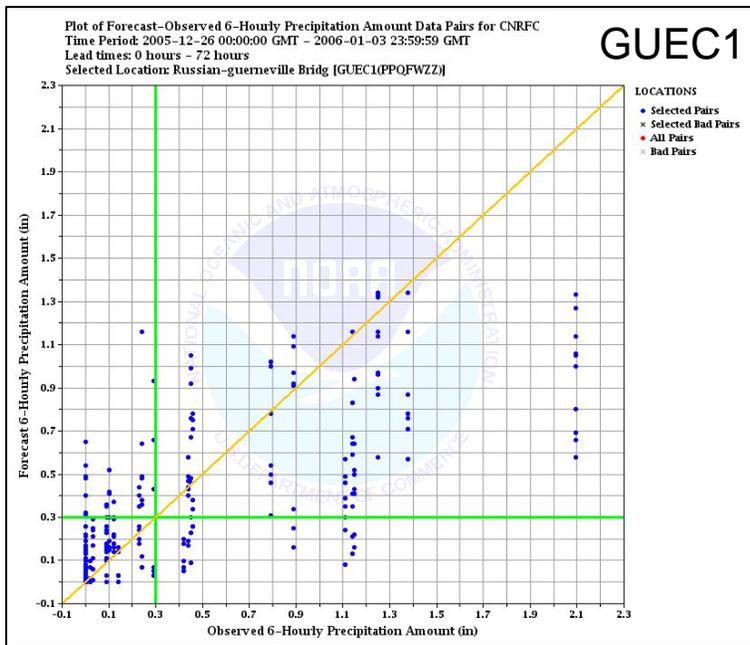


HPC

Scatterplot and Time Series for MAP

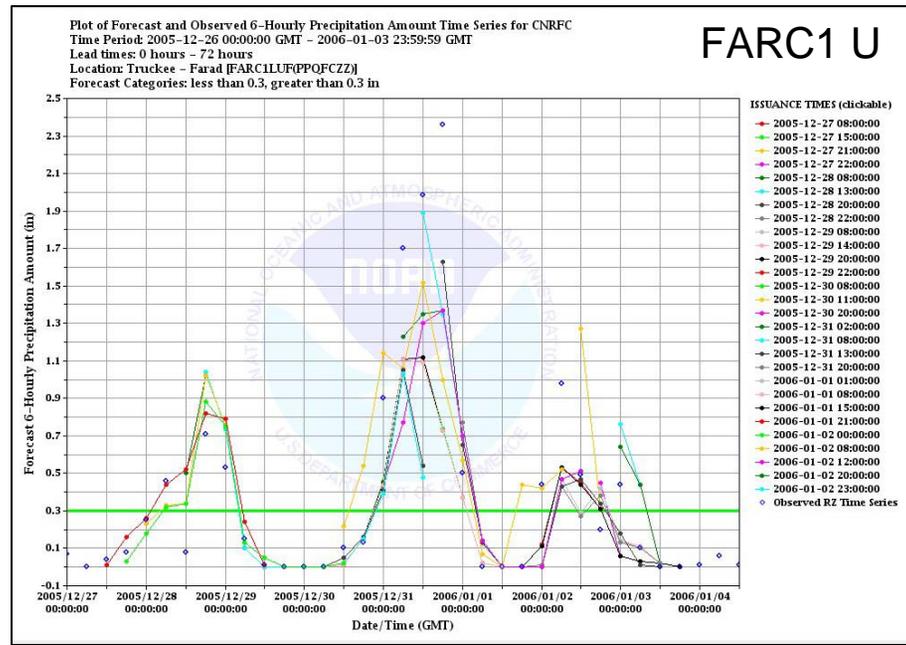
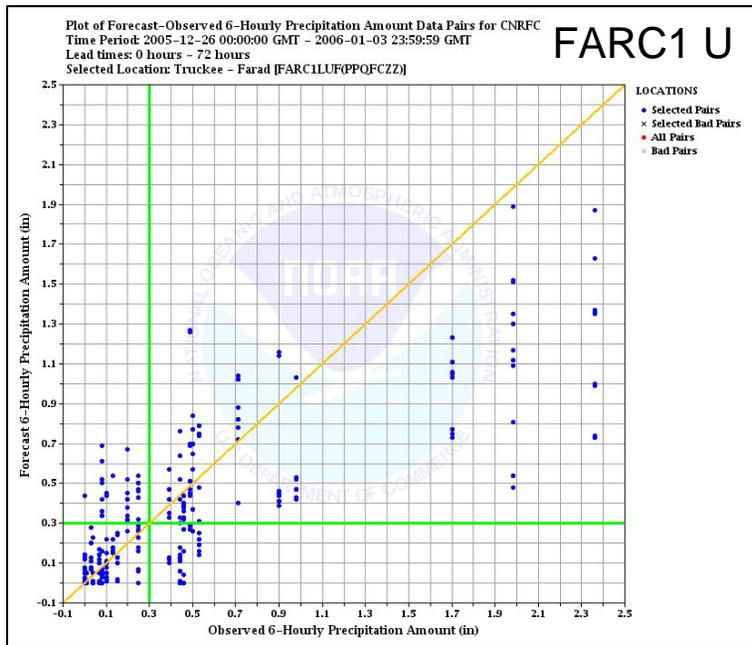


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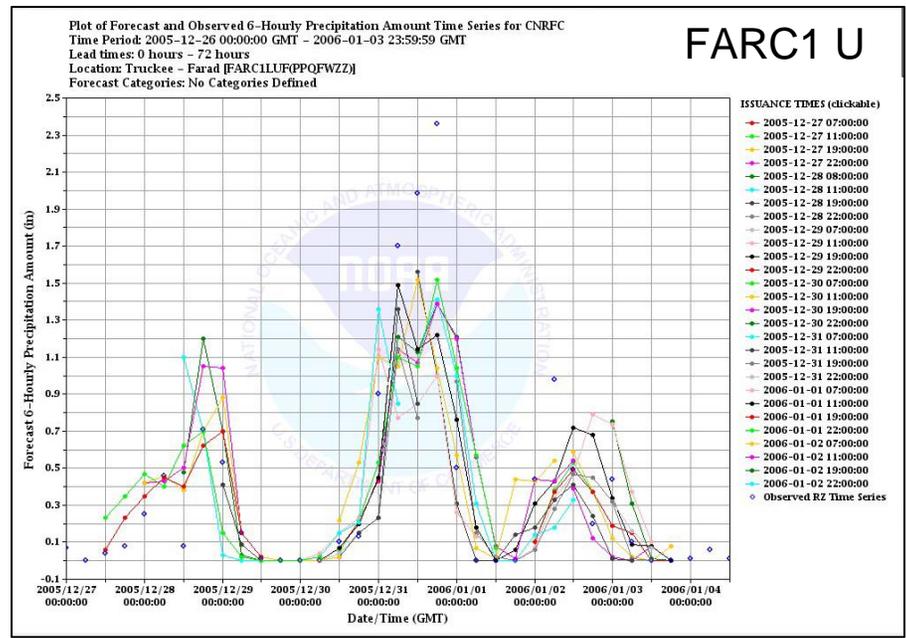
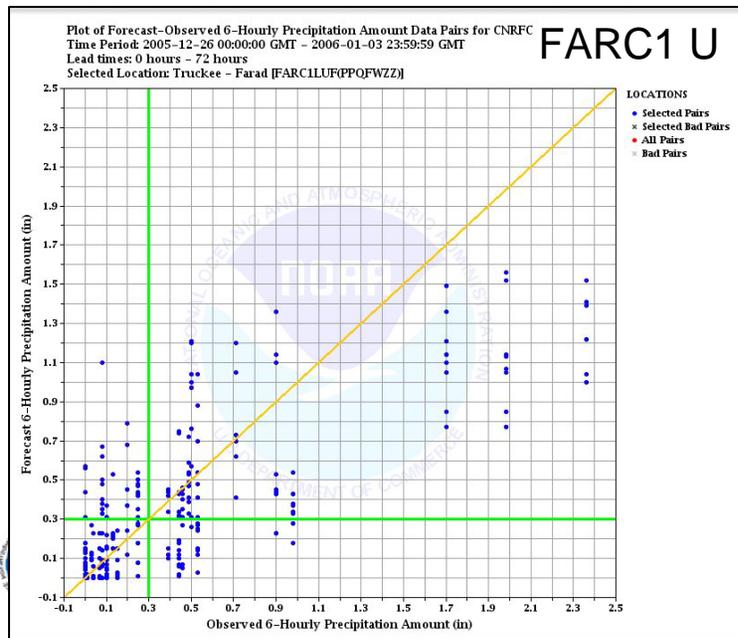


HPC

Scatterplot and Time Series for MAP – Farad Upper basin

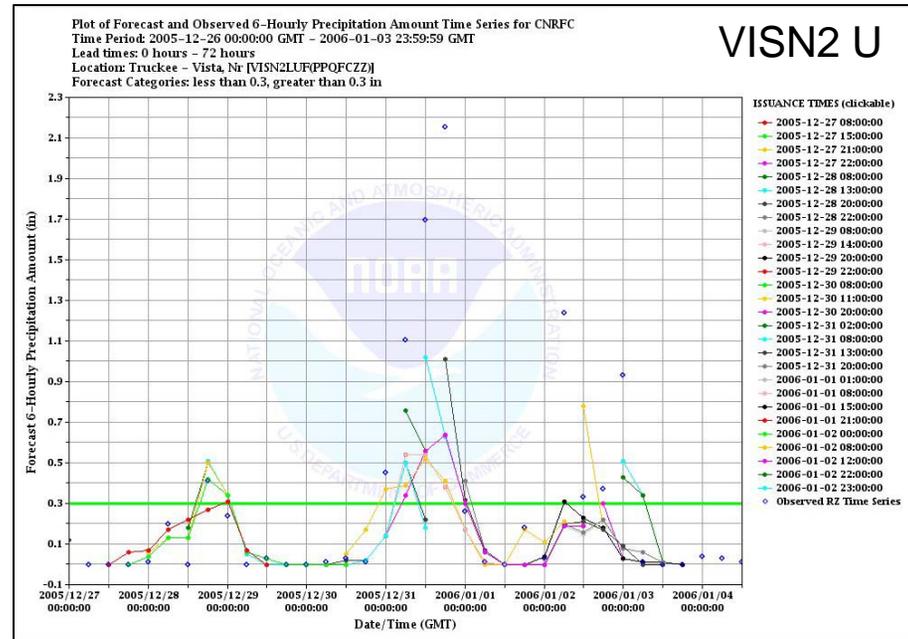
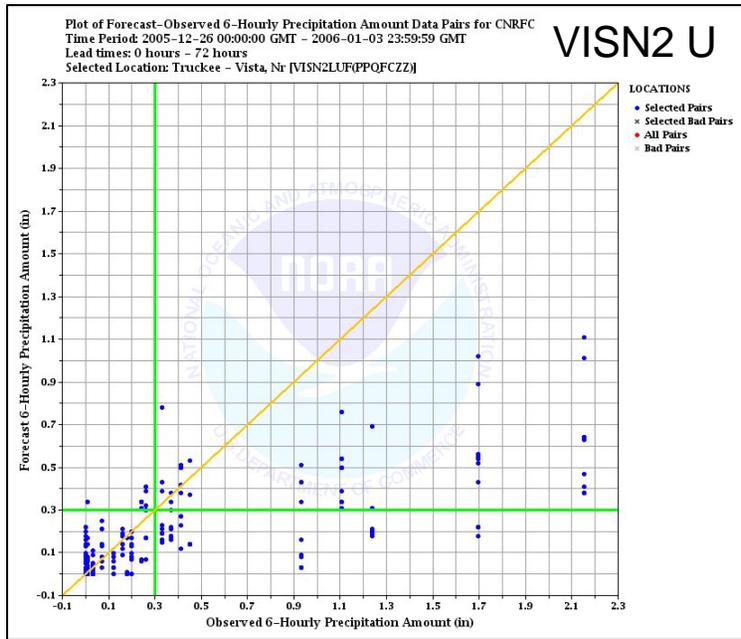


