



National Precipitation Verification Unit

Letitia L. Soulliard
RSIS & NOAA/NWS/OCWWS

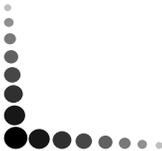
COMET
RFC/HPC Hydrometeorology Course 03-1
August 20, 2003
Boulder, Colorado



Introduction

What is the NPVU?

- National
 - Precipitation
 - Verification
 - Unit
-
- Verifies the QPF from the NGM, ETA, AVN, CONUS RFCs and HPC





Introduction

Who oversees the NPVU?

- Office of Climate, Water, and Weather Services
- Located at and co-overseen by:
 - ▶ Hydrometeorological Prediction Center / NCEP

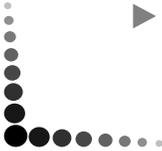




Introduction

Why is the NPVU Important?

- "Verification of direct NWP model, statistical, and forecaster value-added QPFs and PoPs is necessary to quantify and improve the skill of QPF/ PQPF and PoP forecasts, and to assess the value-added to these forecasts at each step of the NWS [End- to- End] Forecast Process."
 - ▶ - Office of Meteorology (1999)

 - "One of the most important components of an effective national QPF program is a comprehensive objective comparative verification system"
 - ▶ -National Weather Service (1999)
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Background

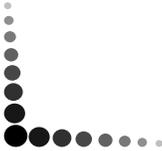
When did the NP VU Start?

- Operational start date was October 1, 2000
 - Not every RFC was implemented immediately
 - Eastern RFCs
 - ▶ August 2000 (day 1 totals)
 - ▶ October 2000 (6hr amounts)
 - Western RFCs
 - ▶ CN and CB November 2000
 - ▶ NW January 2001
 - Mosaic
 - ▶ January 2001
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Background

What are the different NPVU Products found on the web?

- QPF Verification Statistics
 - Comparison Plots
 - RFC “Live” Data - QPF, QPE, FFG, HYD, QPS
 - RFC Archive QPE
 - HPC Archive QPF
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Background

How can each of the NPVU products be used?

■ Statistics

- ▶ Main Function of NPVU
- ▶ See how forecast products change over time
- ▶ Get a quick idea of how each product is doing in general
- ▶ Relative QPF performance measures

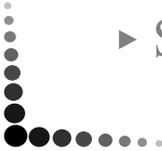
■ Comparison Plots

- ▶ See a subjective comparison of performance for a particular 6-hour forecast

■ “Live” Data

- ▶ Quick and Easy - “One stop shopping”
- ▶ Mosaic of all Continental RFCs

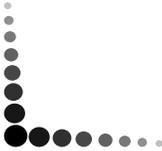
■ Archive Data

- ▶ Studies of historical precipitation events/periods
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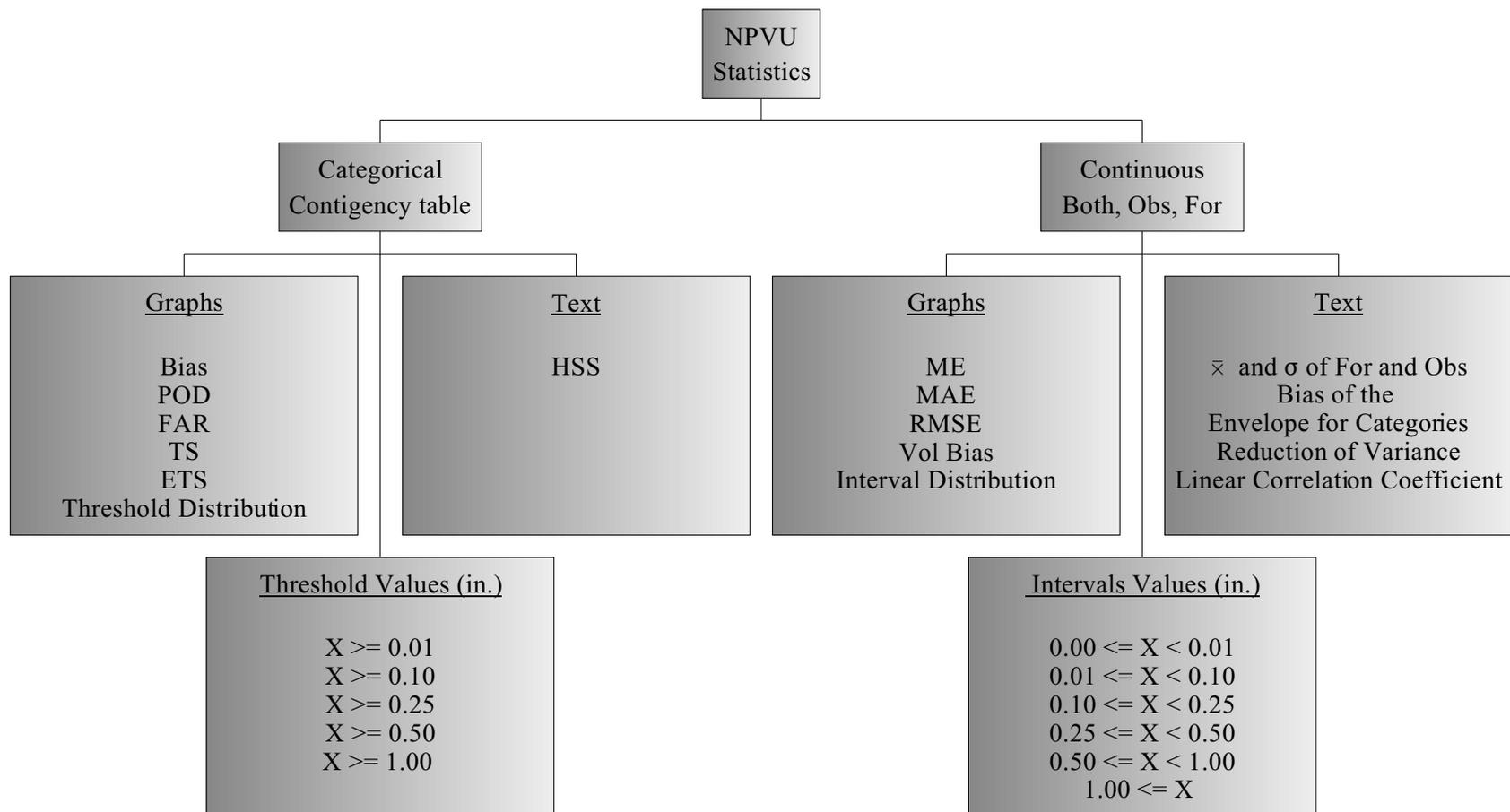
Background

What is verified by the NPVU and when is it updated?

- 12Z QPF cycle for RFCs and HPC
 - 00Z QPF cycle for Models
 - Once a Month approximable around the 10th for the previous month
 - E-mail notification
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Background

What statistical Scores are calculated by the NPVU?

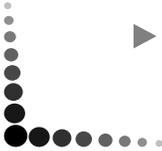




The NPVU Verification Process

How is the data sent from the RFCs to the NPVU?

- RFCs: QPF & QPE \Rightarrow AWIPS WAN \rightarrow NCF
 - NCF \Rightarrow SBN \rightarrow OSO
 - OSO \Rightarrow dbnet \rightarrow IBMSP
 - IBMSP \Rightarrow FTP \rightarrow NPVU

 - Frequent problems (“missing” data) in this area
 - ▶ Difficult to trace
 - ▶ Ask RFCs to resubmit data
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The NPVU Verification Process

How are the forecast and observation grids modified in order to be compared?

Receive

- 4km QPE from RFC
- 10km QPF from RFC
- 1x1 degree AVN
- 32km ETA
- 90km NGM
- 32km HPC

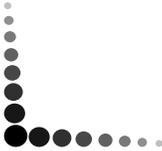
Convert to 32km by:

- Spatial Average
- Area Preservation Technique
- Area Preservation Technique
- Change of area and map projection
- Area Preservation Technique
- No Conversion Needed



The NPVU Verification Process

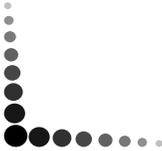
Why should you use the NPVU's products?

