

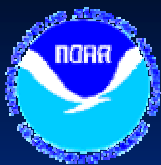
Use of Weather and Climate Forecast Information in the California-Nevada River Forecast Center

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Hydrologist in Charge
NWS / California-Nevada River Forecast Center



Mission of NWS Hydrologic Services Program

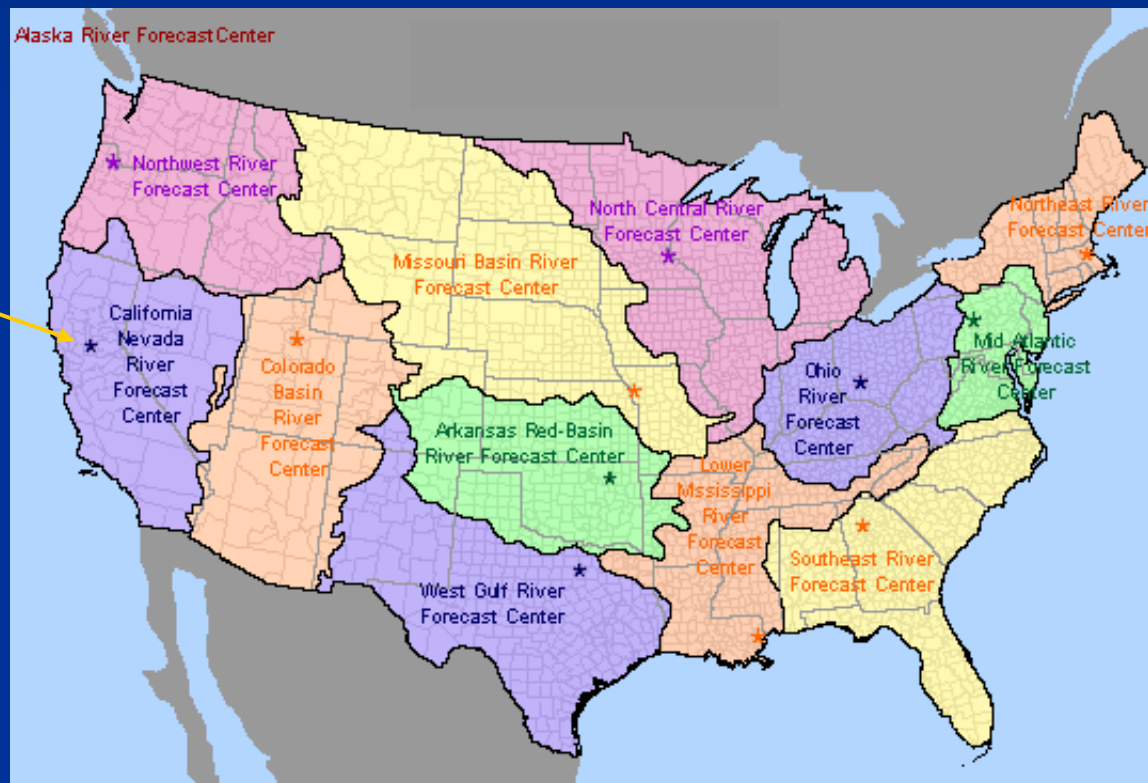
- Provide river and flood forecasts and warnings for the protection of lives and property.
- Provide basic hydrologic forecast information for the nation's environmental and economic well being.



NWS River Forecast Centers

CNRFC

- 245,000 sq. miles
- 182+ modeled basins
- 80+ flood forecast points
- 42+ reservoir inflows
- 50 water supply points
- Lots of people!





CNRFC Hydrologic Products and Services

Short Range Long Range

Local Flood Warning Systems Support

Flash Flood Guidance

Headwater Guidance

Flood Forecast Guidance

Reservoir Inflow Forecasts

Spring Snow Melt Forecasts

Water Supply Volume



CNRFC Hydrologic Modeling

Short Range Long Range

NWSRFS – OFS

6 hour time step, 5 day duration
modular, deterministic

NWSRFS - ESP.....

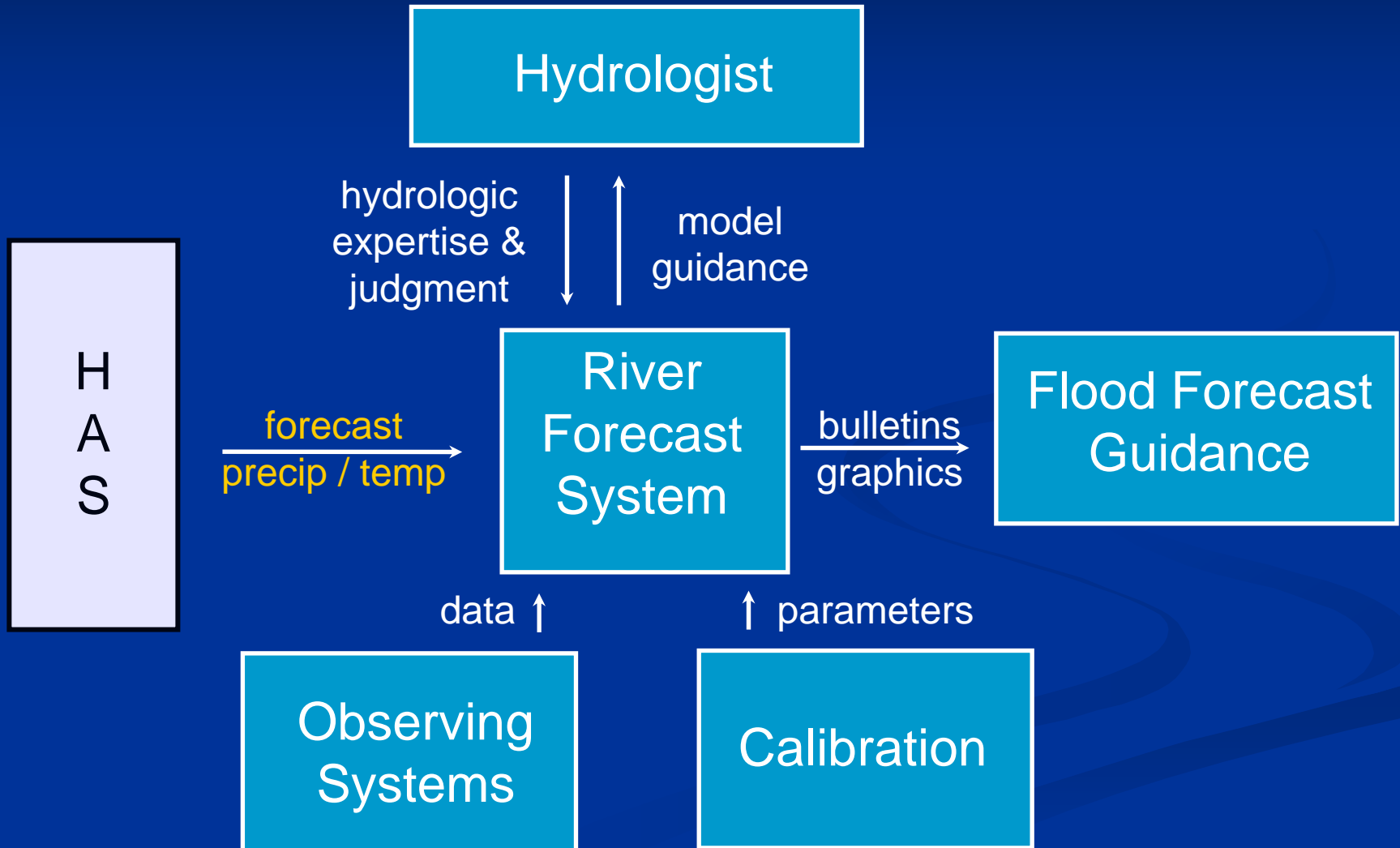
6 hour time step, ~ 1 year duration,
ensemble-based, probabilistic