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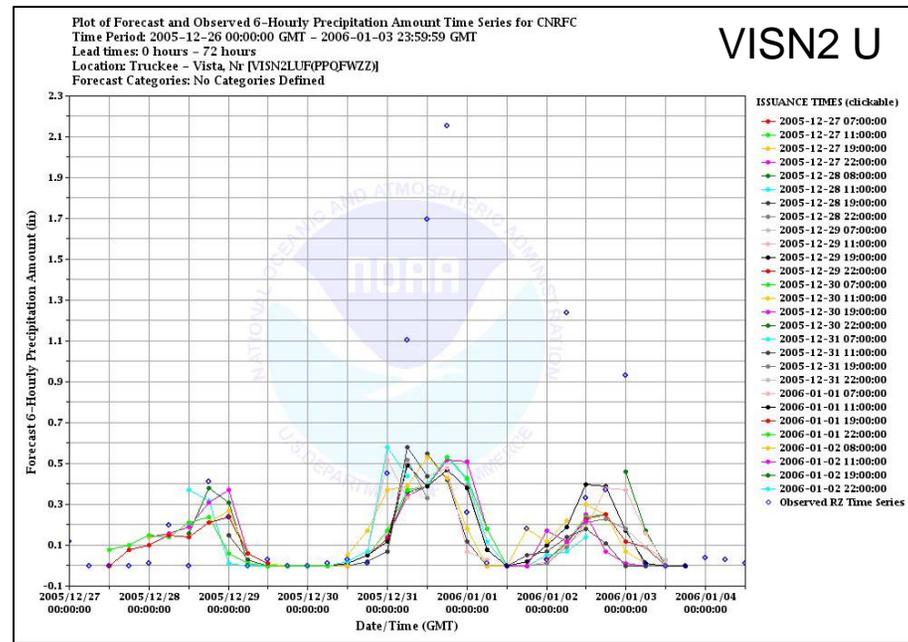
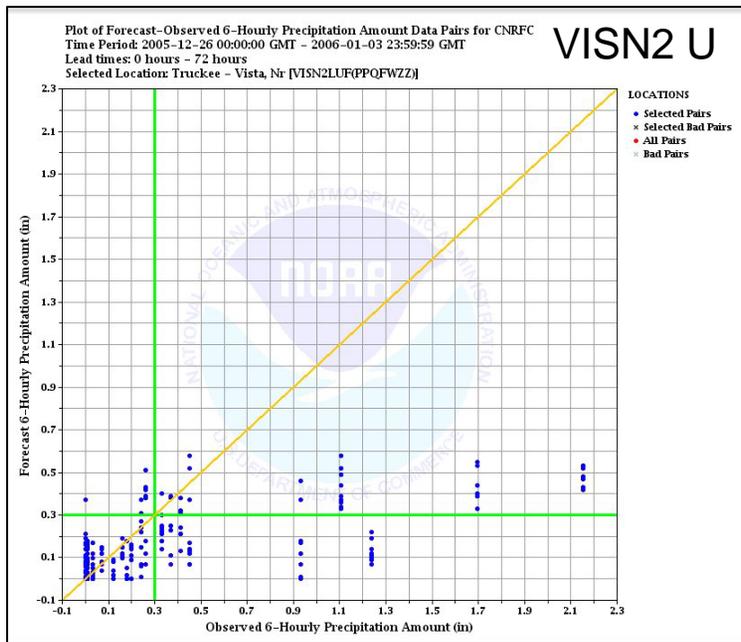


HPC

Scatterplot and Time Series for MAP – Vista Upper basin

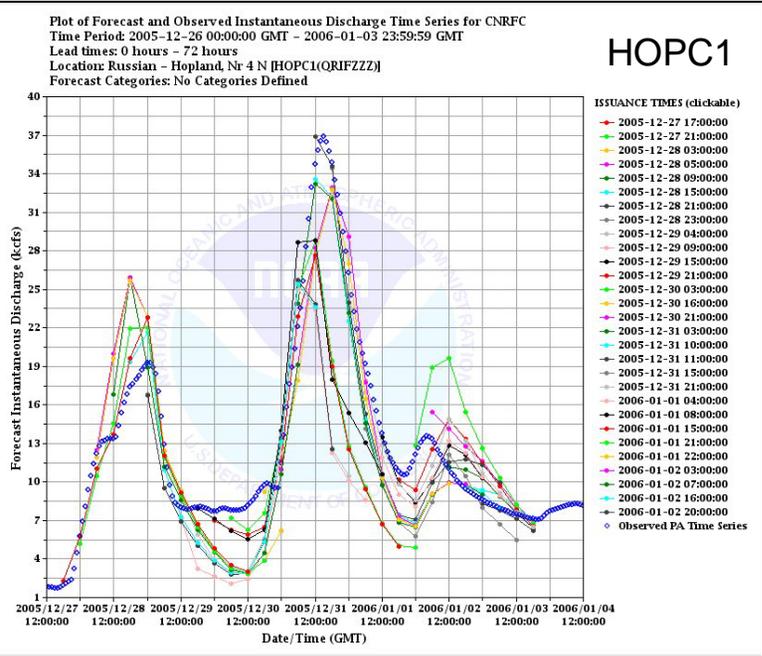
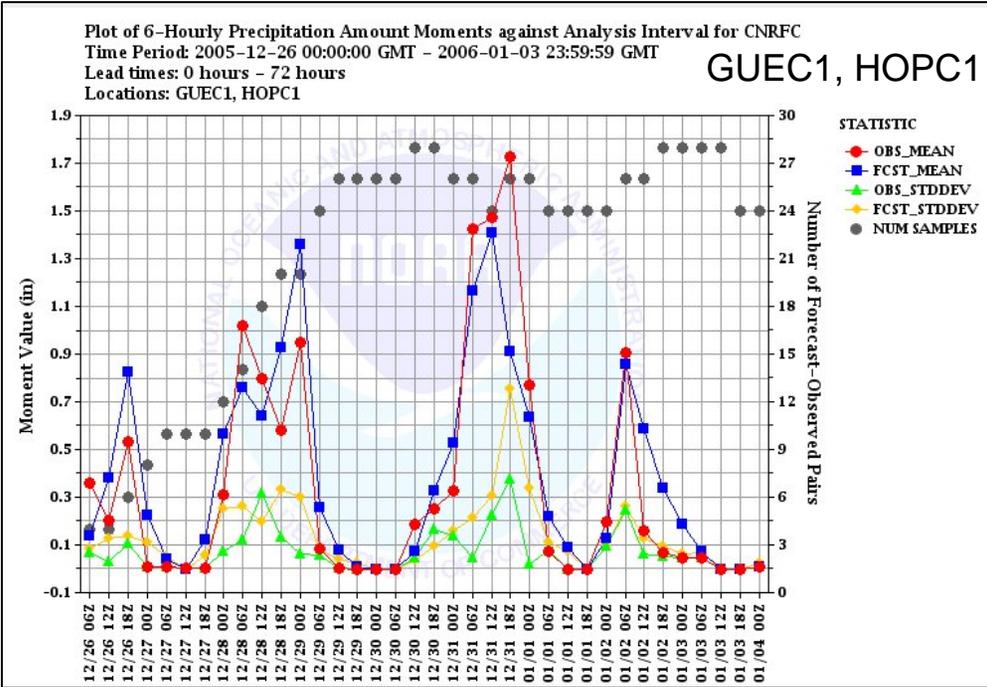


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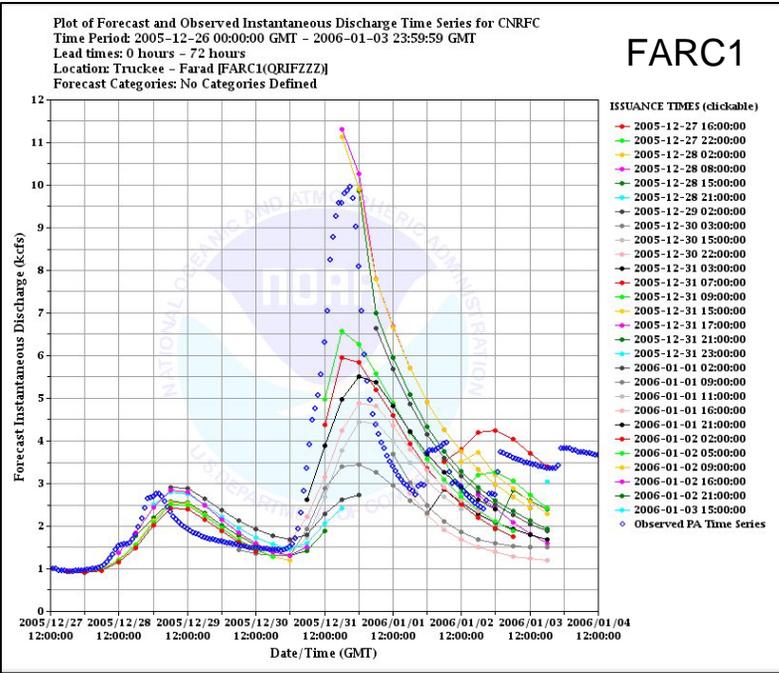
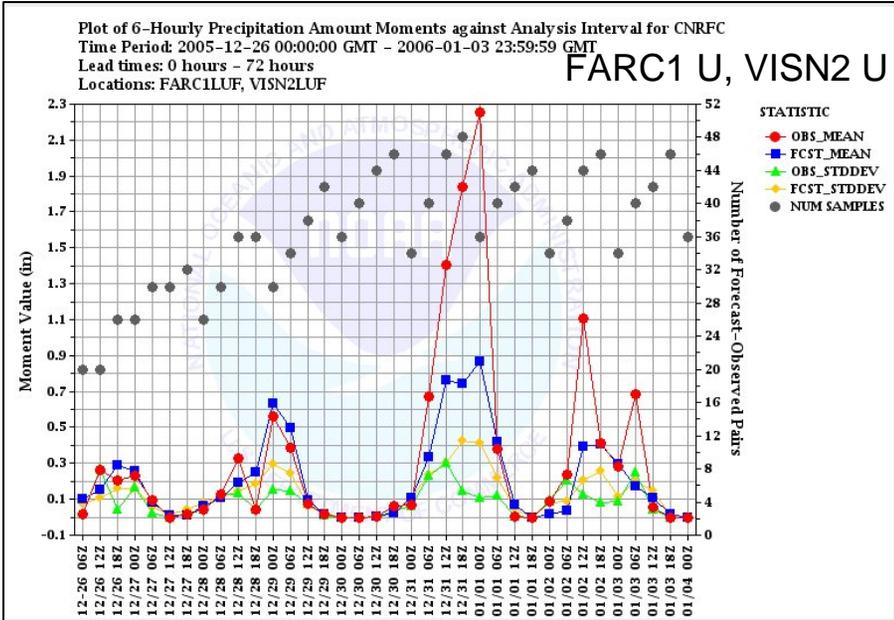