- To see if there is an improvement over HPC's forecast.
 - To see if HPC is improving upon the models.
 - See which Model might be better for each season or for each RFC area.
 - View QPF products for other RFC's and view continuity issues.
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Things To Be Aware Of

What problems are there in the statistics?

- Example of when small sample sizes can result in anomalous scores.
 - Example of general comparative trends and how the Eastern RFCs differ from the Western RFCs due to Mountain Mapper
 - Examples of QPE discontinuity problems
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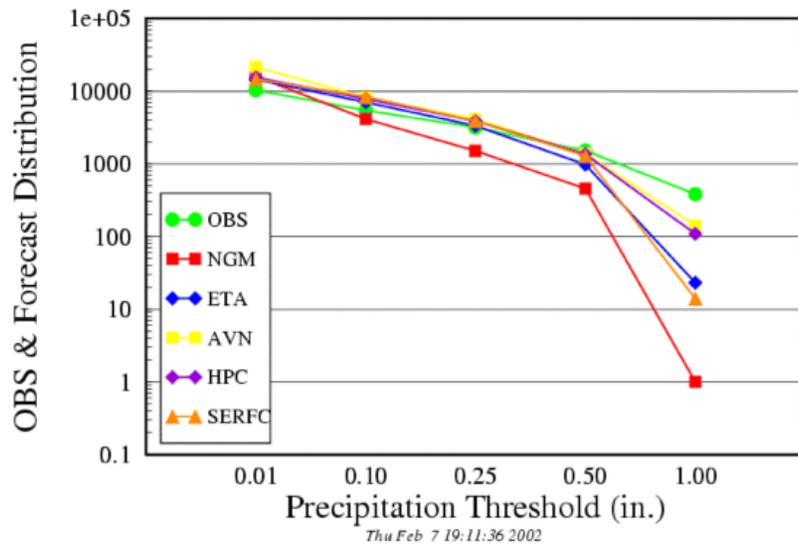
Things To Be Aware Of

Example of when small sample sizes can result in anomalous scores.

- Observation Profile shows that the number of cases is dramatically less in 2003 than in 2002

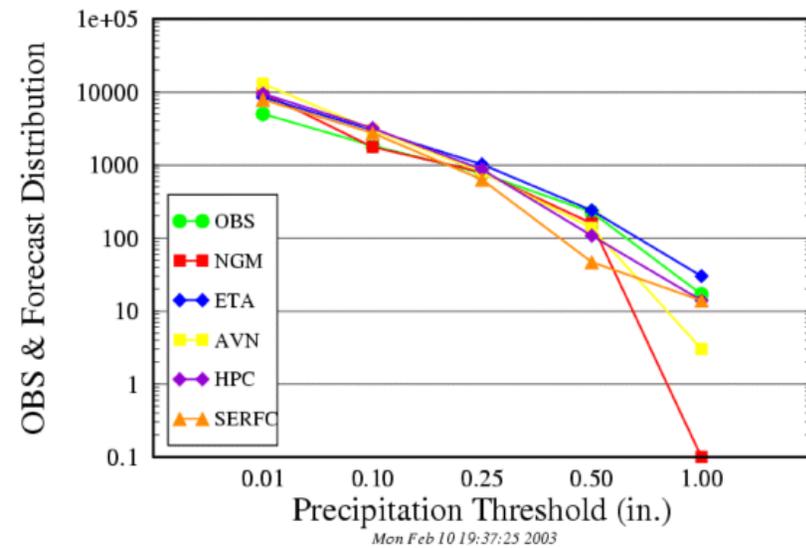
NPVU – SERFC – DIST

Jan2002 DAY1 06H GRD



NPVU – SERFC – DIST

Jan2003 DAY1 06H GRD



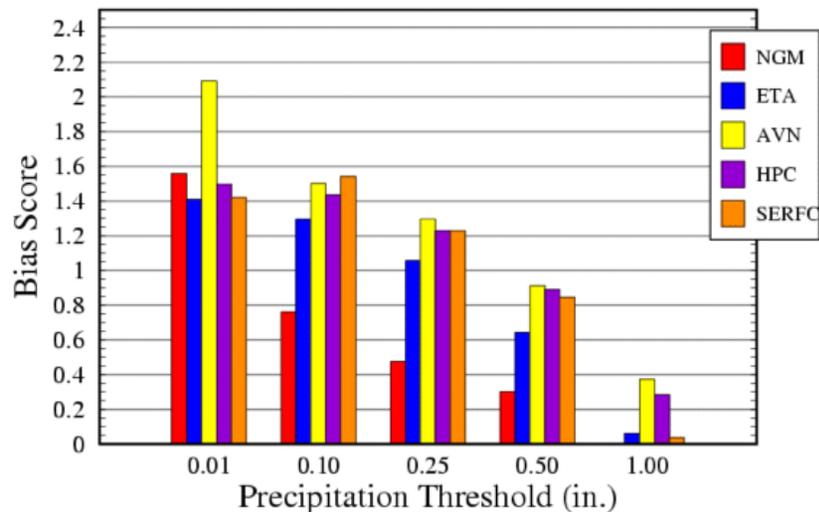
Things To Be Aware Of

Example of when small sample sizes can result in anomalous scores.

- Categorical Bias improves for all categories except ≥ 0.50

NPVU – SERFC – BIAS

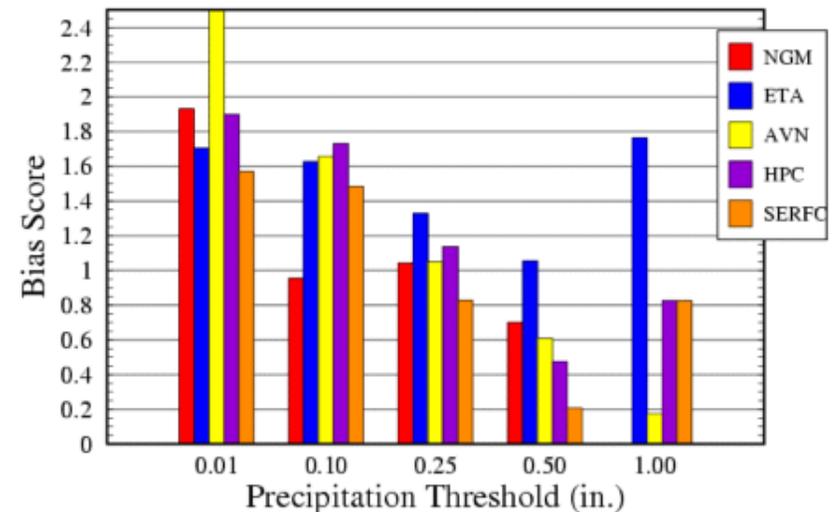
Jan2002 DAY1 06H GRD



Thu Feb 7 19:11:22 2002

NPVU – SERFC – BIAS

Jan2003 DAY1 06H GRD



Mon Feb 10 19:37:11 2003

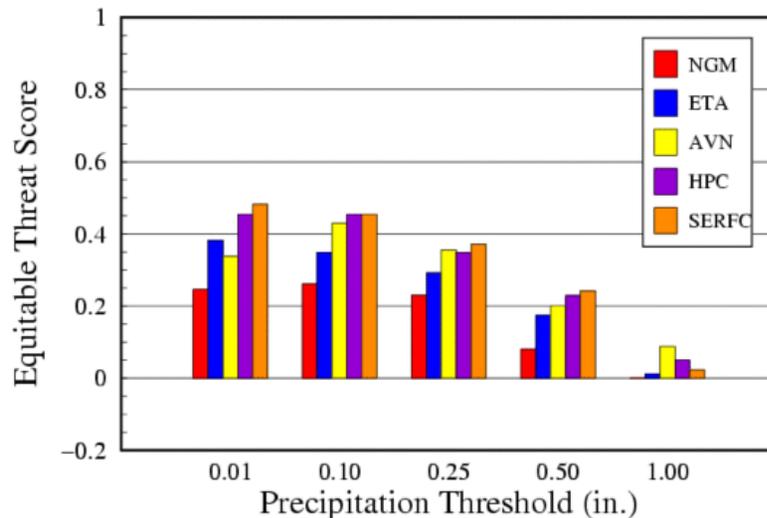
Things To Be Aware Of

Example of when small sample sizes can result in anomalous scores.