Statistical

simple, efficient, inflexible
seasonal duration

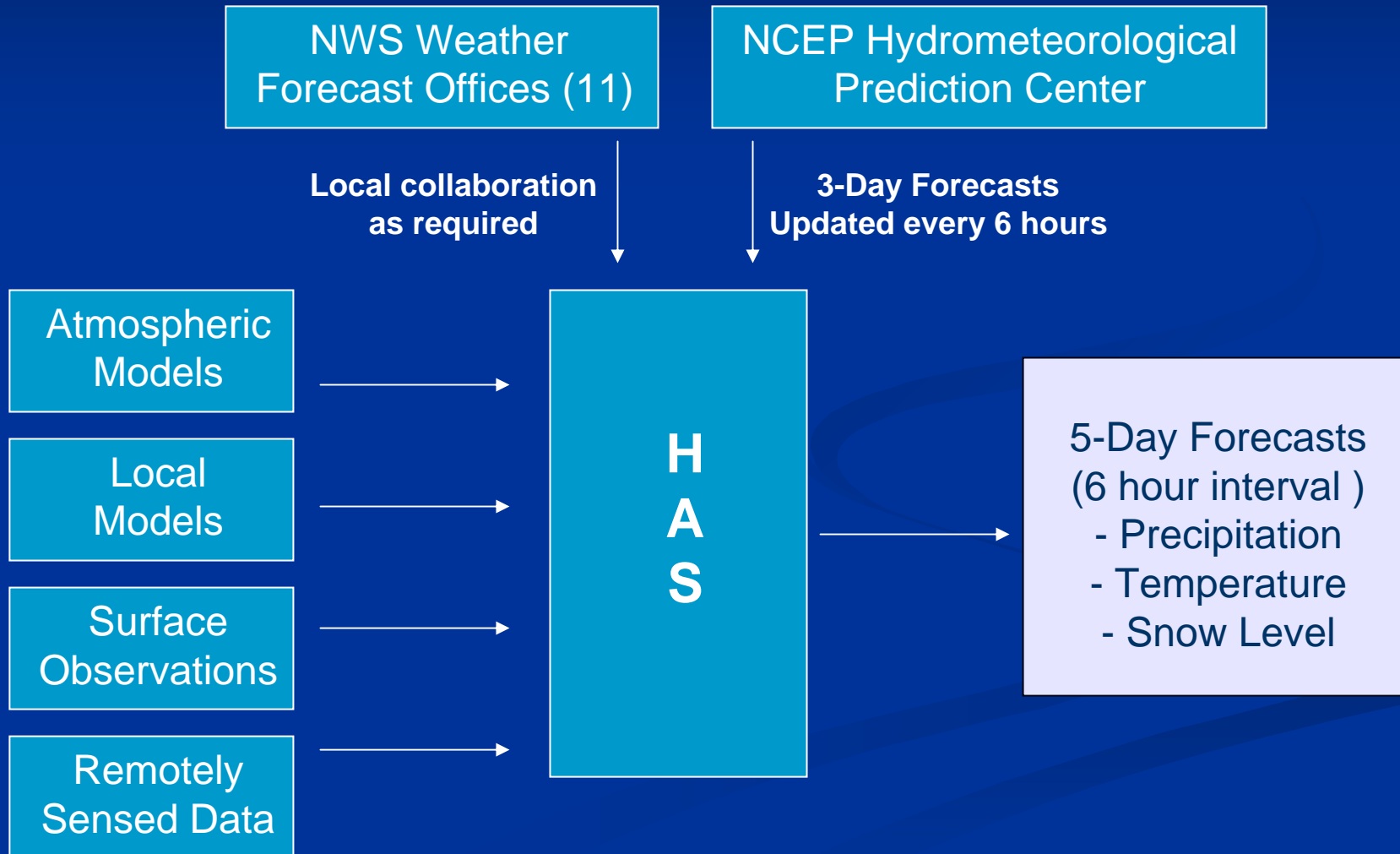


Operational Flood Forecasting