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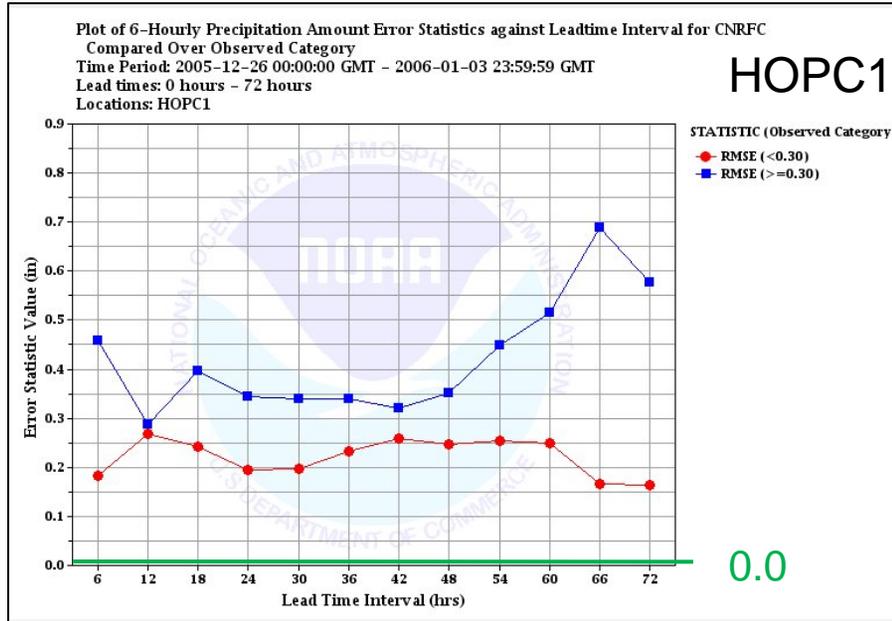
Moments – Russian River MAPs



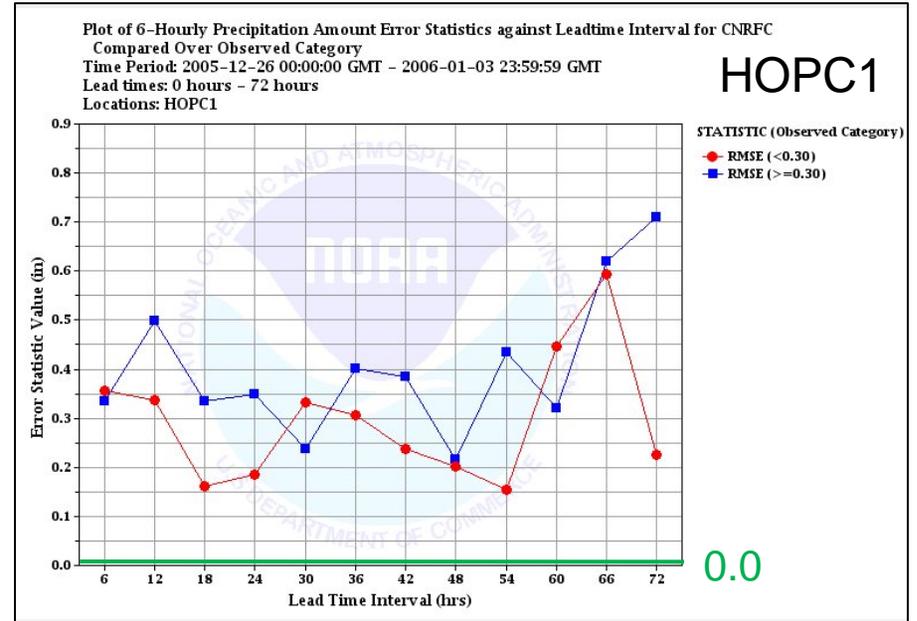
Moments – Truckee River MAPs



Leadtime Statistics for RMSE - MAP



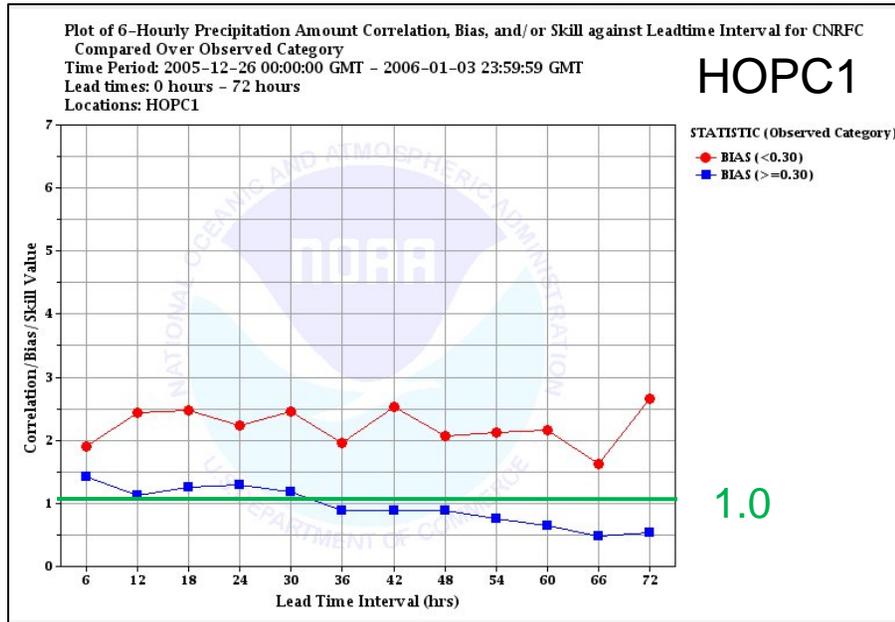
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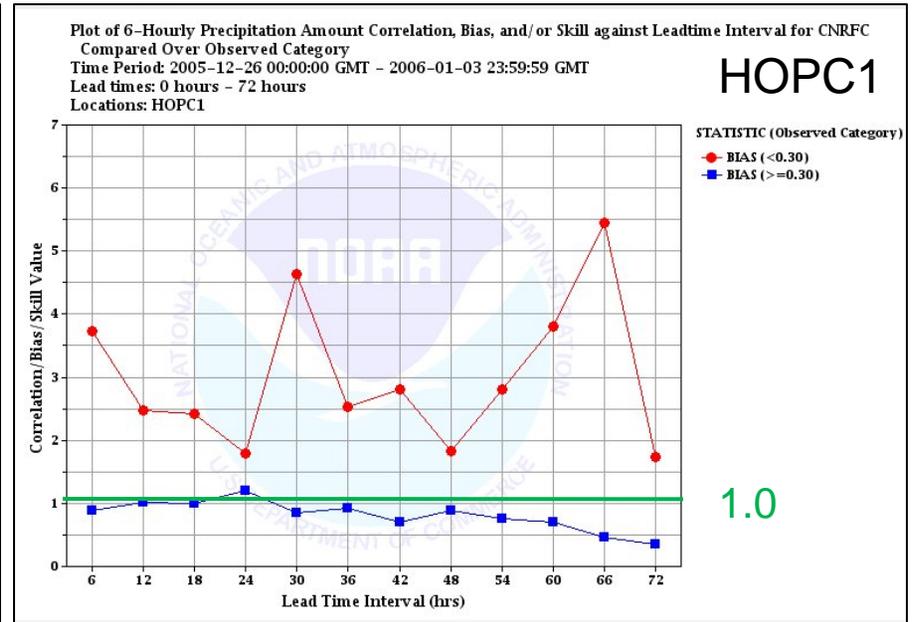
HPC