- Equitable Threat Score improves for highest category

NPVU – SERFC – ETS

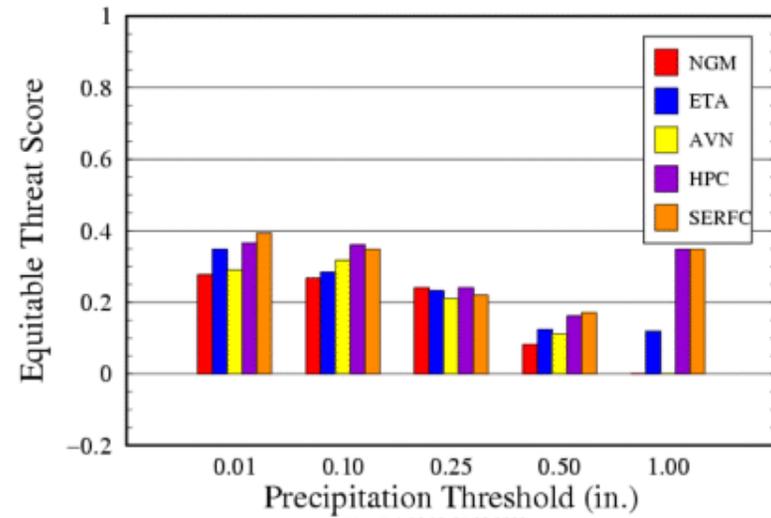
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NPVU – SERFC – ETS

Jan2003 DAY1 06H GRD



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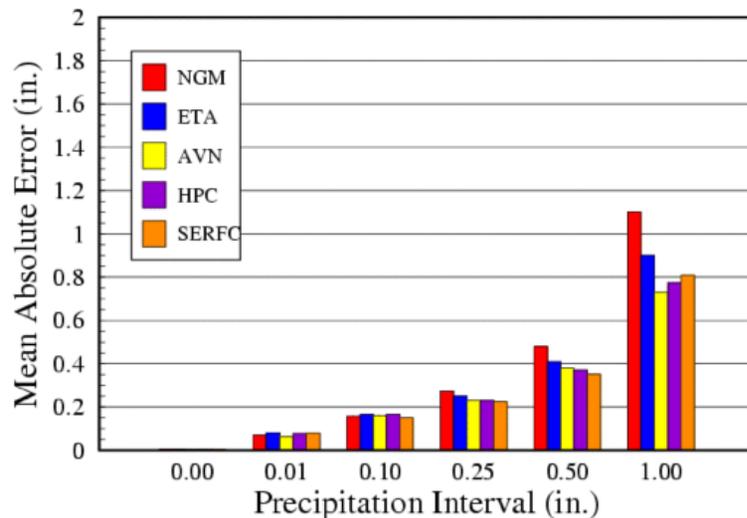
Things To Be Aware Of

Example of when small sample sizes can result in anomalous scores.

- Mean Absolute Error improves for all intervals

NPVU – SERFC – MAE

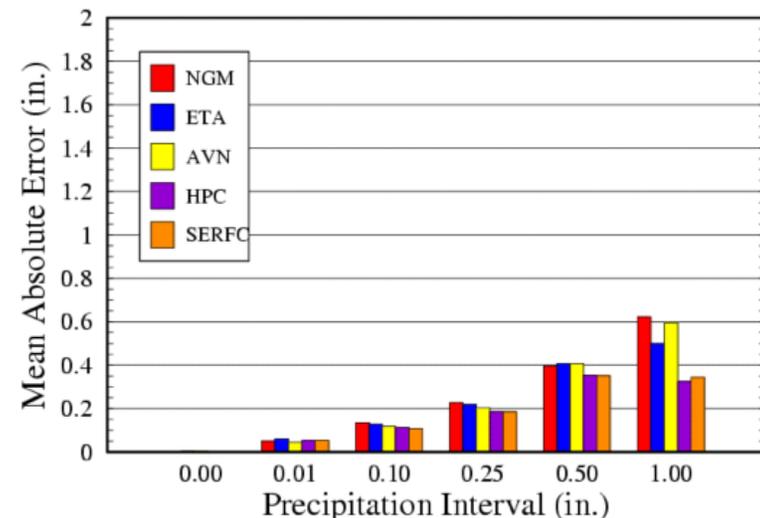
Jan2002 DAY1 06H GRD (OBS & FOR)



Thu Feb 7 19:14:55 2002

NPVU – SERFC – MAE

Jan2003 DAY1 06H GRD (OBS & FOR)



Mon Feb 10 19:41:05 2003



Things To Be Aware Of

What are the differences between the Eastern RFCs and the Western RFCs?

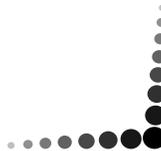
Eastern RFCs

ABRFC
LMRFC
MARFC
MBRFC
NCRFC
NERFC
OHRFC
SERFC
WGRFC

Western RFCs

CBRFC
CNRFC
NWRFC

APRFC



Things To Be Aware Of

What are the differences between the Eastern RFCs and the Western RFCs?

Eastern RFCs

- 00Z and 12Z Forecast
- 18Z forecast
 - ▶ AB, MA, MB, and NC RFC
- Forecast out to 24hr
 - ▶ MARFC out to 48hr
- QPE are stage III multi-sensor data

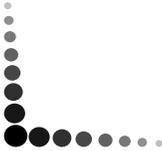
Western RFCs

- 12Z Forecast ONLY
- Forecast out to 72hr
- QPF is made for points
- QPE is gauge data
- Both are gridded using Mountain Mapper



Things To Be Aware Of

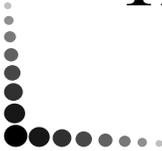
What is Mountain Mapper and how does it affect the NPVU's product/process?