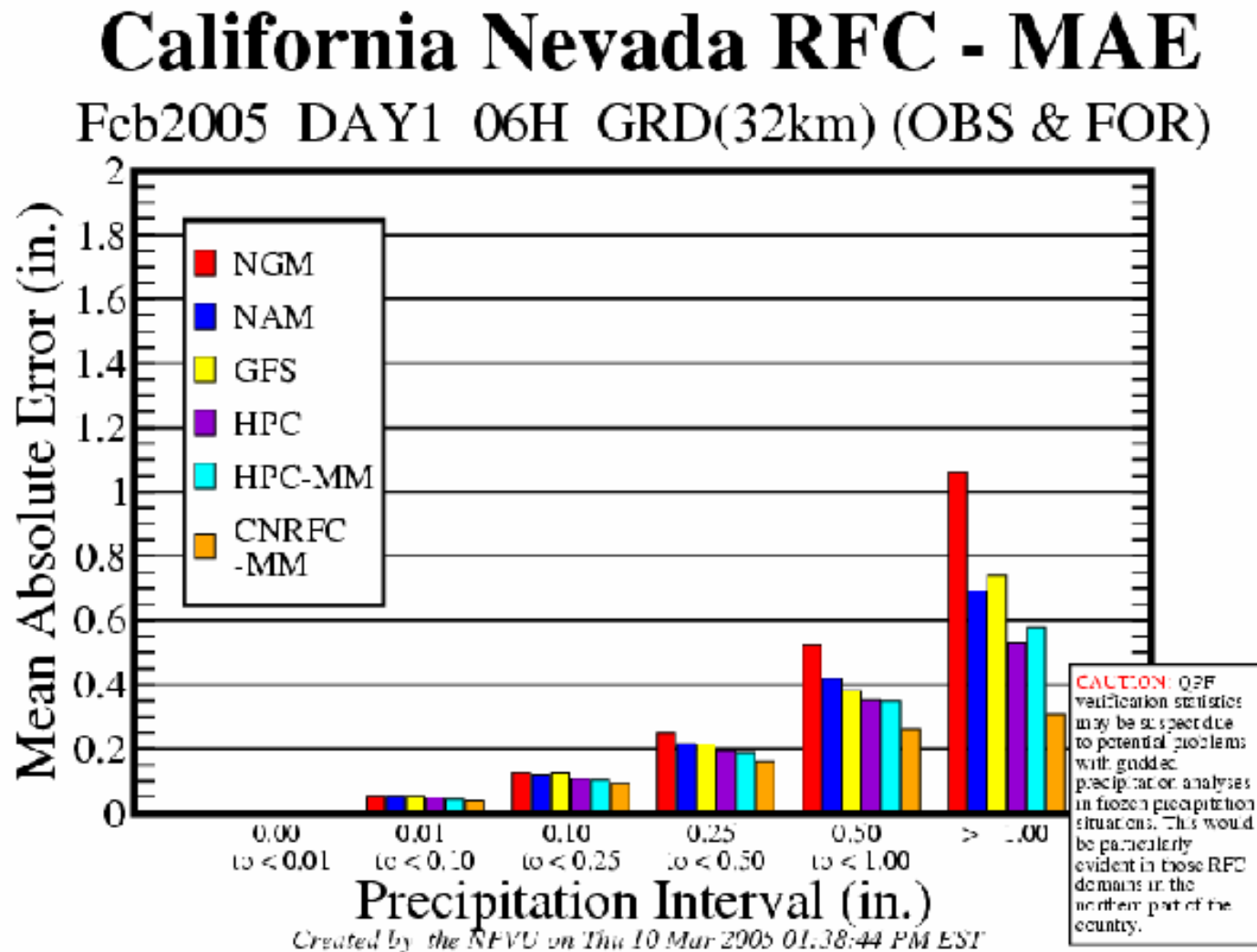


Operational HAS Function



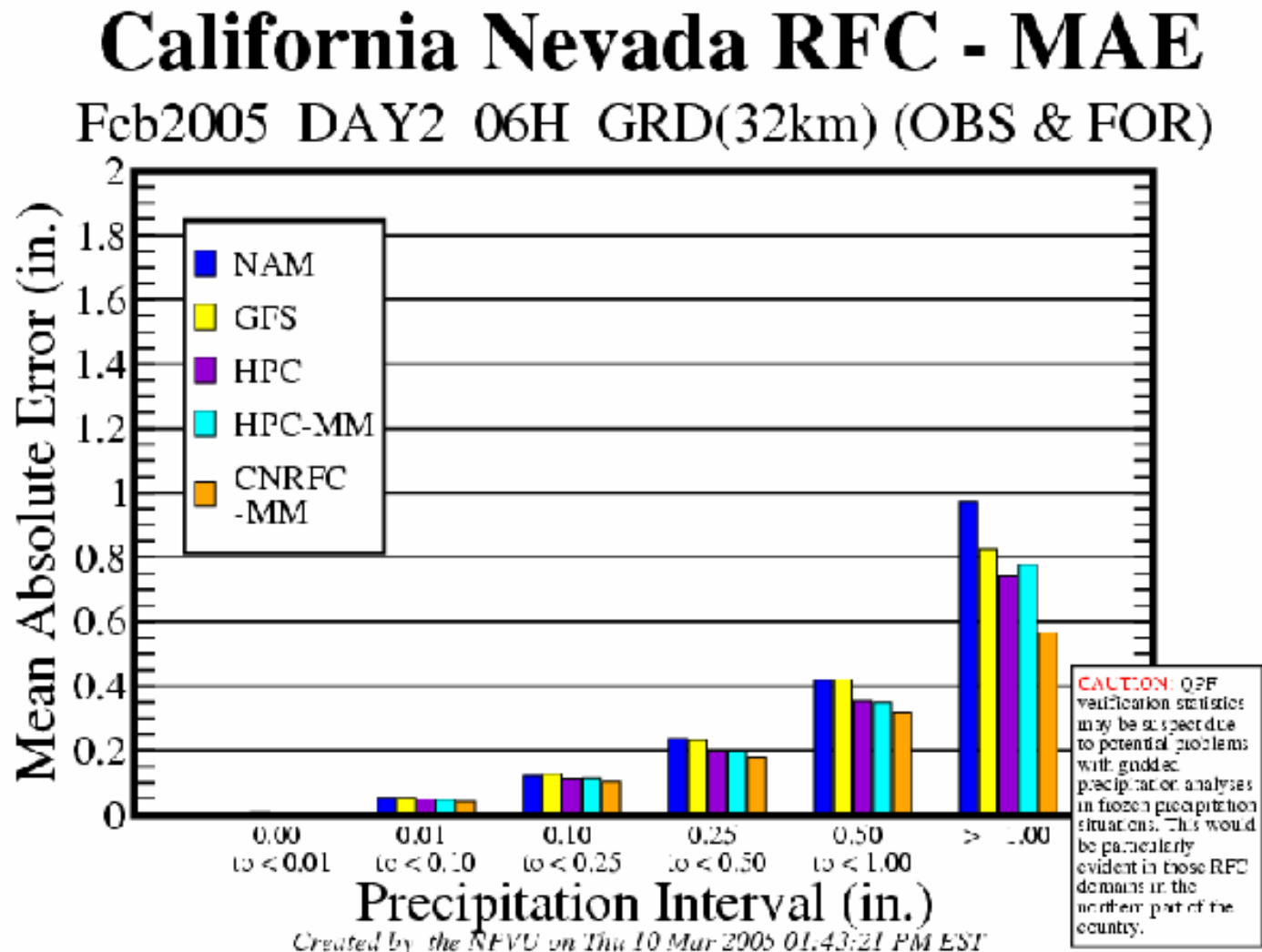


Day 1 QPF Error (Feb05)