Leadtime Statistics for Bias - MAP



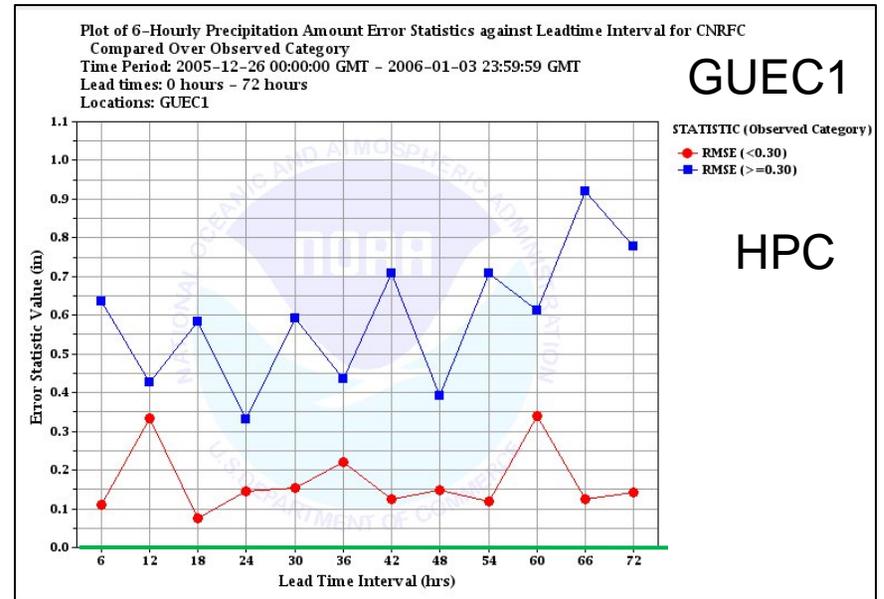
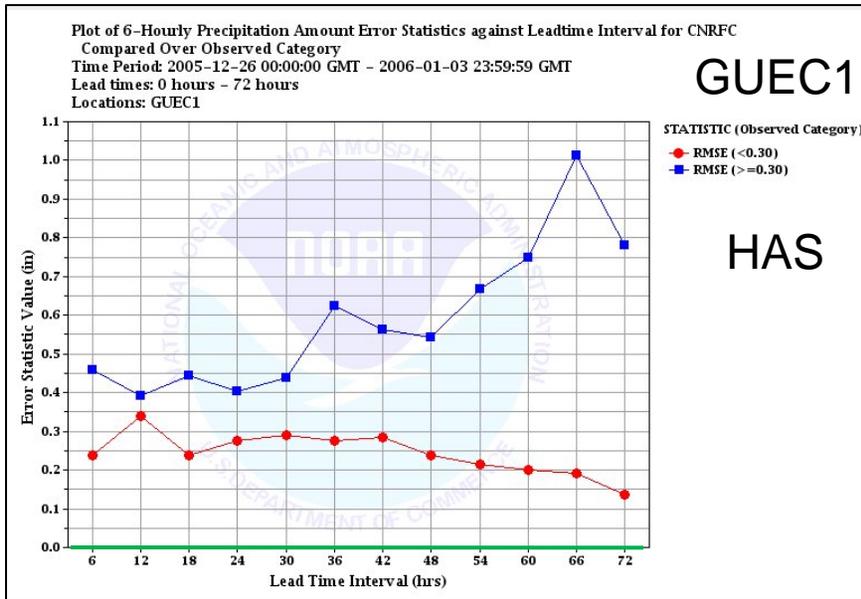
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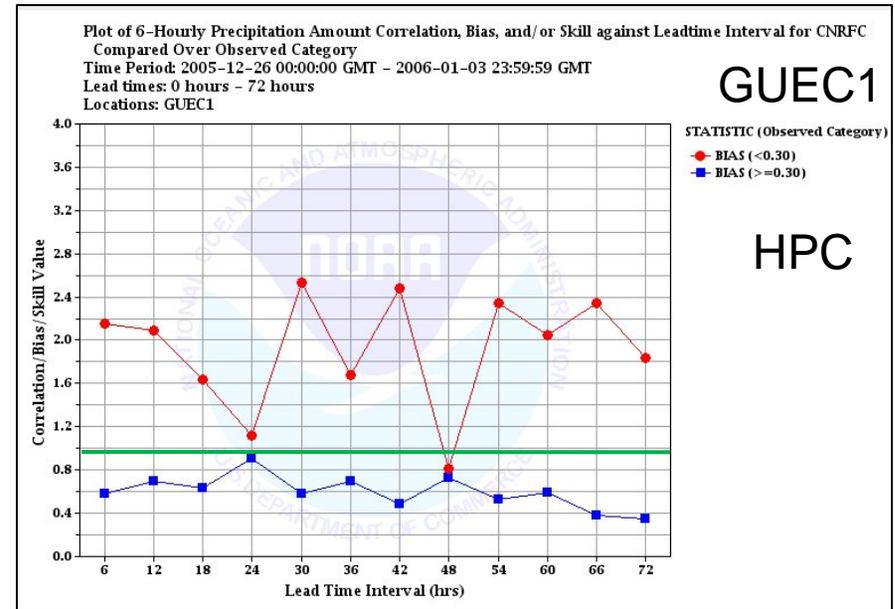
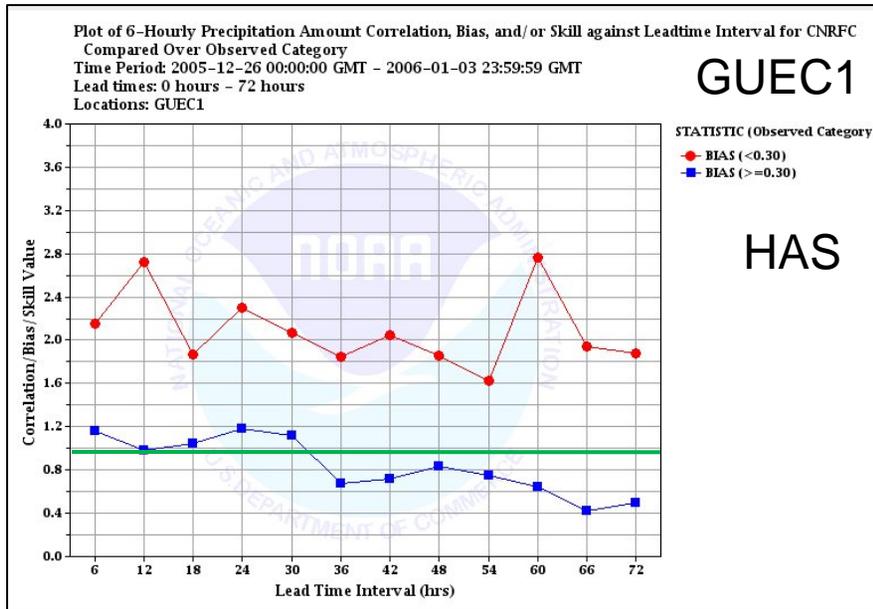
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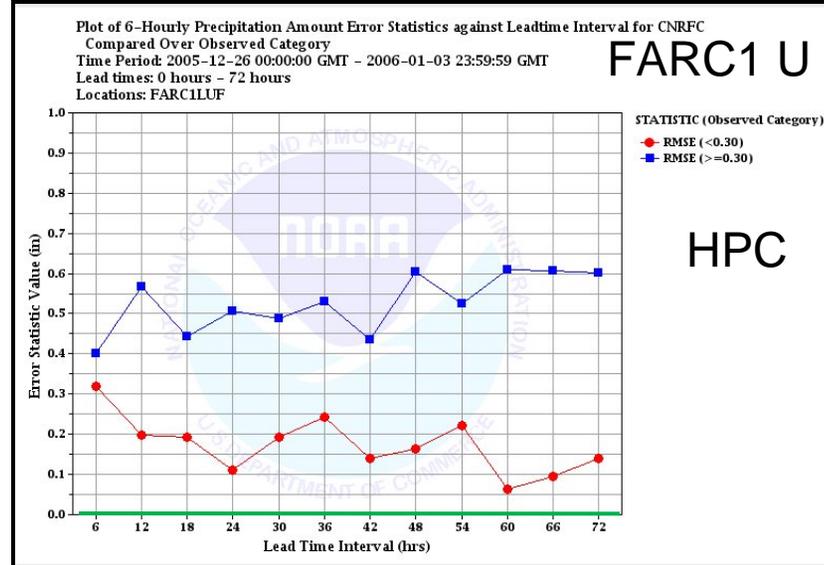
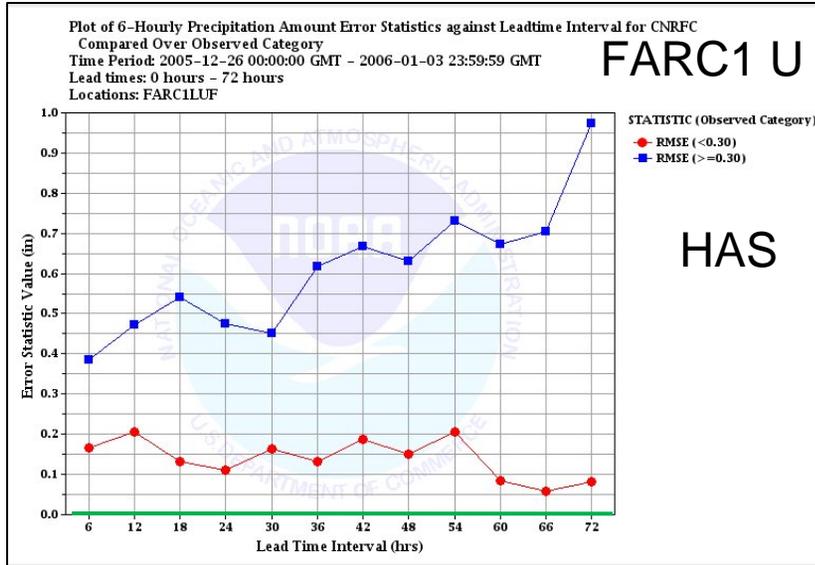
Leadtime Statistics for RMSE - MAP



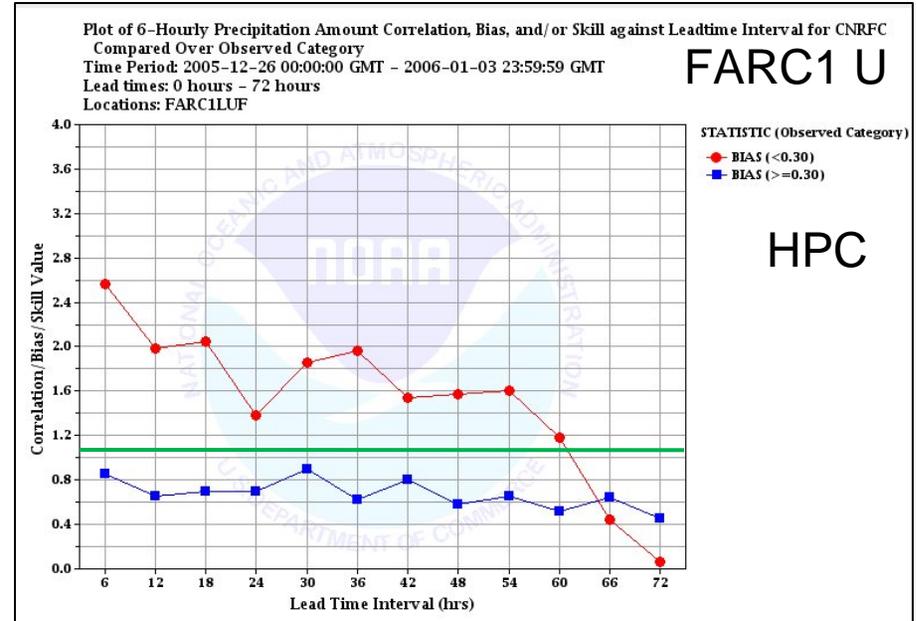
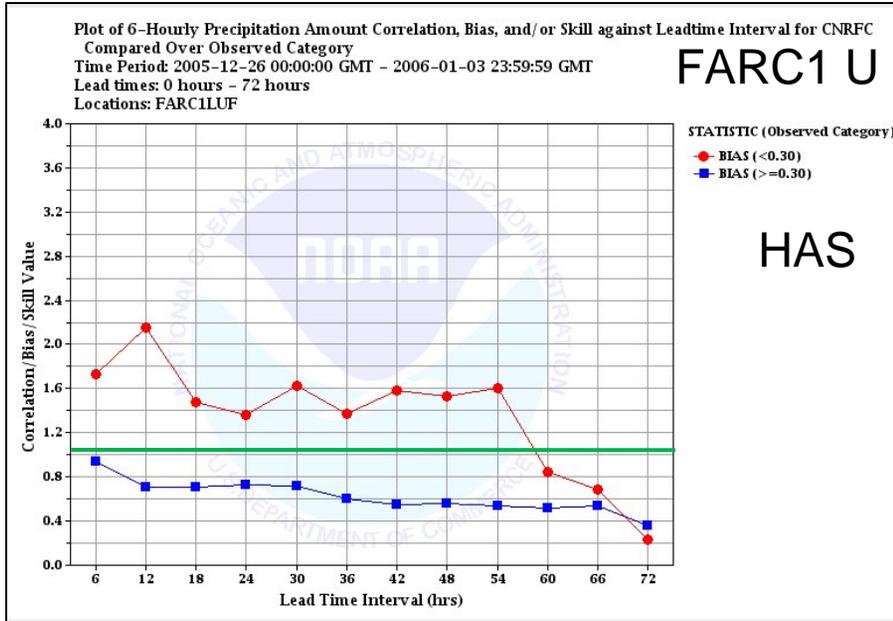
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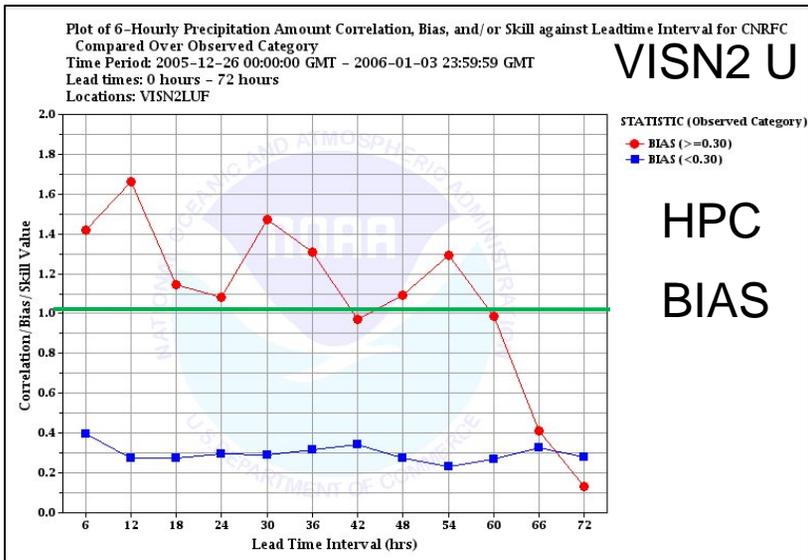
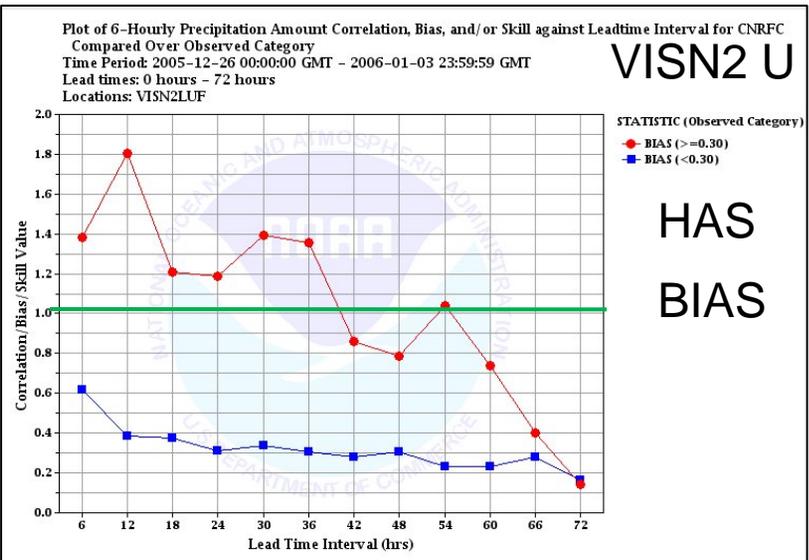
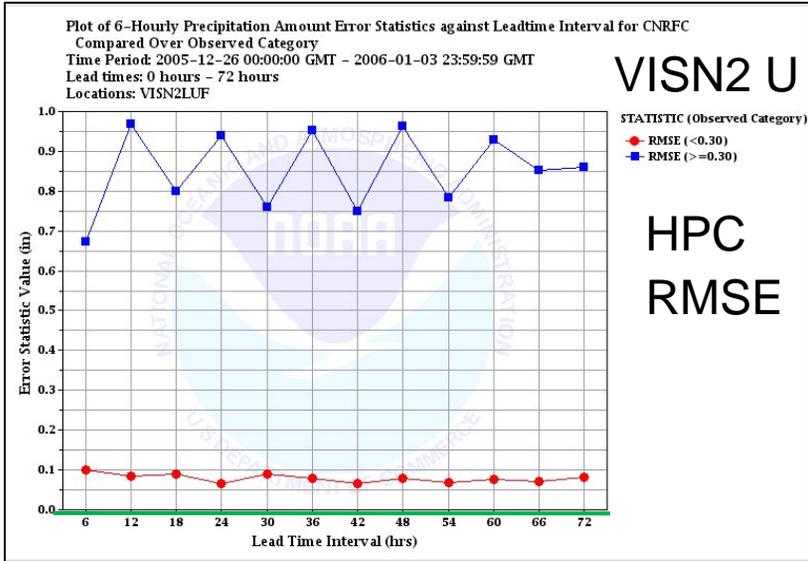
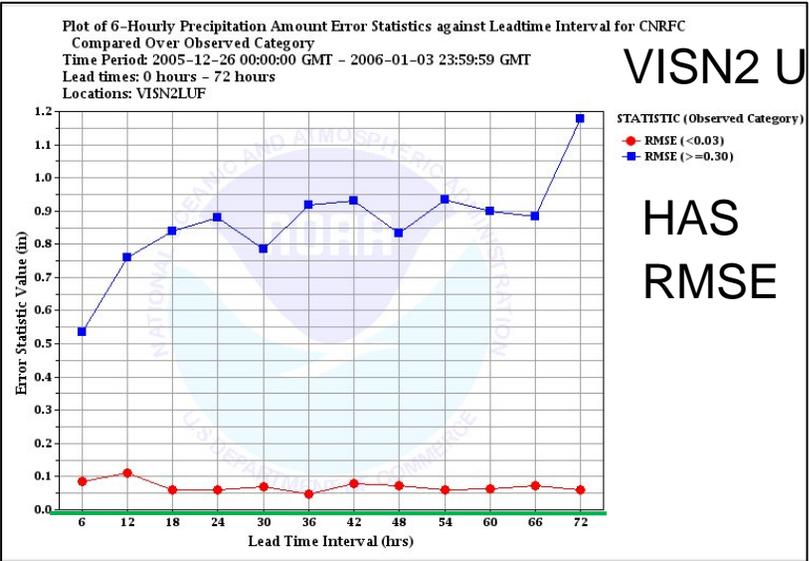
Leadtime Statistics for RMSE - MAP