- Developed at CBRFC to convert point data into gridded data
 - Uses PRISM precipitation Climatology
 - Since both QPE and QPF are run through this they are both “biased” toward the climatology where as the models and HPC are not
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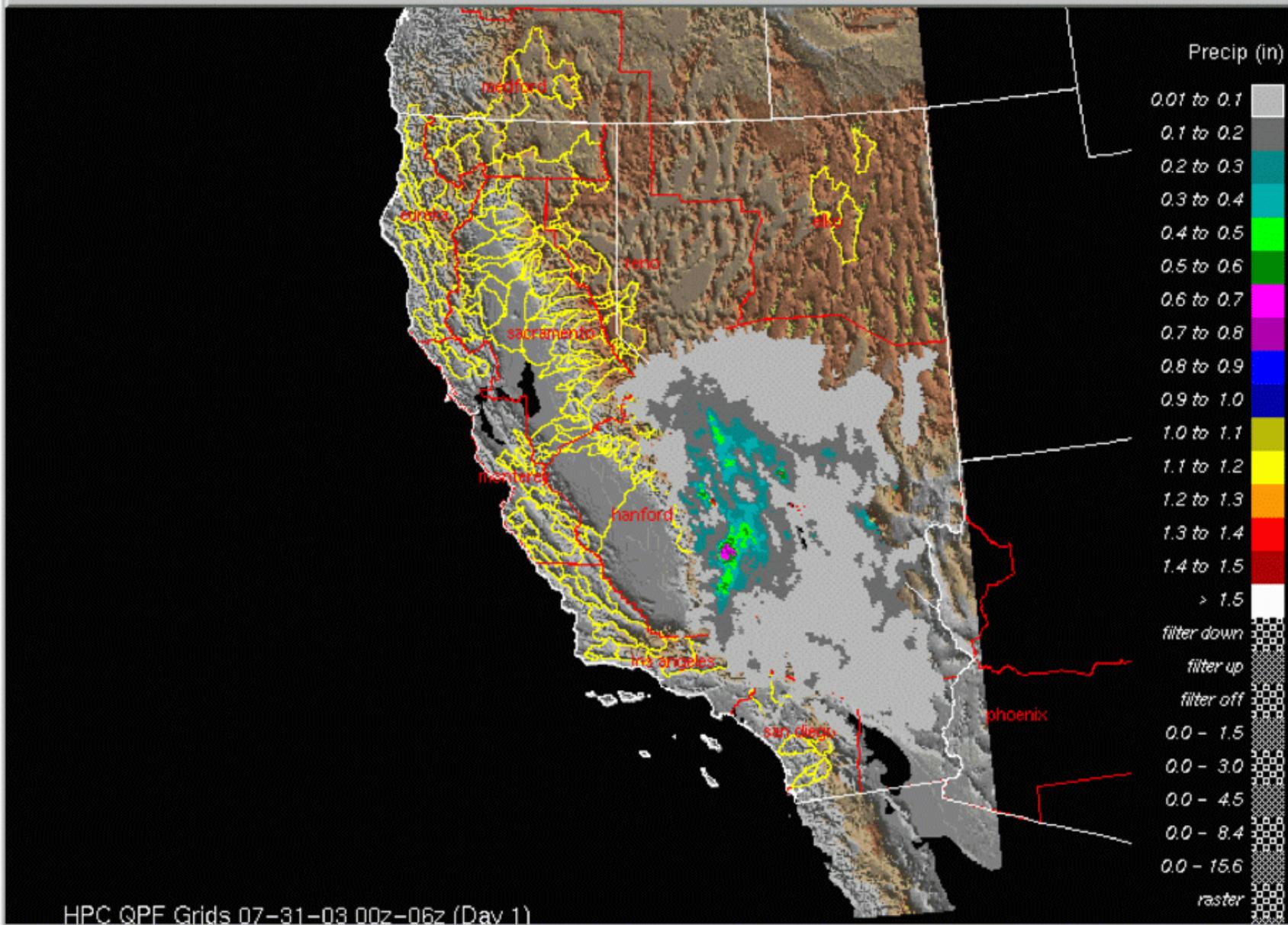
Things To Be Aware Of

What is NPVU doing about this Mountain Mapper Issue?

- HPC started running its forecast for CBRFC and CNRFC through Mountain Mapper in June
 - Started running the HPC's Mountain Mapper forecast through the statistics but number of cases is still too small to draw a definitive conclusion.
 - Can notice that the new Mountain mapper forecast's statistics are between the current HPC's forecast and the RFC's forecast statistics.
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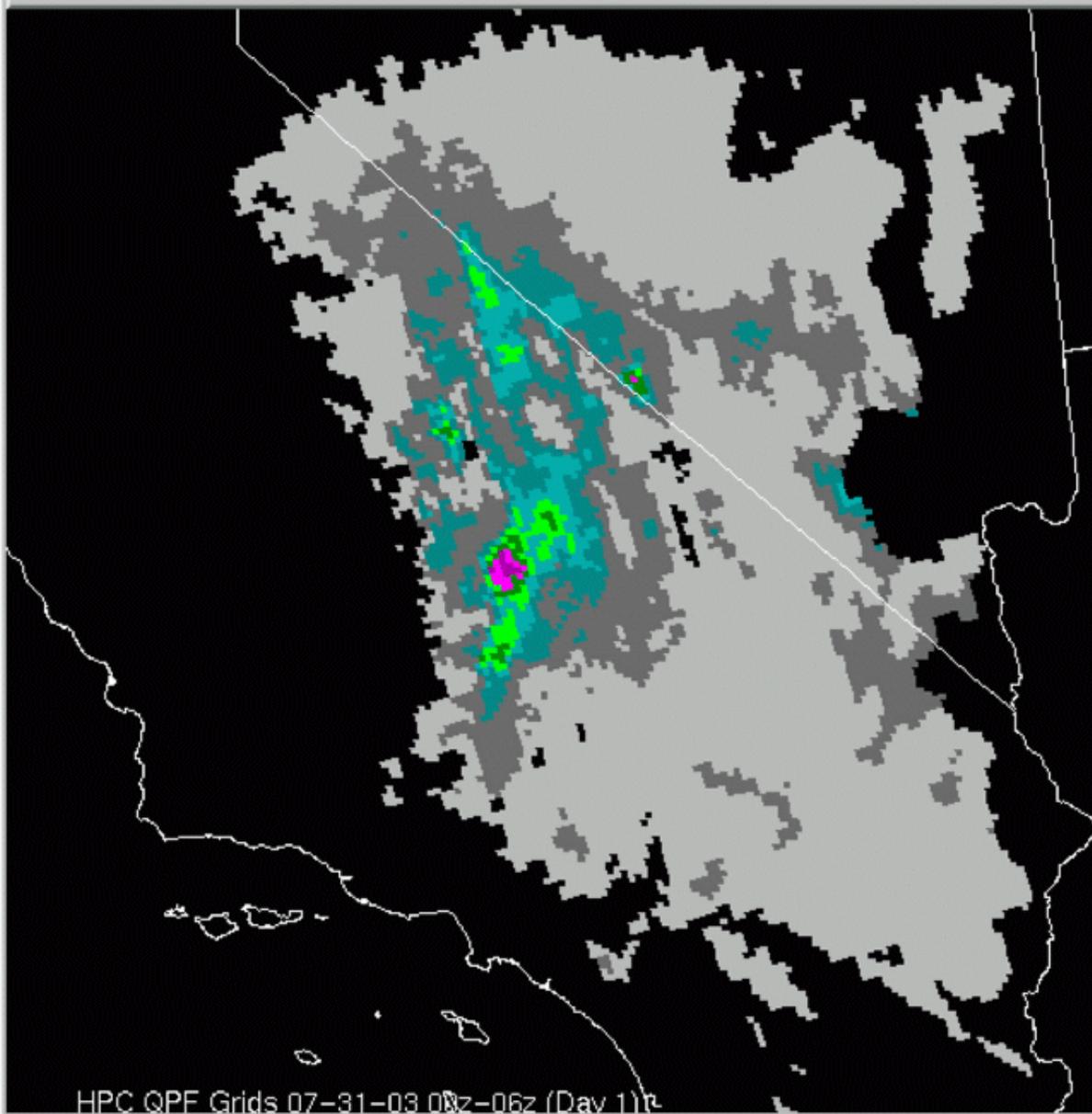
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File Edit Backgrounds Move



specify 3.0 (cnrfc) :0

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Precip (in)