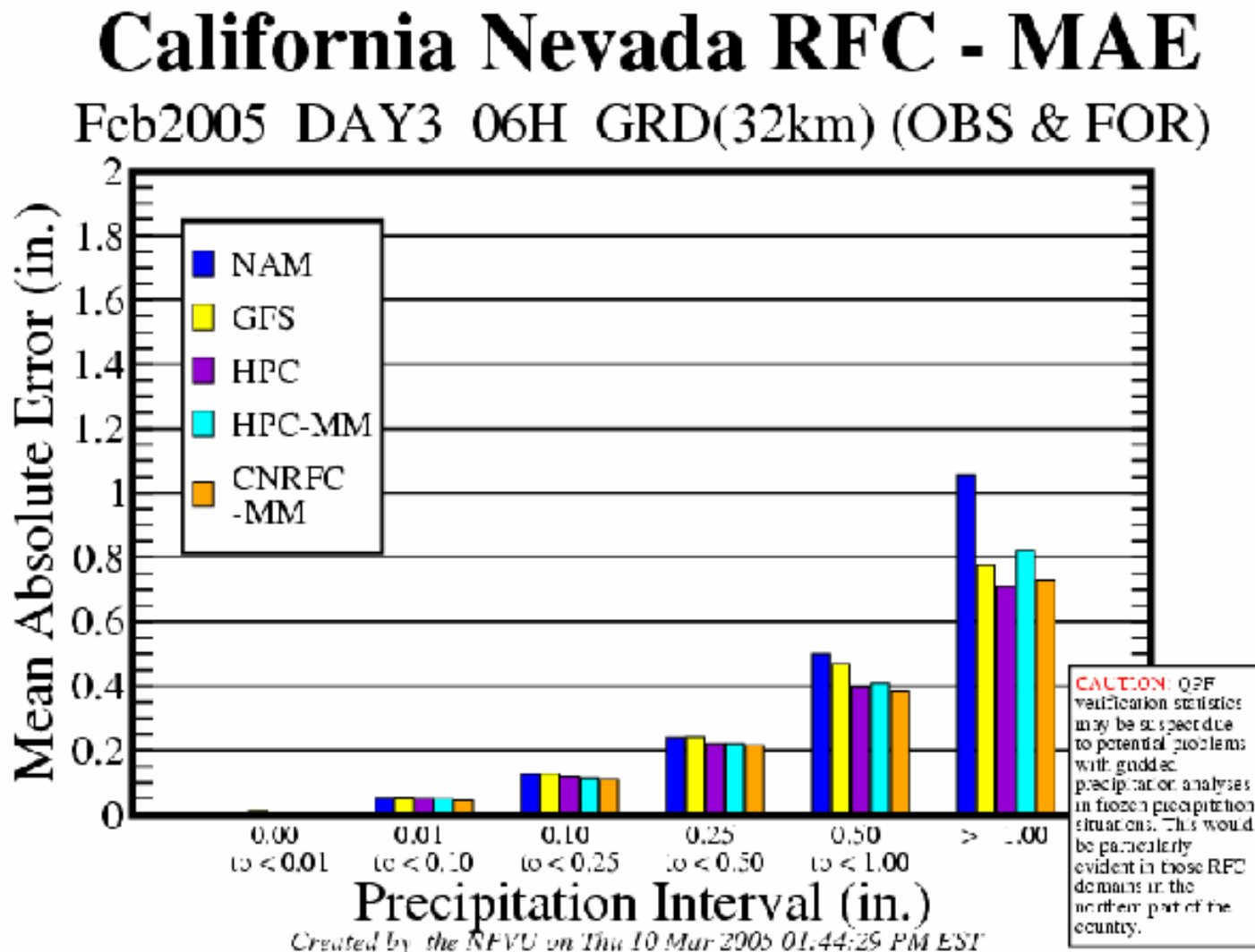


Day 2 QPF Error (Feb05)



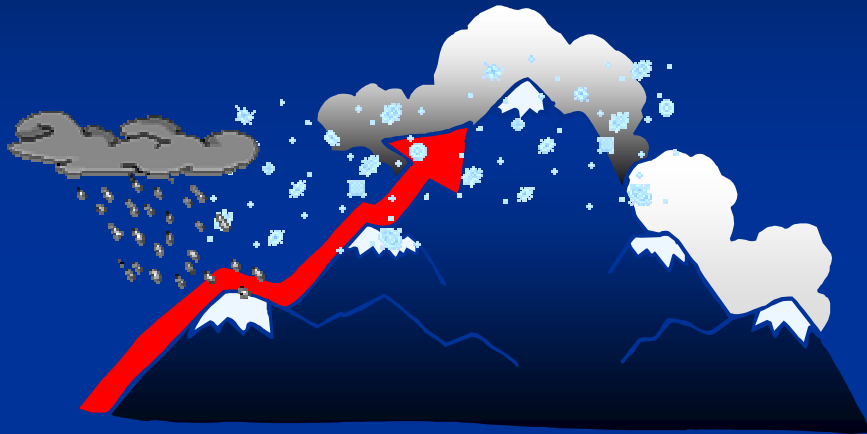


Day 3 QPF Error (Feb05)





Rhea Orographic Aid (Days 4-5)



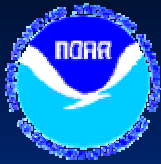
Sample output...

```

==< SHASTA ABOVE SHASTA DAM - SHDC1
>=====
      STRDA  BEG-END   QPF  SLVL FRZGLVL  700DIR
  6    19  16-22     .00   35    5.1   253-299  WIND&RH WK SSE-NNW PRDIF
 12    19  22- 4     .04   28    4.3   299-257  WIND&RH WK SSE-NNW PRDIF

 18    20   4-10     .13   26    4.1   257-228  RH ONLY NORMAL PGRAD
 24    20  10-16     .17   27    4.3   228-210  RH ONLY NORMAL PGRAD
 30    20  16-22     .09   28    4.4   210-109  WIND&RH WK SSE-NNW PRDIF
 36    20  22- 4     .00*  30    4.6   109- 49  WIND&RH WK SSE-NNW PRDIF
MODIFIED TOTS 04-04     .38 MOD-FAC = .85 * = 700mbWD >344 or <155 DEG
 42    21   4-10     .00*  38    5.4    49- 15  WIND&RH WK SSE-NNW PRDIF
 48    21  10-16     .00*  51    6.6    15- 14  WIND&RH WK SSE-NNW PRDIF
 54    21  16-22     .00*  57    7.3    14-  7  WIND&RH WK SSE-NNW PRDIF
 60    21  22- 4     .00   56    7.1    7-303  WIND&RH WK SSE-NNW PRDIF
MODIFIED TOTS 04-04     .00 MOD-FAC = .85 * = 700mbWD >344 or <155 DEG
  
```

- Objective tool
- Outputs 6-hour orographic QPF
- Input - NCEP gridded datasets from AWIPS
 - Eta and GFS
- Performed well during large-scale rain events in California (1986, 1997)
- Mesoscale resolution