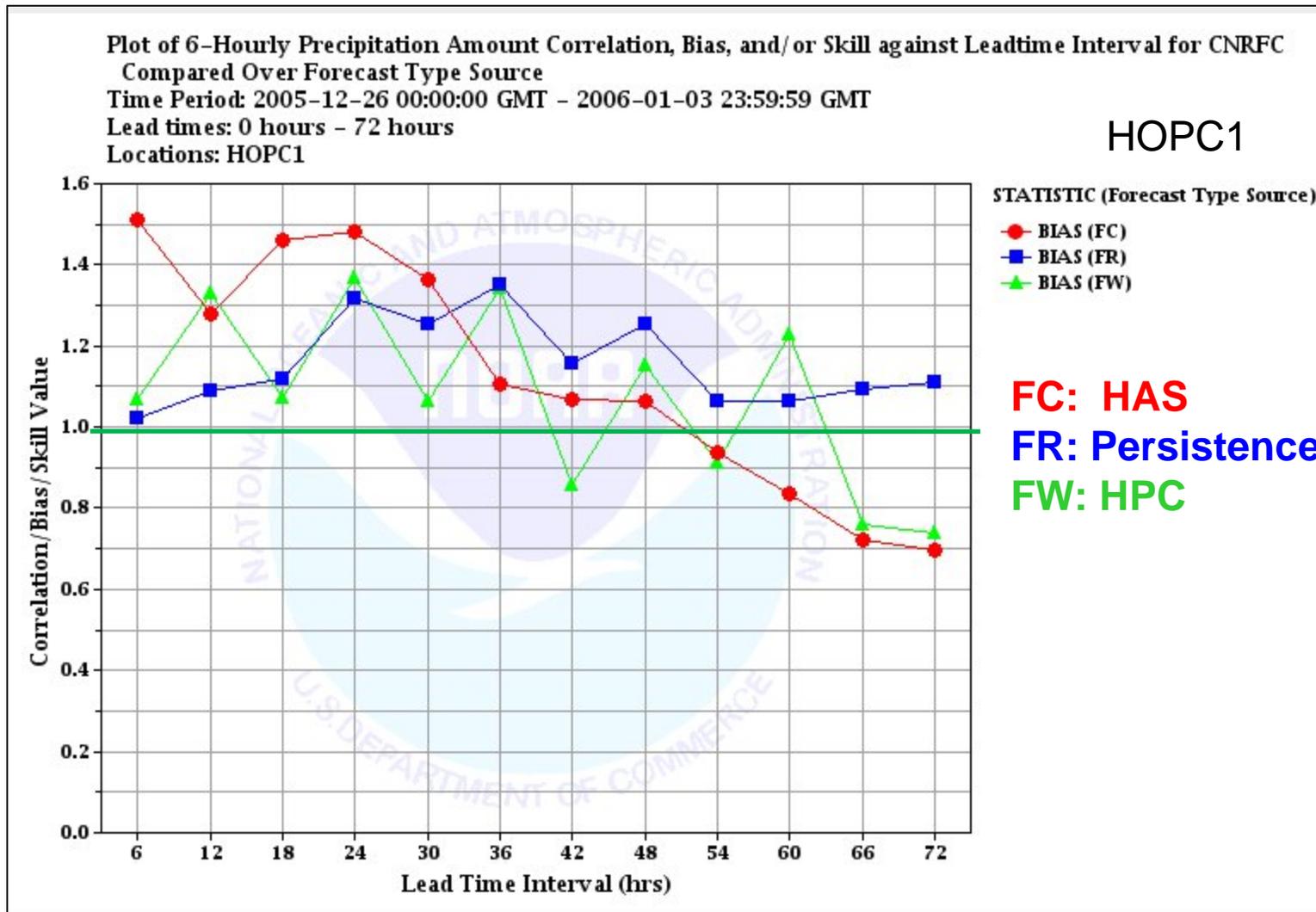
Leadtime Statistics for Bias - MAP



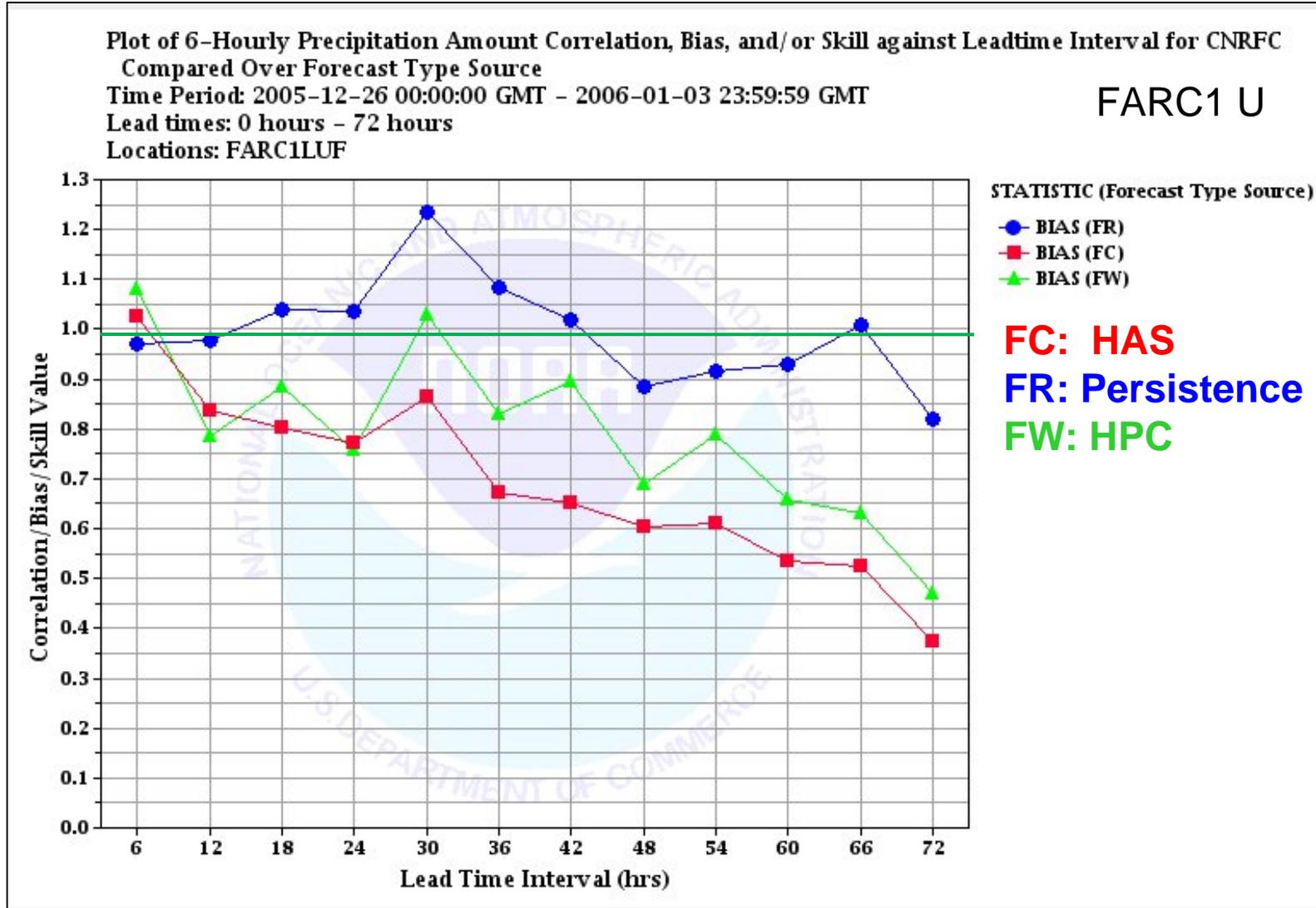
Leadtime Statistics for RMSE - MAP



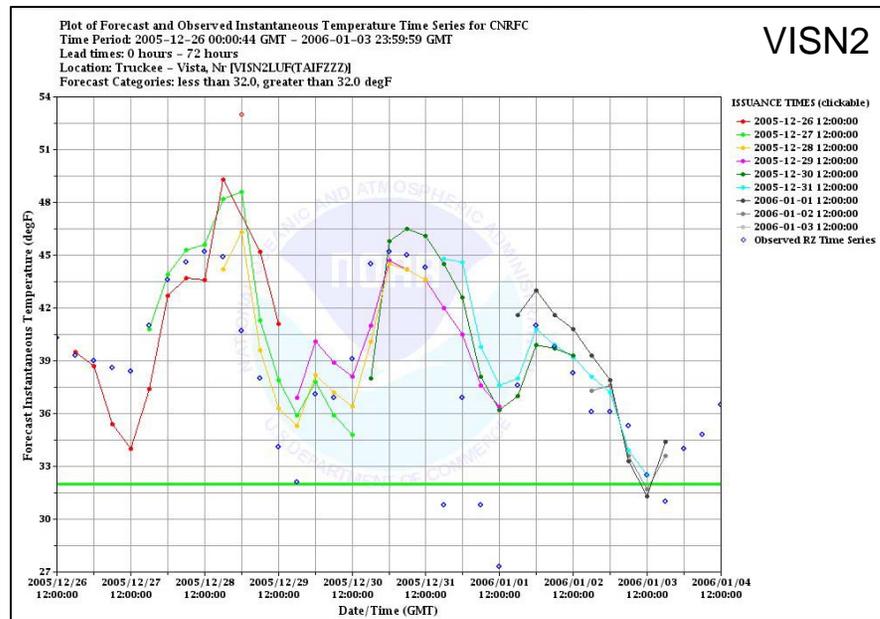
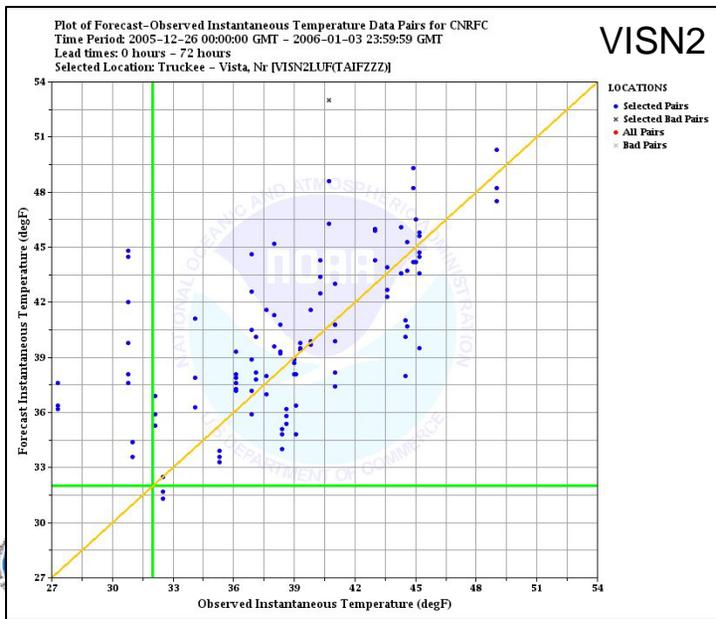
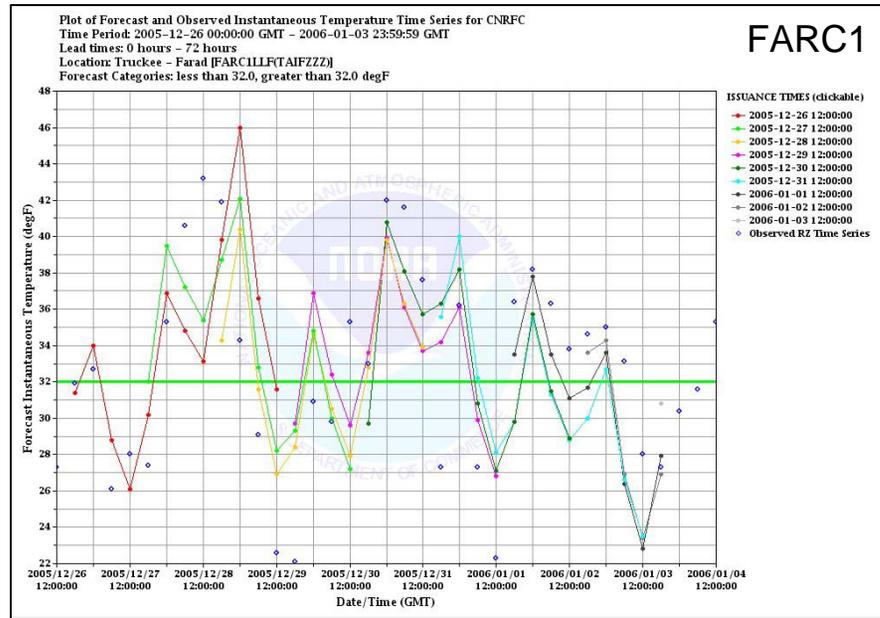
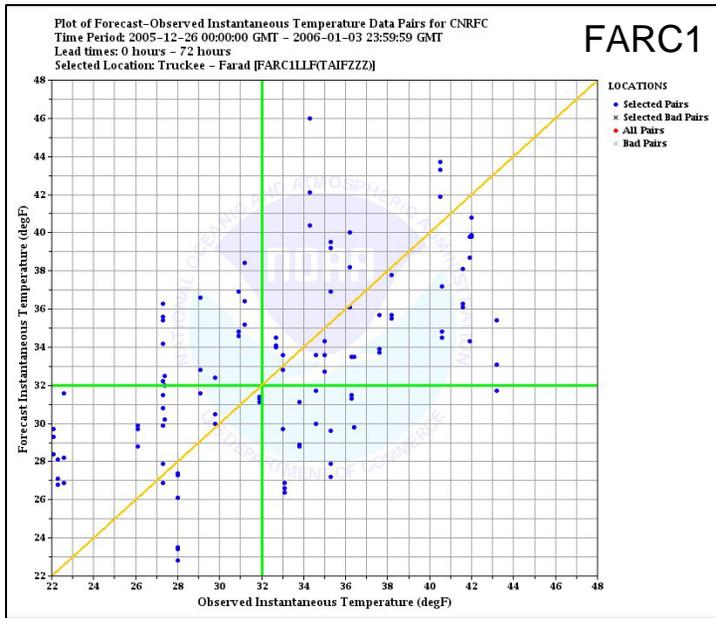