0.01 to 0.1

0.1 to 0.2

0.2 to 0.3

0.3 to 0.4

0.4 to 0.5

0.5 to 0.6

0.6 to 0.7

0.7 to 0.8

0.8 to 0.9

0.9 to 1.0

1.0 to 1.1

1.1 to 1.2

1.2 to 1.3

1.3 to 1.4

1.4 to 1.5

> 1.5

filter down

filter up

filter off

0.0 - 1.5

0.0 - 3.0

0.0 - 4.5

0.0 - 8.4

0.0 - 15.6

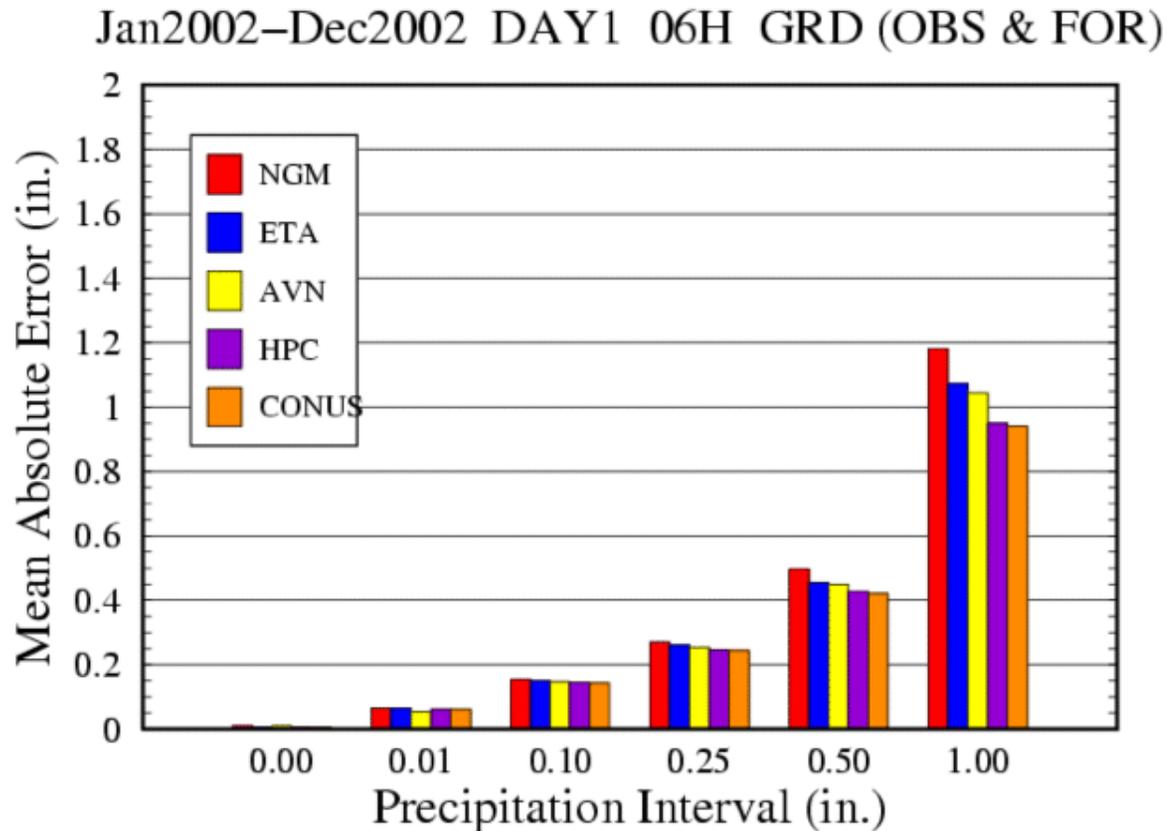
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HPC QPF Grids 07-31-03 08z-06z (Day 1)