Rhea Orographic Aid Performance

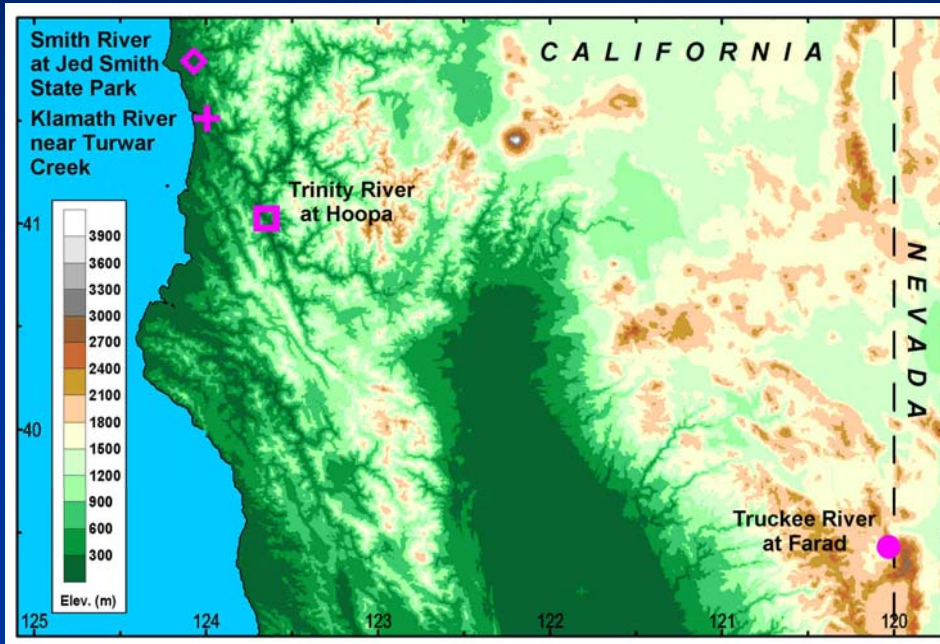
New Year's Flood 1997 – Feather River Basin

Feather River Basin - Dec/Jan 1996-97 Flood Event

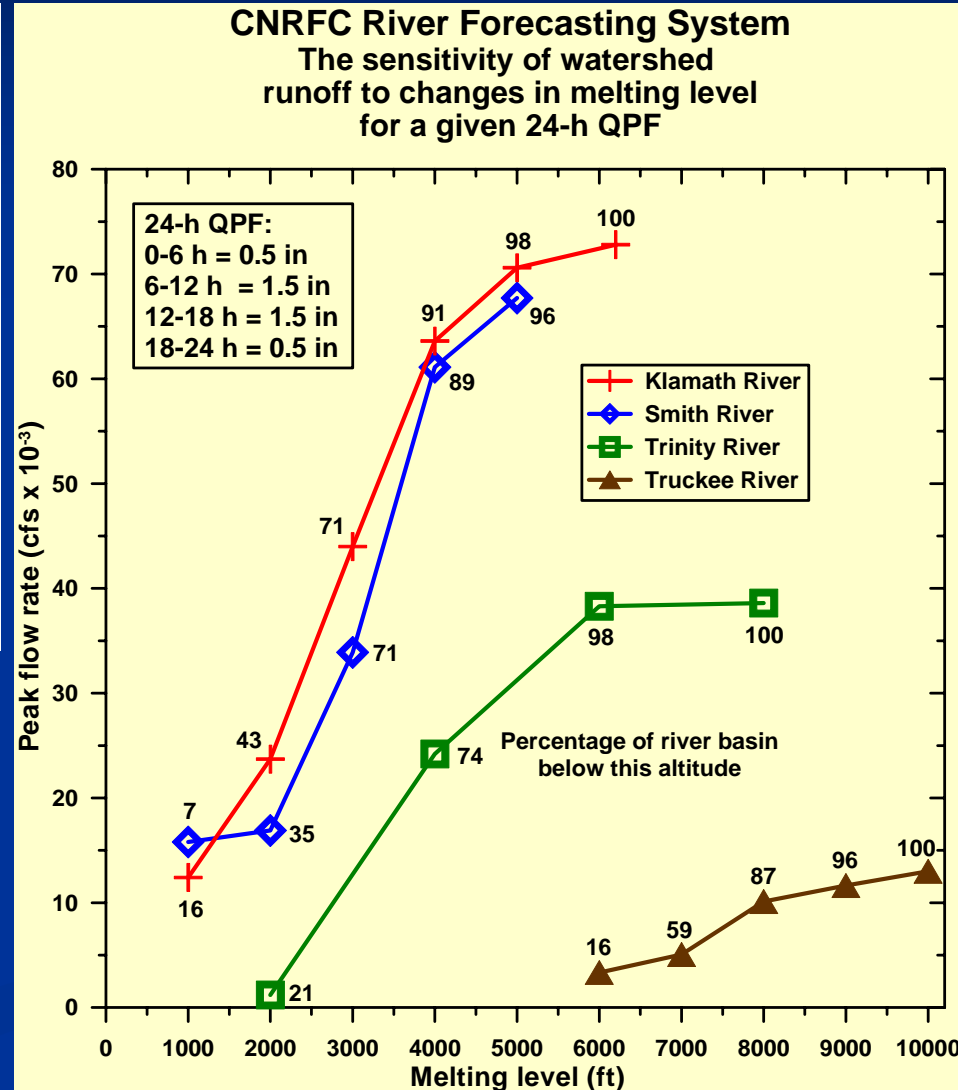
| MRF Model 00 UTC | Dec 24-25 | Dec 25-26 | Dec 26-27 | Dec 27-28 | Dec 28-29 | Dec 29-30 | Dec 30-31 | Dec 31 -Jan 01 | Jan 01-02 | Jan 02-03 | Total Orog | Total Obsvd |
|---------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------|--------------|--------------|---------------|----------------|
| 12/24/96 | 0.0 | 0.2 | 2.1 | 1.0 | >.3 | | | | | | >3.6 | 5.6 |
| 12/25/96 | | 0.2 | 2.2 | 1.8 | 4.3 | >4.6 | | | | | >13.1 | 8.3 |
| 12/26/96 | | | 2.6 | 1.4 | 4.0 | 4.2 | >2.1 | | | | >14.3 | 13.9 |
| 12/27/96 | | | | 1.4 | 3.4 | 4.2 | 5.4 | >2.2 | | | >16.6 | 15.5 |
| 12/28/96 | | | | | 3.2 | 3.8 | 4.4 | 3.2 | >4.3 | | >18.9 | 20.8 |
| 12/29/96 | | | | | | 4.2 | 4.1 | 5.8 | 4.7 | >2.7 | >21.5 | 21.2 |
| 12/30/96 | | | | | | | 3.5 | 6.2 | 5.4 | 1.3 | 16.4 | 18.5 |
| 12/31/96 | | | | | | | | 5.4 | 6.2 | 3.3 | 14.9 | 12.8 |
| 01/01/96 | | | | | | | | | 6.3 | 4.2 | 10.5 | 8.0 |
| 01/02/96 | | | | | | | | | | 3.1 | 3.1 | 1.3 |
| Observed | 0.0 | 0.1 | 3.2 | 1.4 | 0.9 | 2.7 | 5.7 | 4.8 | 6.7 | 1.3 | -- | -- |
| 00 UTC Eta Model 12-36 Hour QPF | | | | | | | | | | | | |
| 12-36hr | 0.0 | 0.4 | 2.4 | * | 2.8 | 4.1 | 4.3 | 3.7 | 5.7 | 3.4 | 26.8 | -- |
| Observed | 0.0 | 0.1 | 3.2 | 1.4 | 0.9 | 2.7 | 5.7 | 4.8 | 6.7 | 1.3 | -- | 26.8 |