BIAS: leadtime interval compared over forecast type for MAP



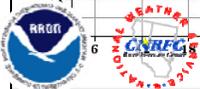
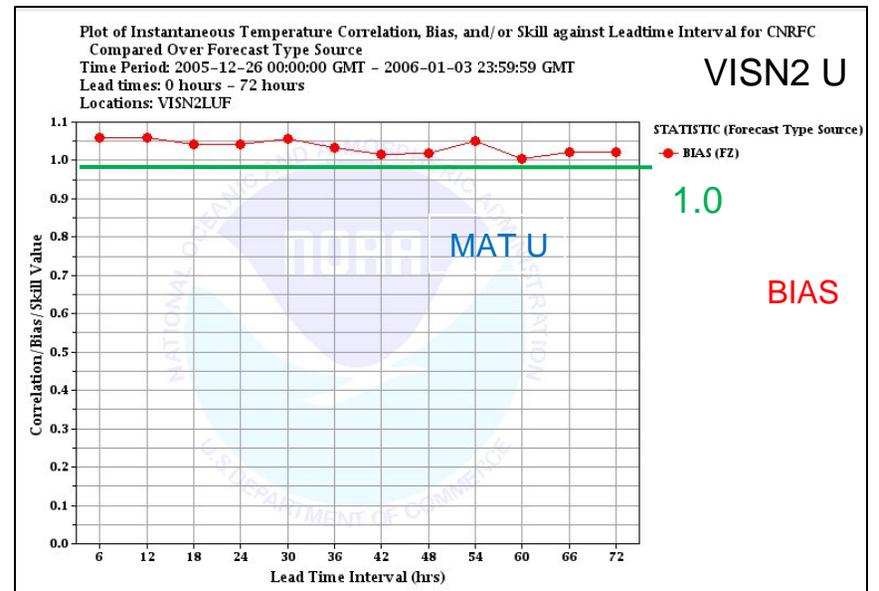
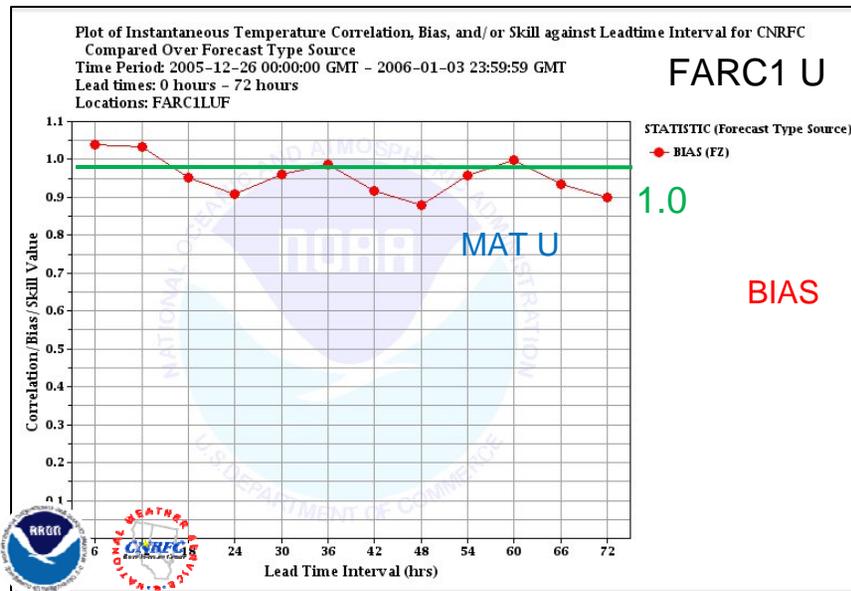
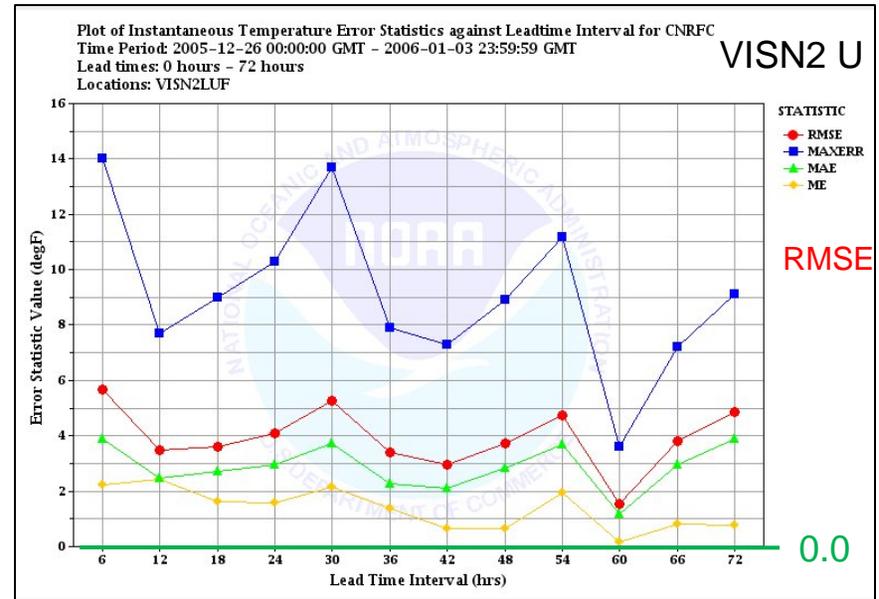
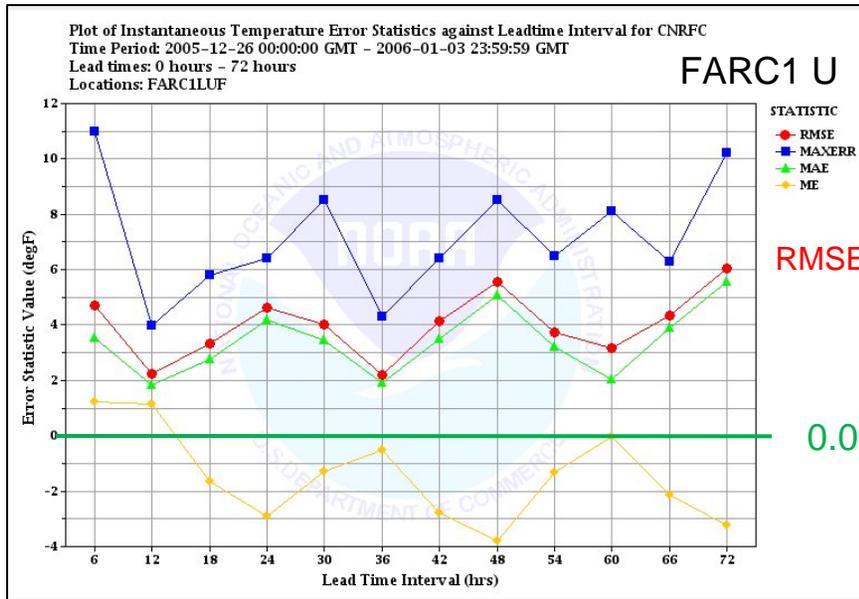
BIAS: leadtime interval compared over forecast type for MAP