Things To Be Aware Of

Relative Score of RFC vs HPC for 2002 Annual Conus

NPVU – CONUS – MAE

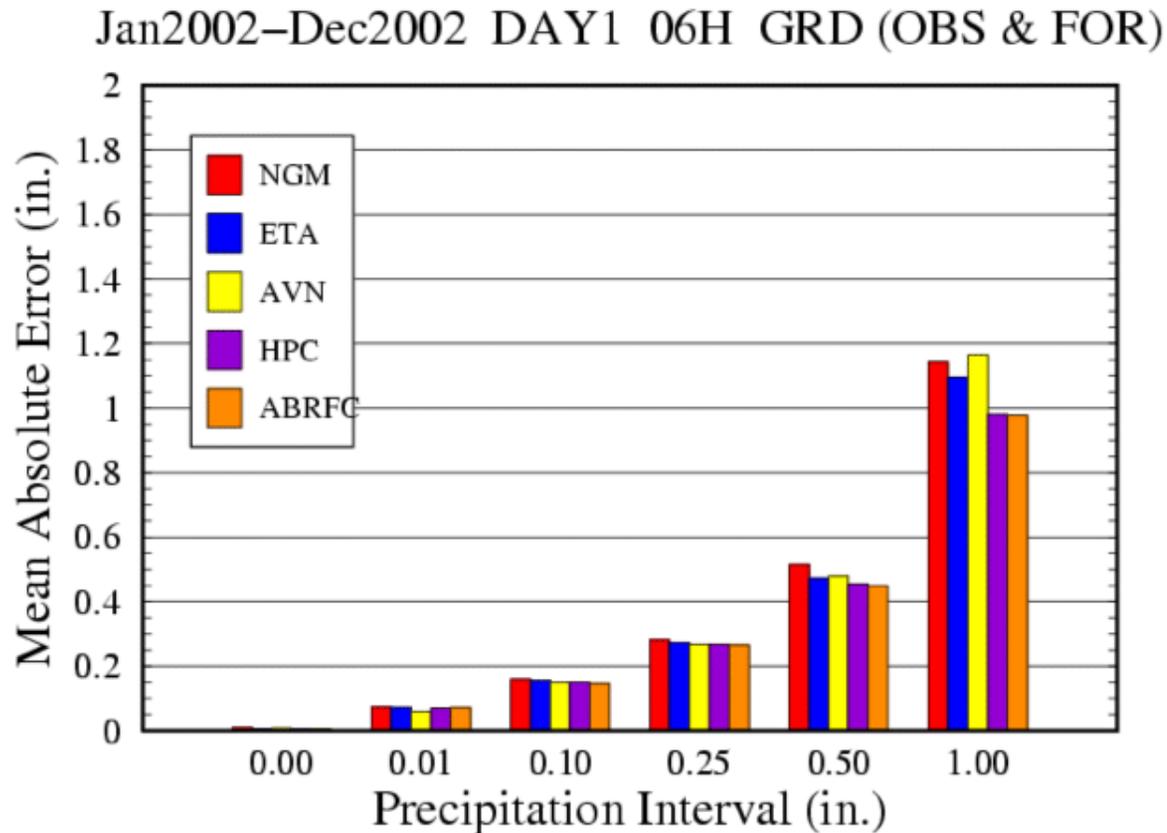


Mon Jan 13 16:51:38 2003

Things To Be Aware Of

Relative Score of RFC vs HPC for 2002 Annual ABRFC

NPVU – ABRFC – MAE

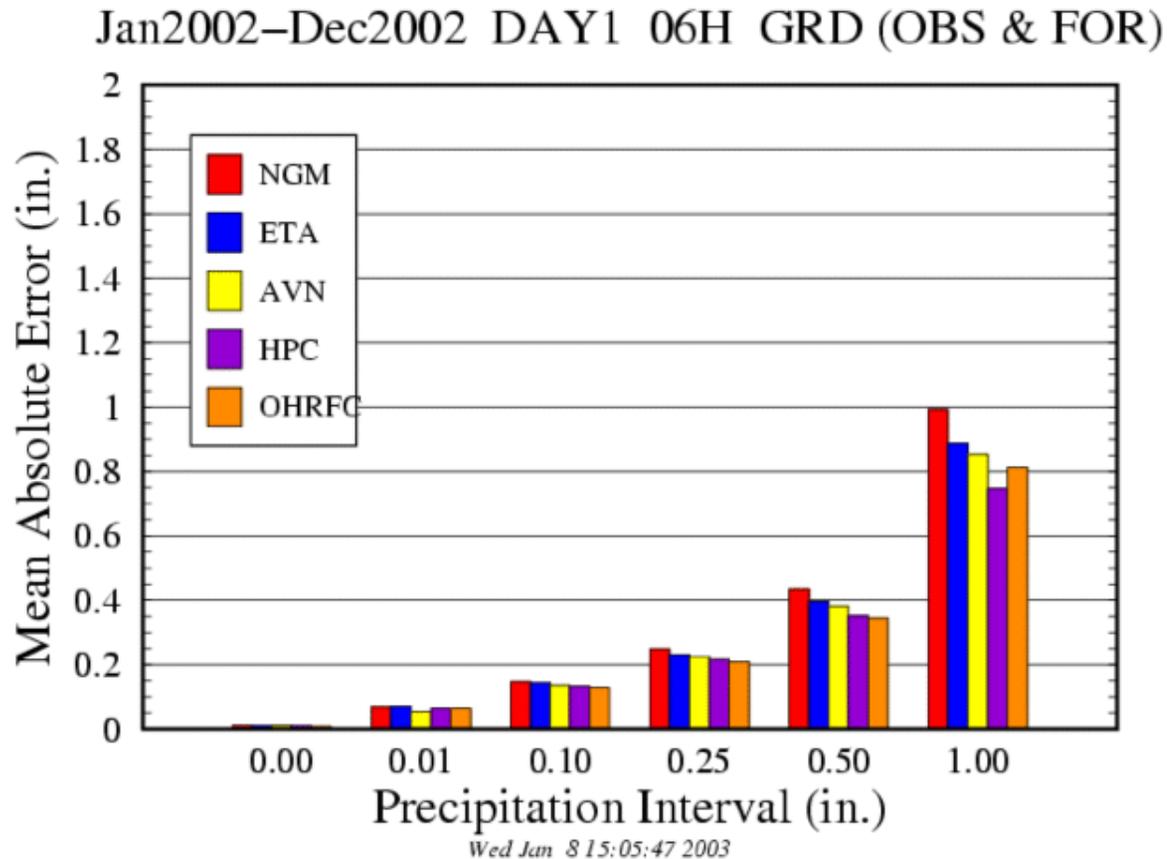


Tue Jan 7 16:46:13 2003

Things To Be Aware Of

Relative Score of RFC vs HPC for 2002 Annual OHRFC

NPVU – OHRFC – MAE

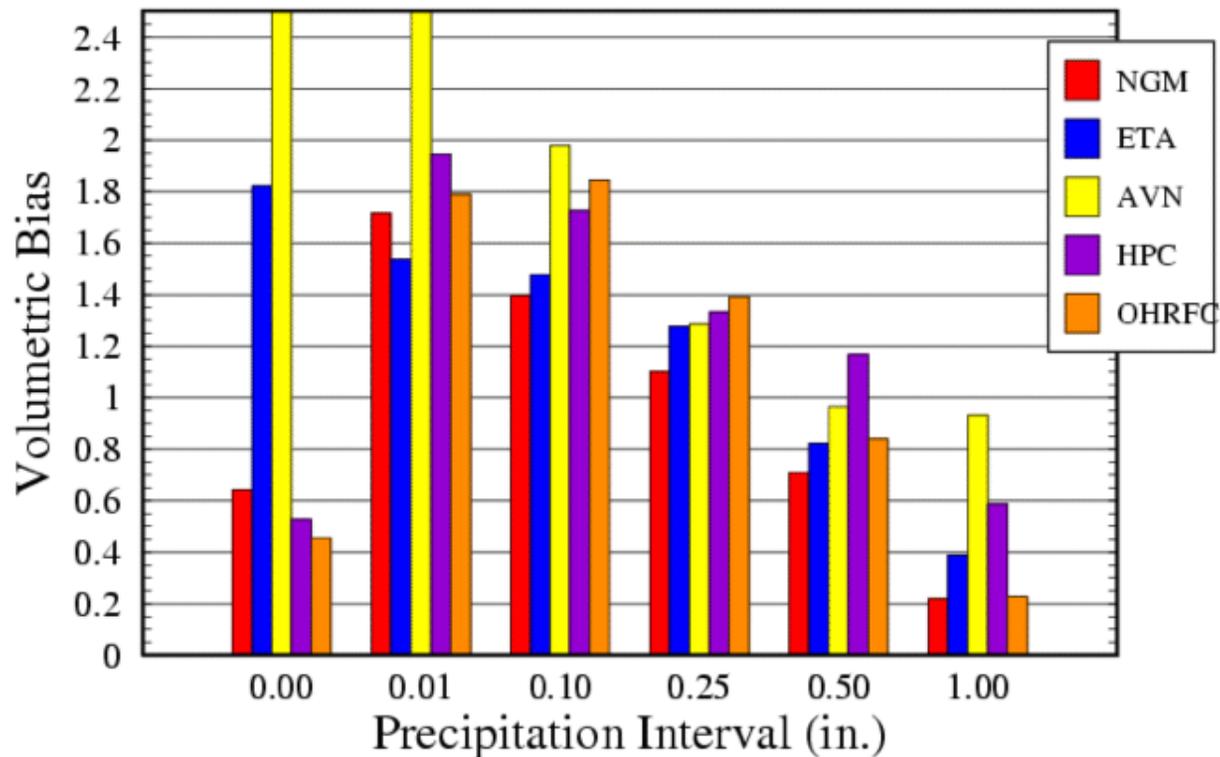


Things To Be Aware Of

Relative Score of RFC vs HPC for 2002 Annual OHRFC

NPVU – OHRFC – CVBIAS

Jan2002–Dec2002 DAY1 06H GRD (OBS & FOR)