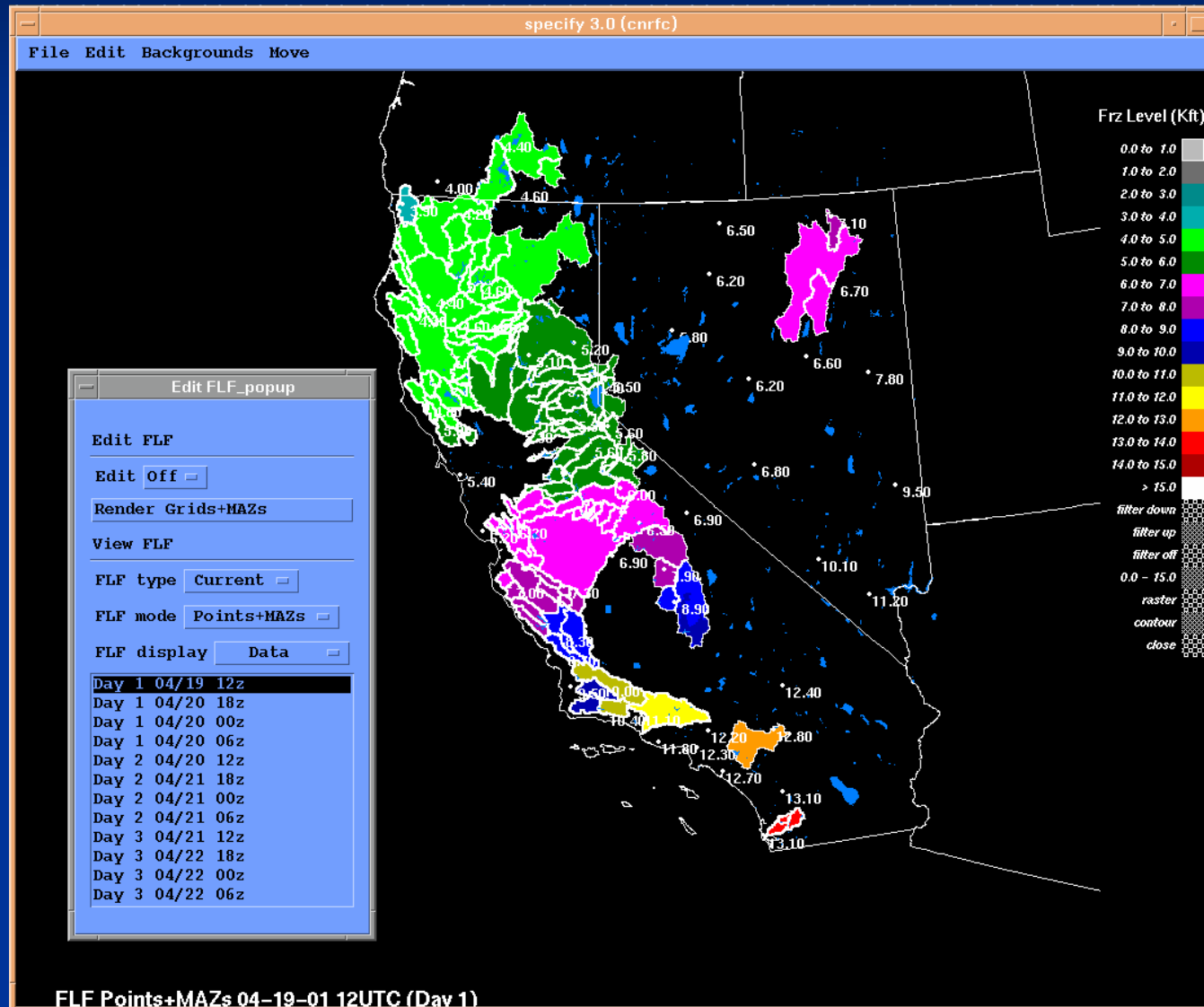


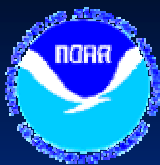
The melting level strongly influences runoff In mountainous watersheds



| River/Basin | Area (mi ²) | Precip. (in) |
|-------------|-------------------------|--------------|
| Klamath | 772 | 70 |
| Smith | 614 | 103 |
| Trinity | 650 | 63 |
| Truckee | 204 | 41 |