MAT Scatterplot and Time Series



Leadtime Statistics for MAT

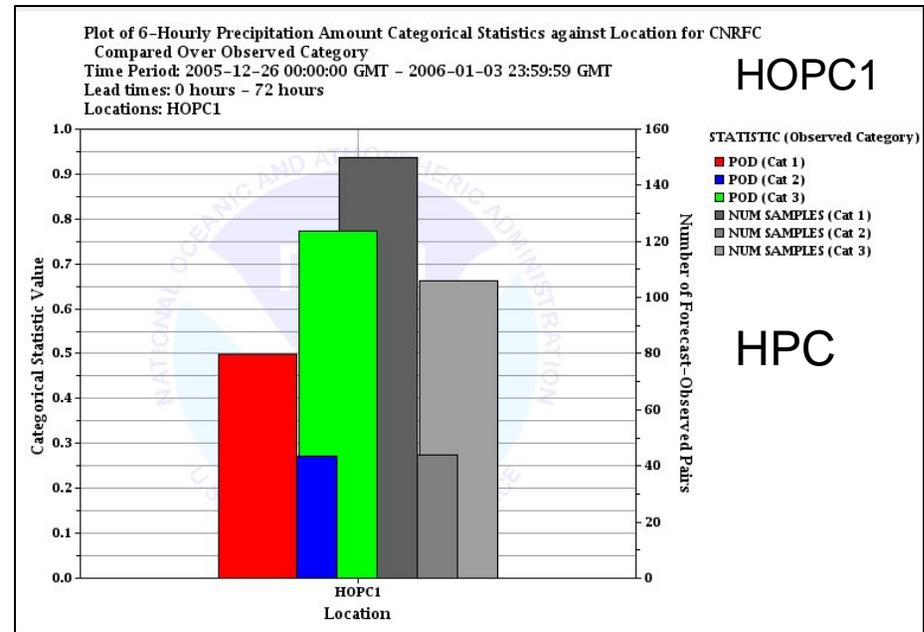
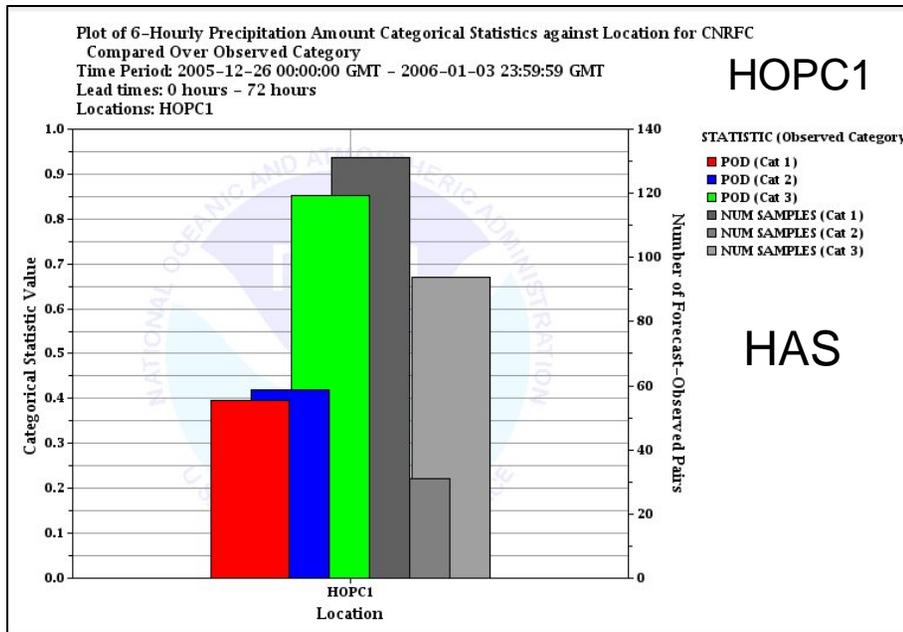


Categorical based on MAP for precipitation thresholds <0.25” and >=0.25”

Category 1: < 0.25”

Category 2: >= 0.25” and < 0.50”

Category 3: >= 0.50”



POD: Probability of Detection (discrimination, perfect score 1)

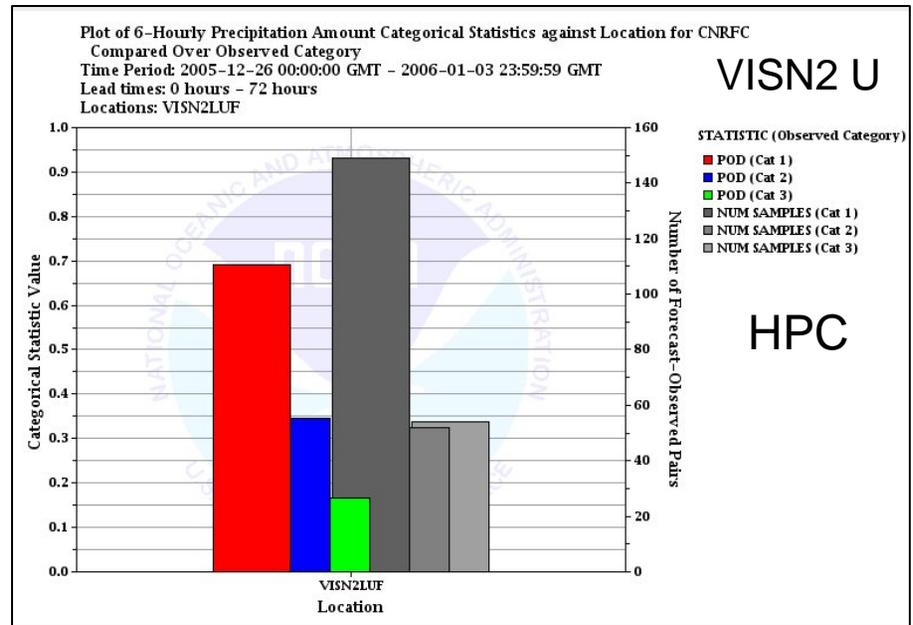
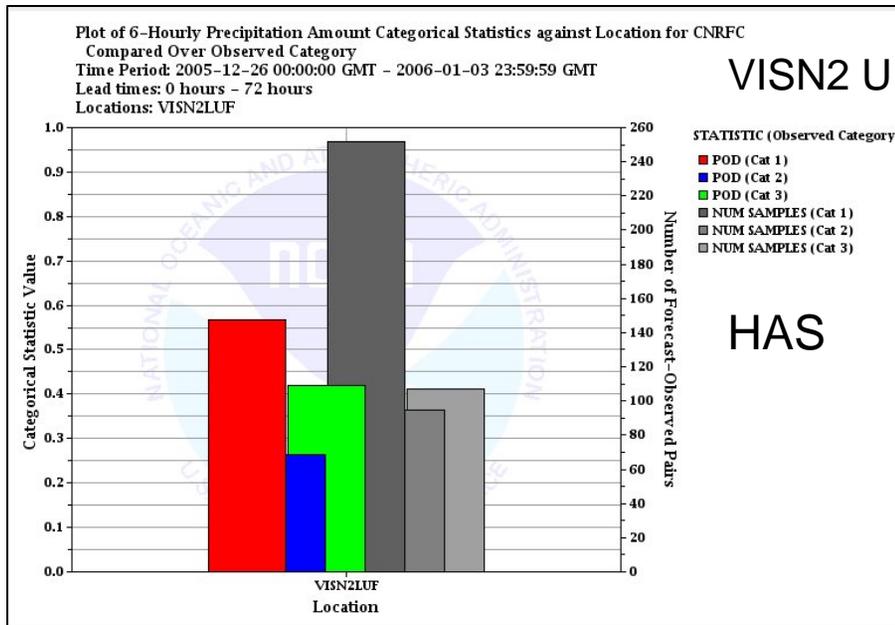


Categorical based on MAP for precipitation thresholds <0.25” and >=0.25”

Category 1: < 0.25”

Category 2: >= 0.25” and < 0.50”