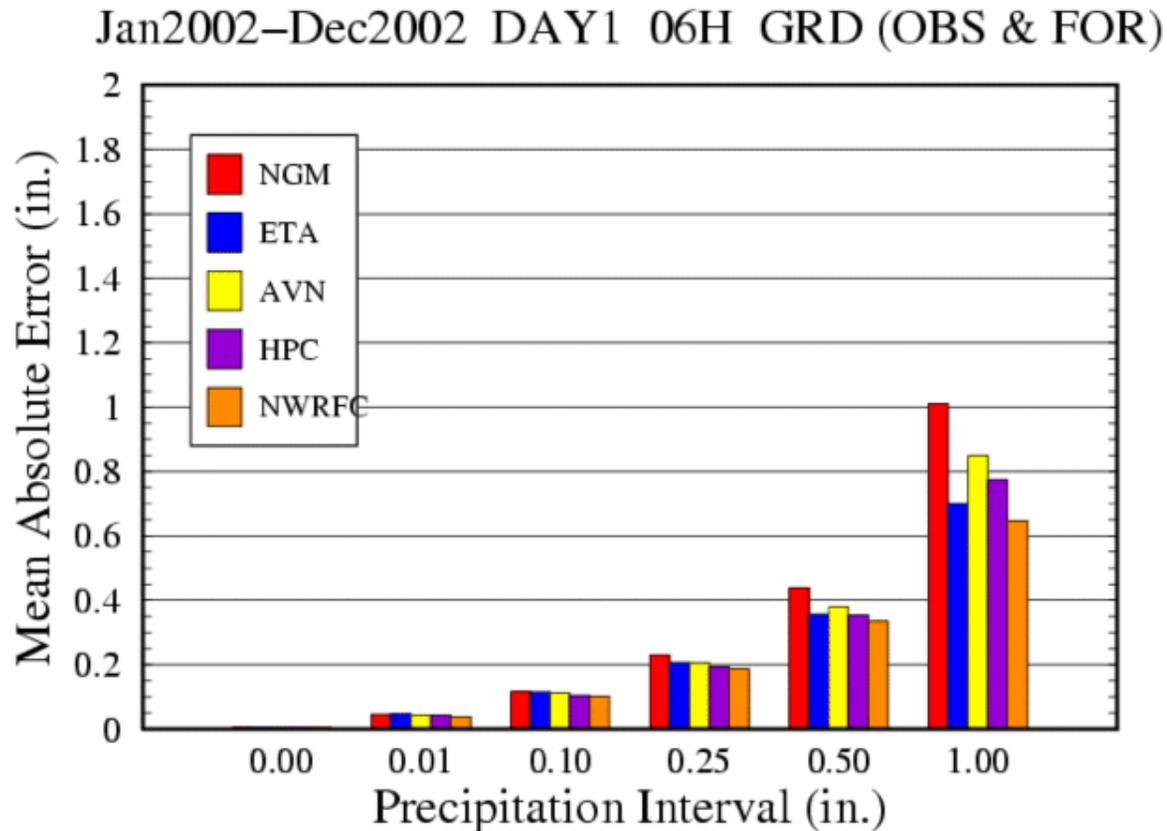


Wed Jan 8 15:05:58 2003

Things To Be Aware Of

Relative Score of RFC vs HPC for 2002 Annual NWRFC

NPVU – NWRFC – MAE

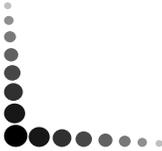


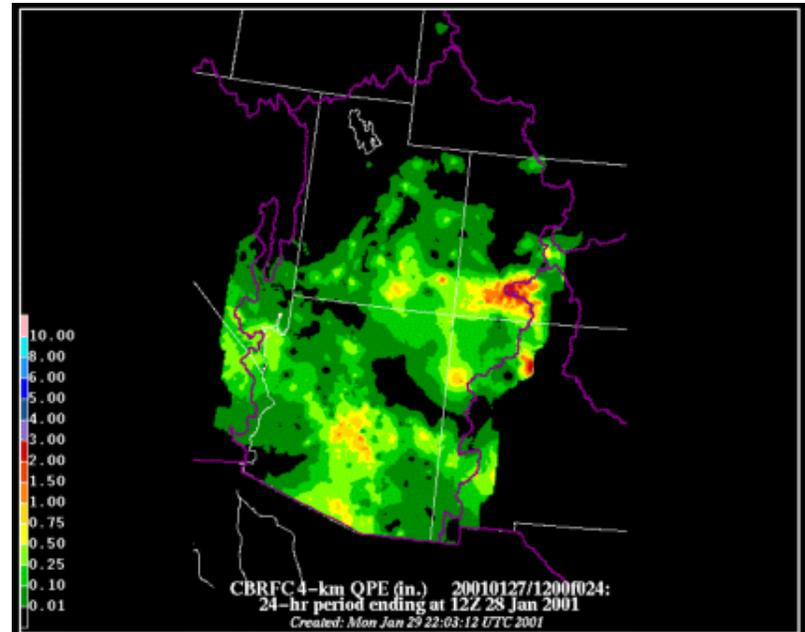
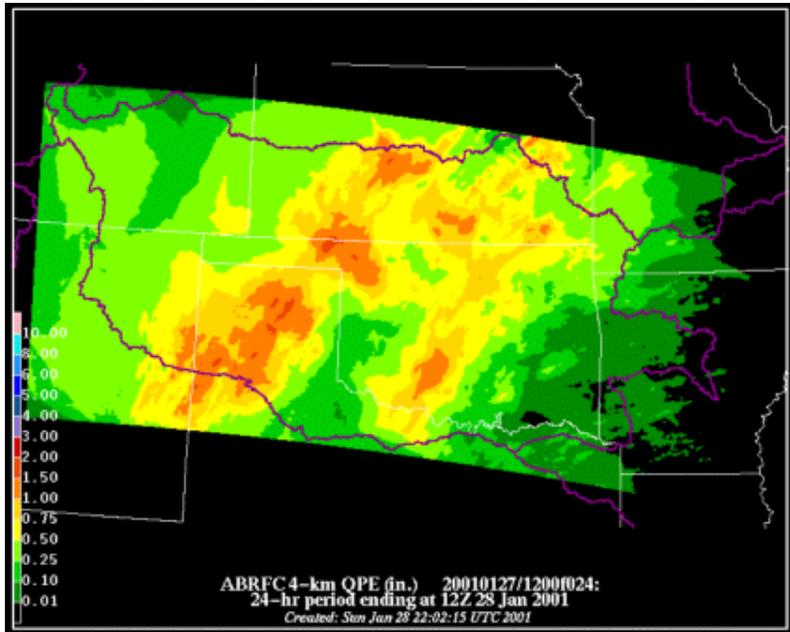
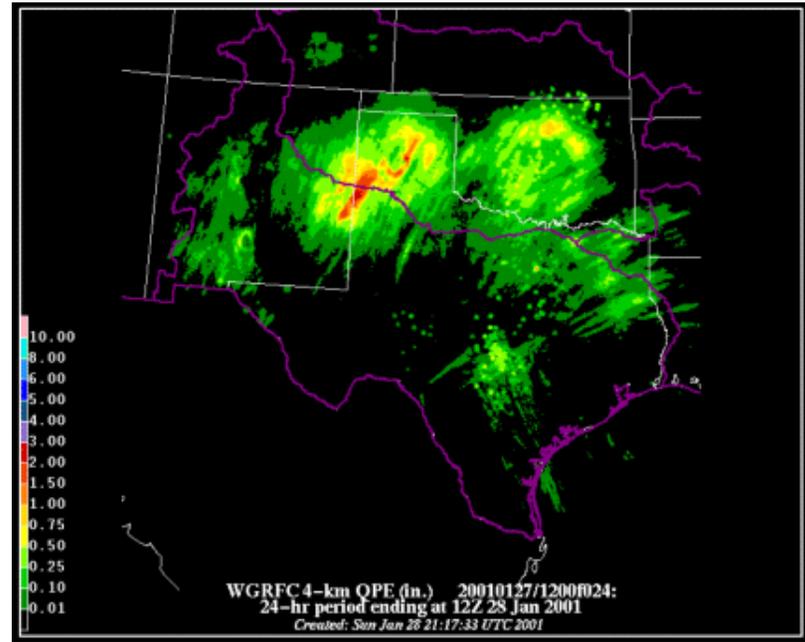
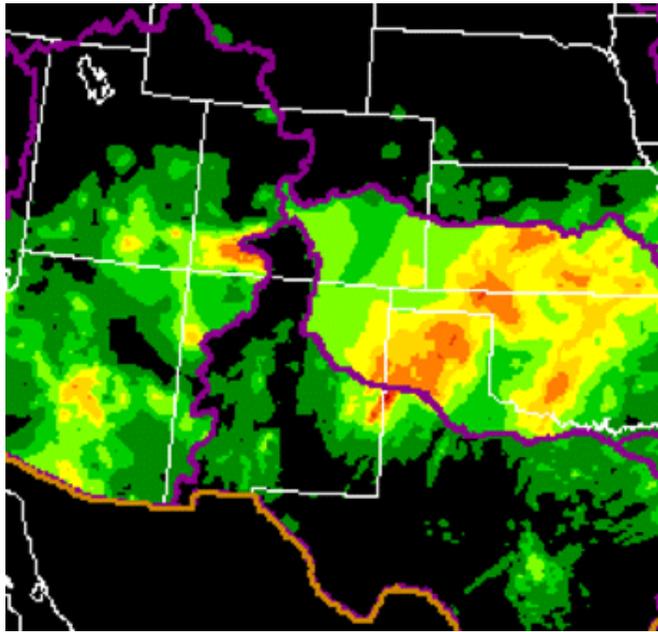
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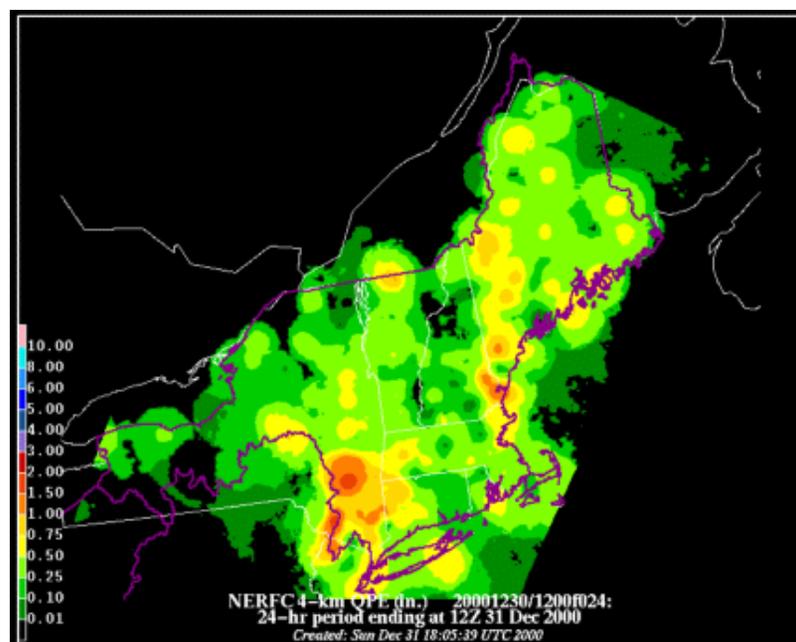
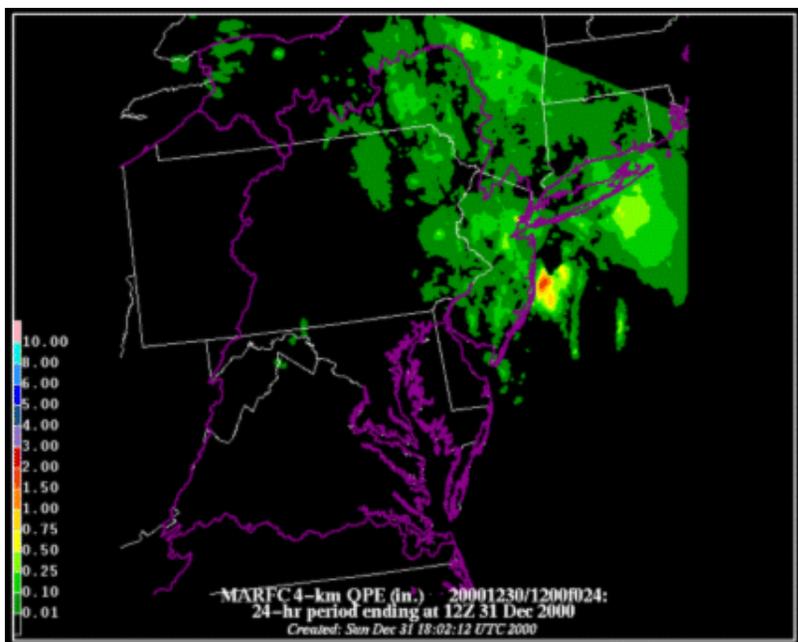
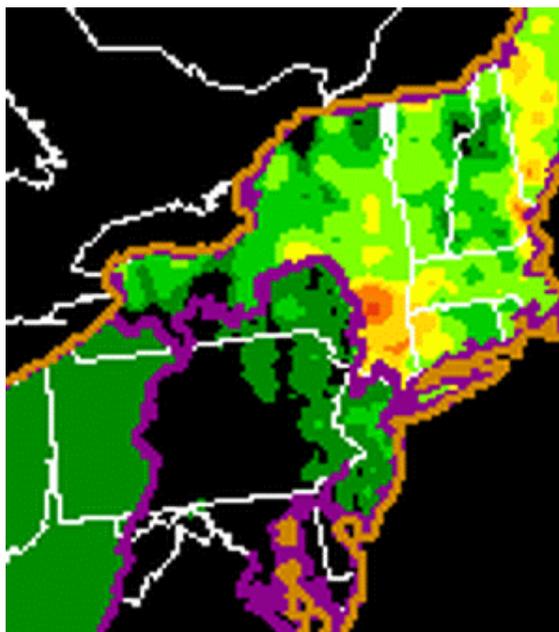