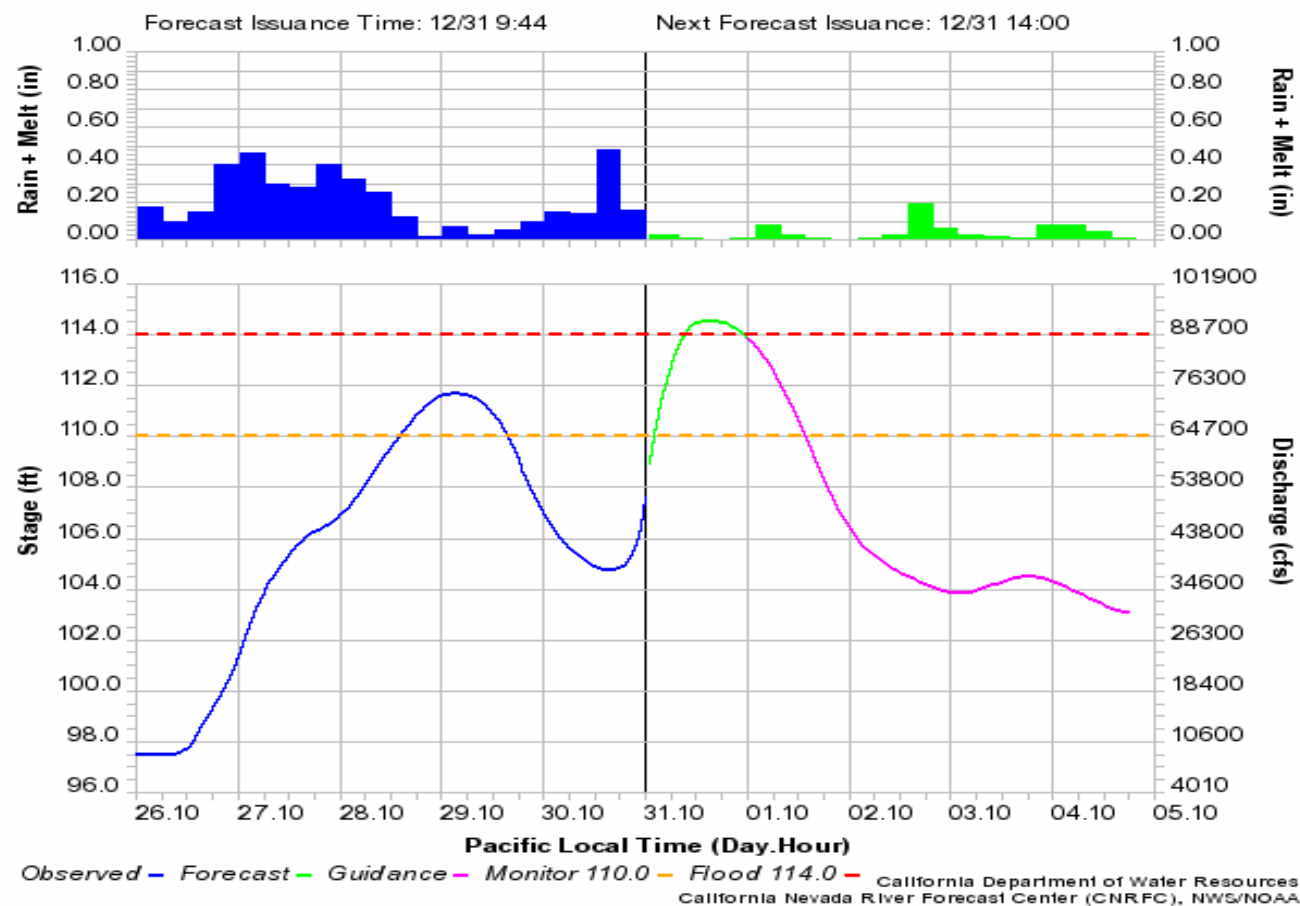






Flood Forecast Guidance

ORFC1 - SACRAMENTO RIVER - Ord Ferry



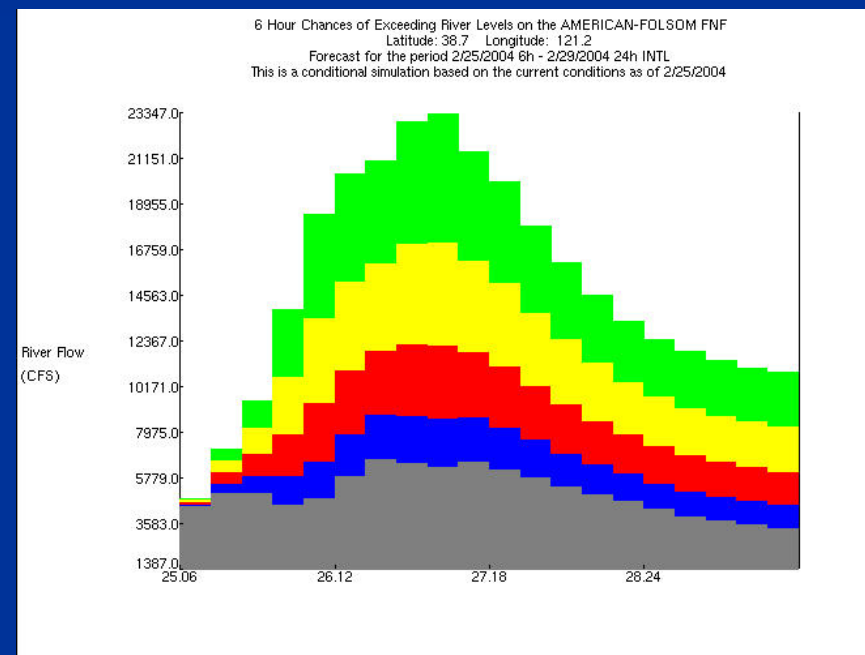
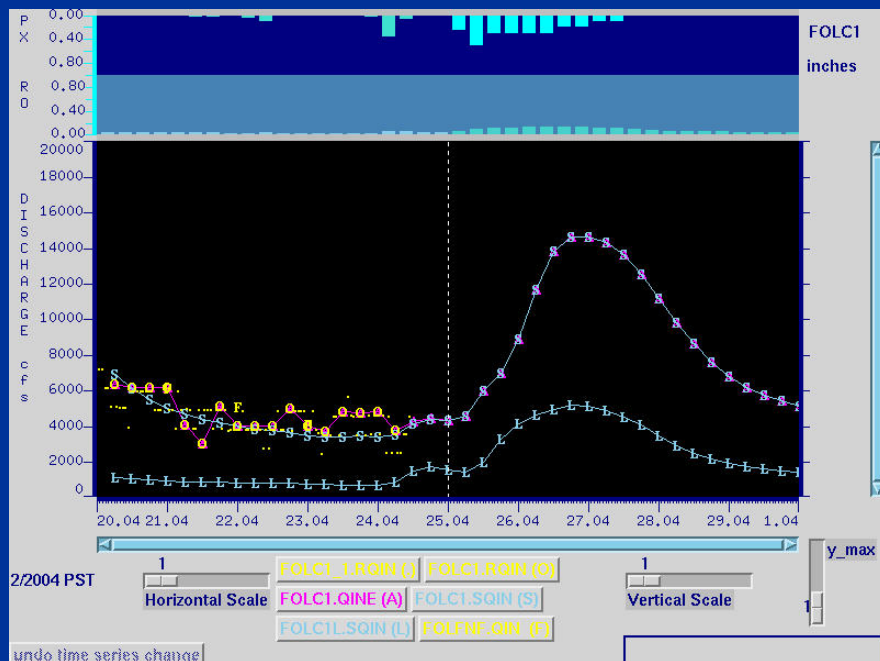
Monitor Stage: 110 feet

Flood Stage: 114 feet



Ensemble Challenges

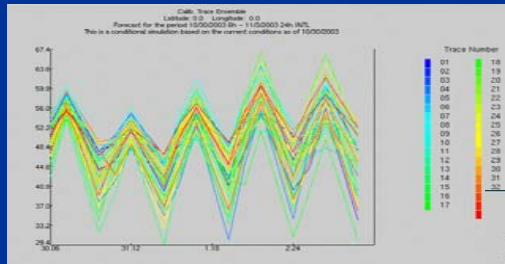
- Maintain coherence between deterministic and ensemble forecasts