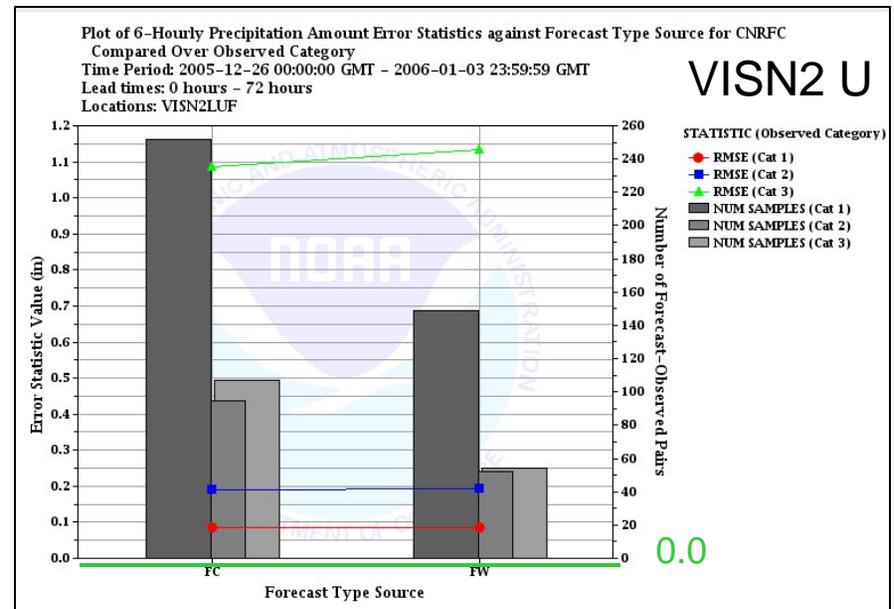
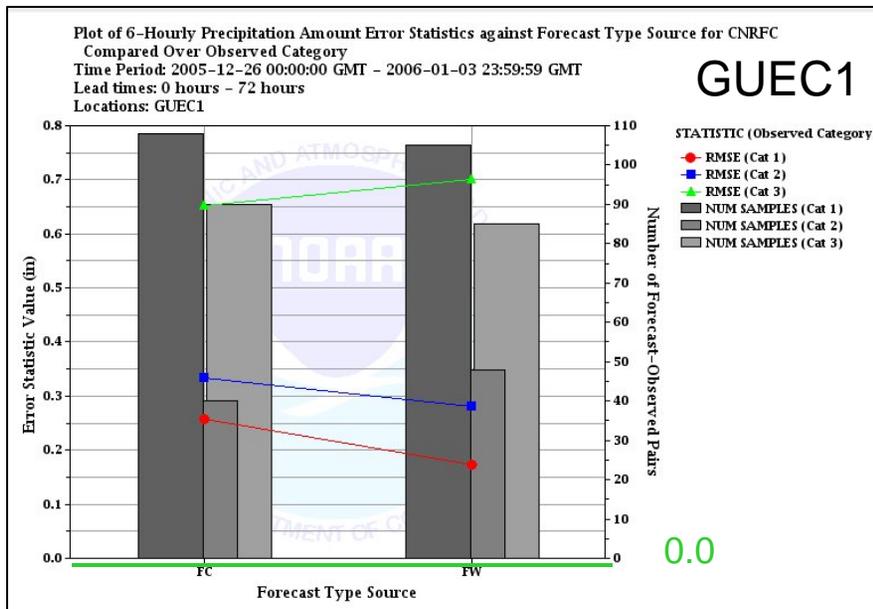
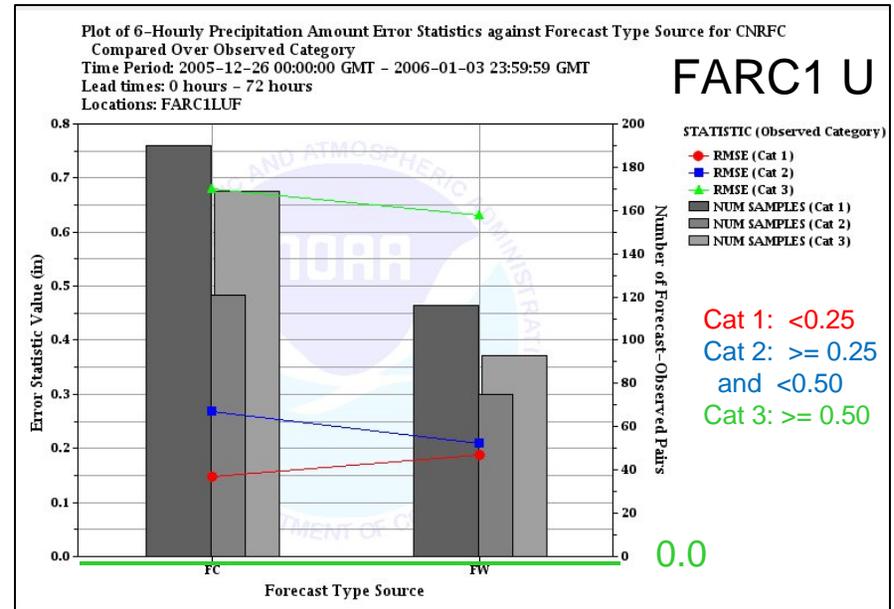
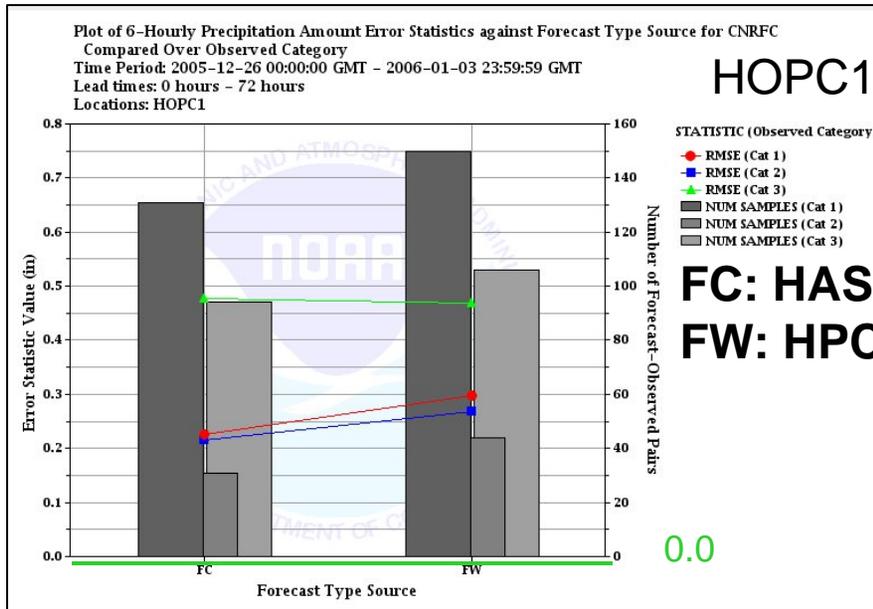
Category 3: >= 0.50”



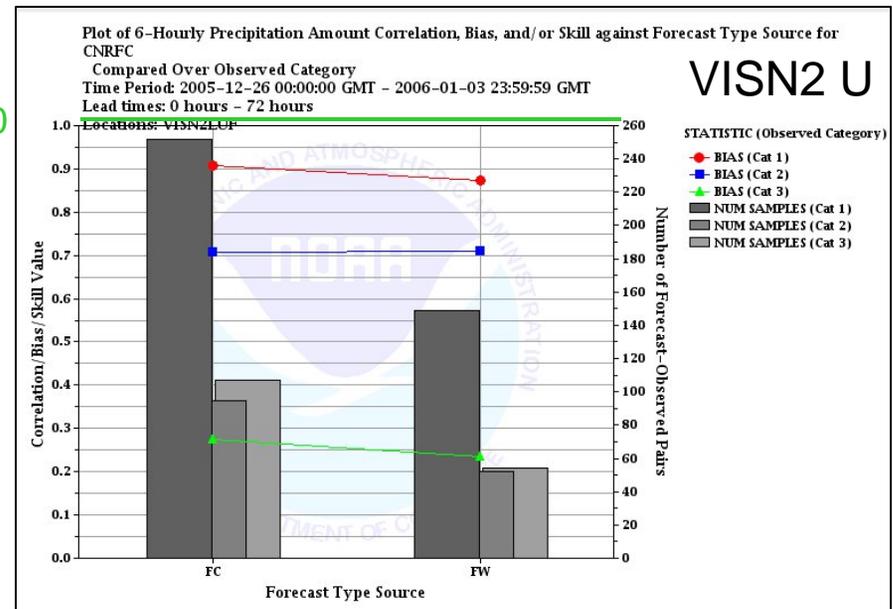
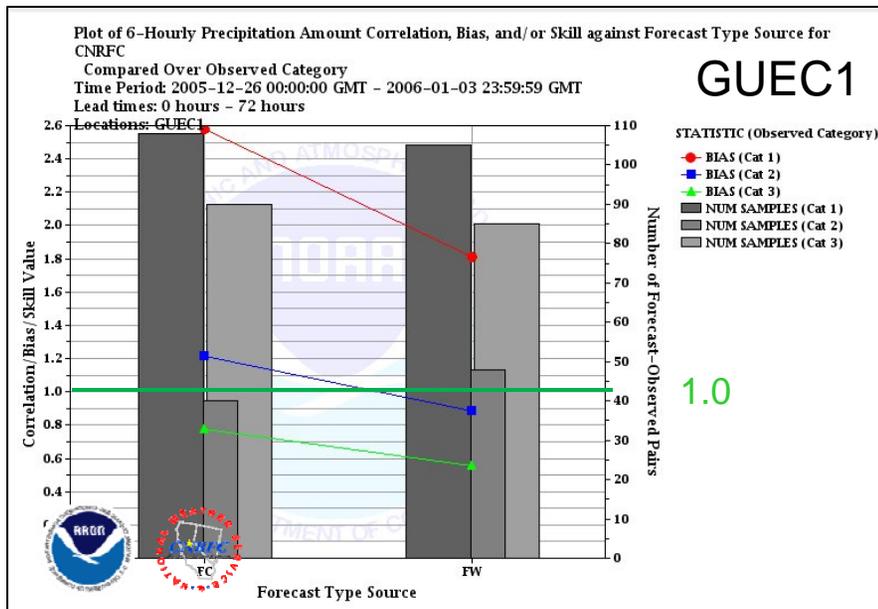
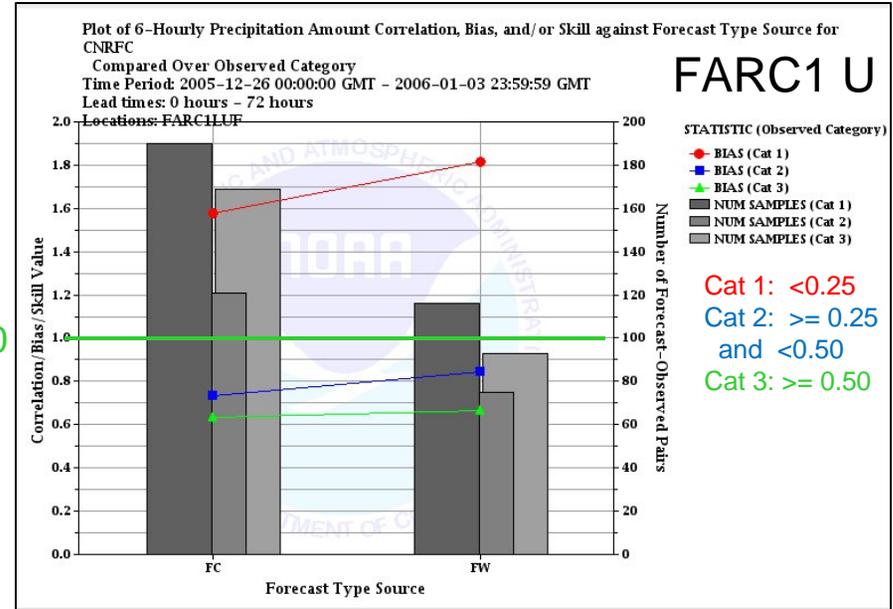
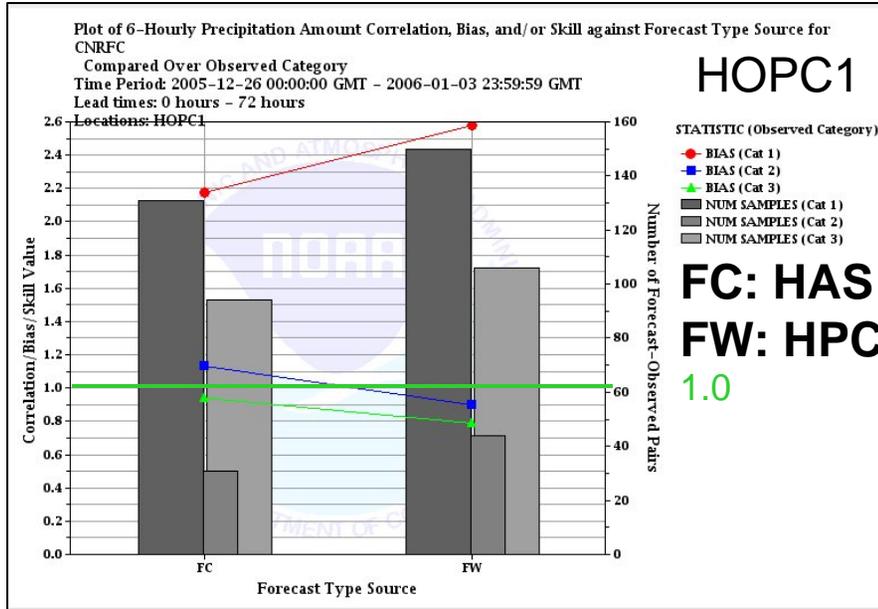
POD: Probability of Detection (discrimination, perfect score 1)



RMSE for MAP based on Type Source



Bias for MAP based on Type Source



Small sample sizes is the major impact affecting the validity of some of the statistics generated. So in many cases, no clear-cut decision can be made on forecaster or model performance.

Based on scatterplot and timeseries output, the Russian River was generally overforecast at the peaks and the Truckee River was underforecast.

There is a need to verify specific flood events.

Performance for the Russian River basin may be better due to basin characteristics that favor orographic enhanced events. “Spillover” events may be more difficult to forecast for the Truckee basin as its location is on the lee side of the Sierra Nevada crest. Orographic precipitation events are more common for the Russian, extreme lower-basin precipitation events are very rare for the Truckee.

Need to define a raw model to establish baseline statistics in order to assess value added by the forecaster or hindcasting capability to flush out relative error sources in the model.



Compare MAP categorical statistics with NPVU (National Precipitation Verification Unit) QPF verification.