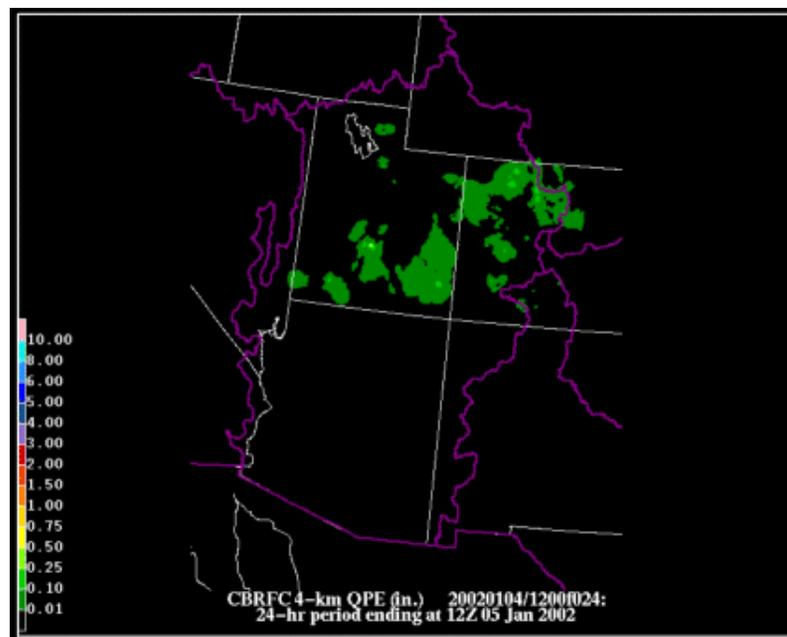
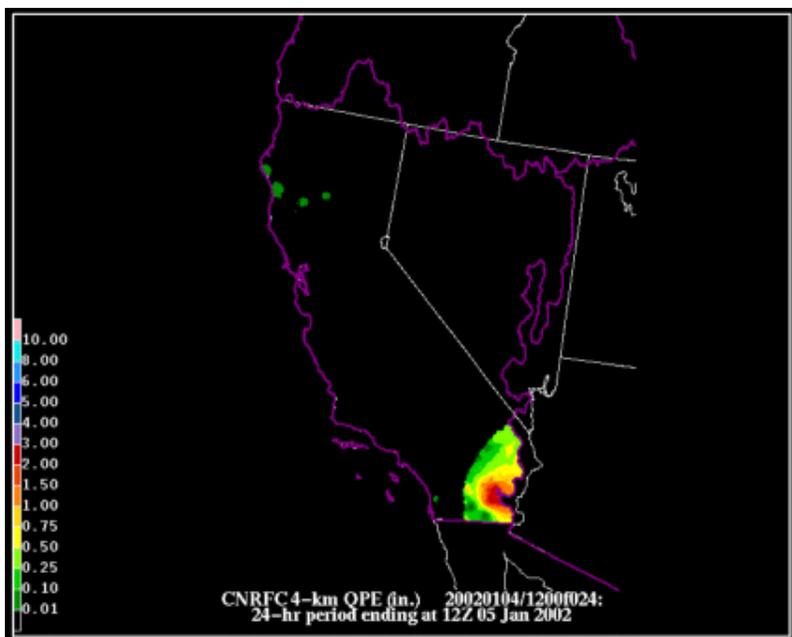
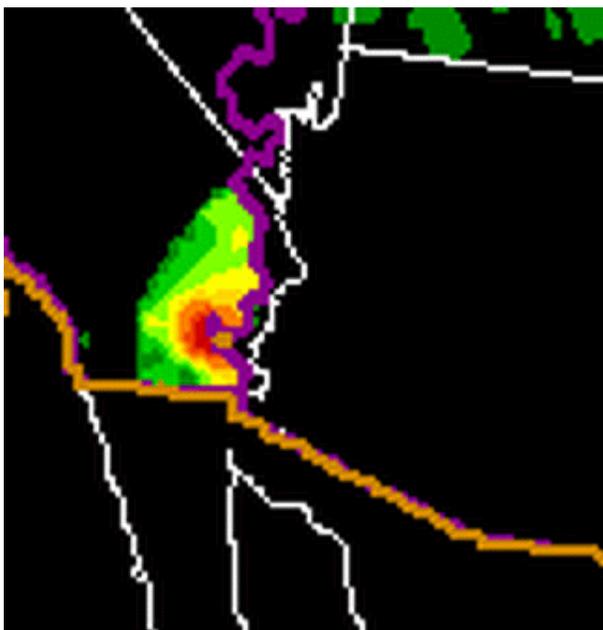
Things To Be Aware Of

Examples of QPE discontinuity problems

- Errors due to different methods (Stage III vs. Gauge Data)
 - Errors due to interference with Radar
 - Errors due to RFC boundaries on ingest data
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Thank you

Do you have any questions?

NPVU web site:

<http://www.hpc.ncep.noaa.gov/npvu>

My e-mail

letitia.soulliard@noaa.gov