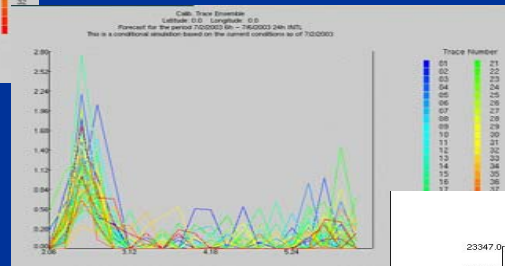


5-Day Ensemble Prototype

- **Status:**
 - Several RFCs collaborating with OHD on short-term prototype

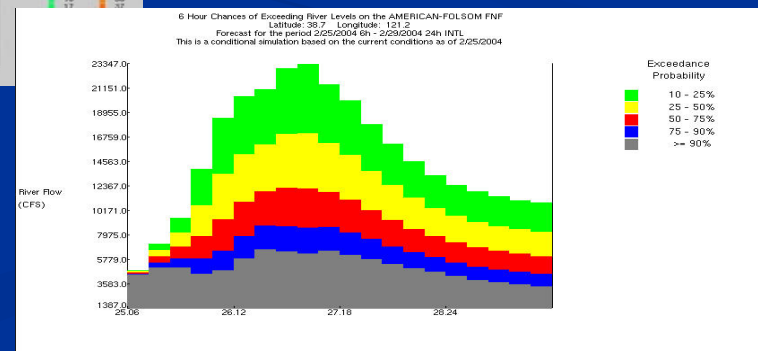


Forecast Temperature
Ensembles



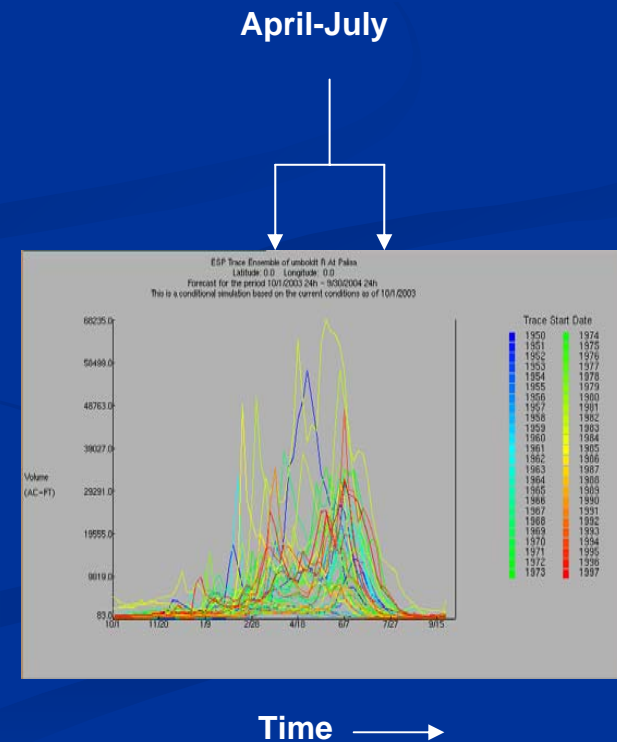
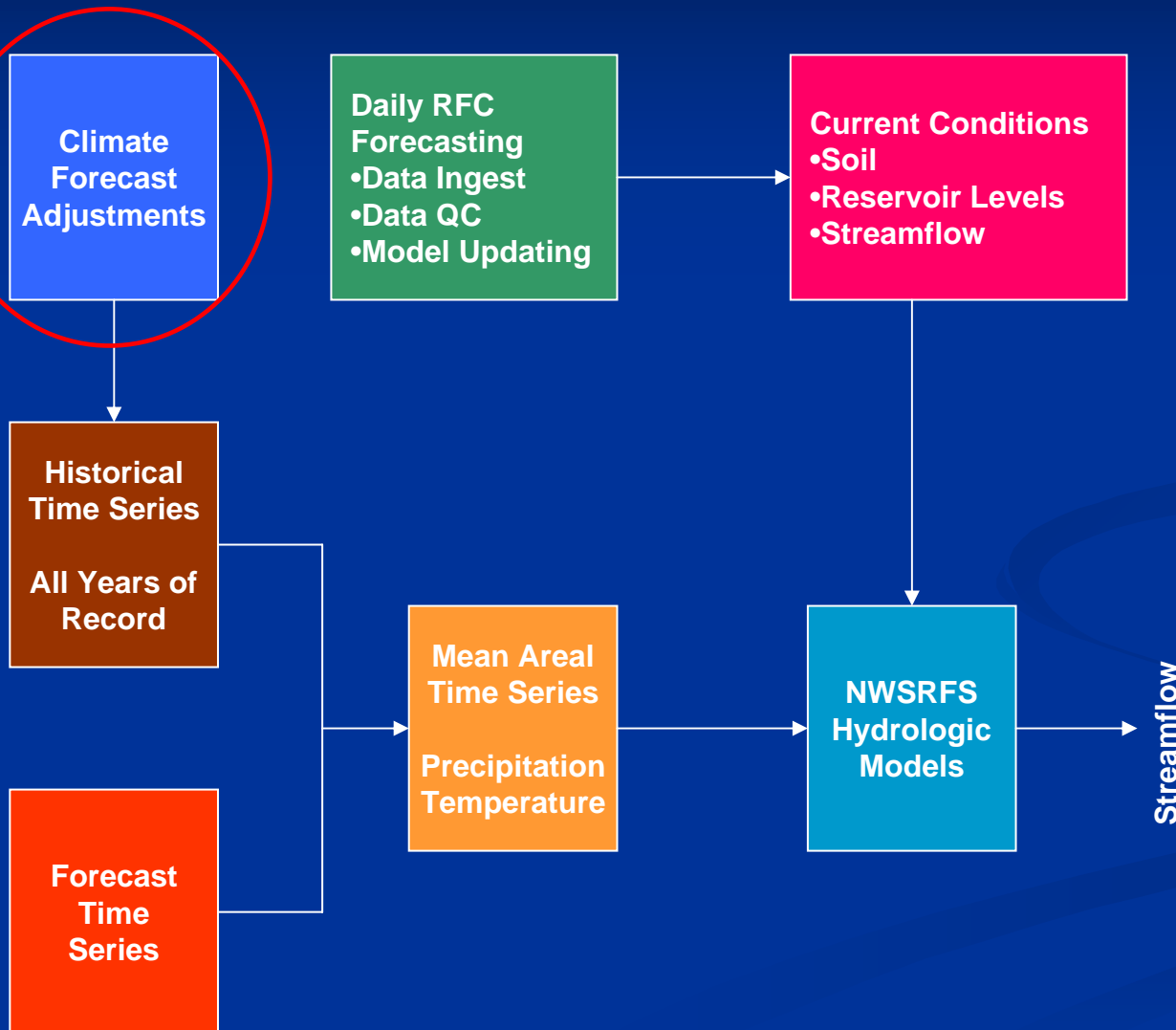
Forecast
Precipitation
Ensembles

Probabilistic Reservoir Inflow





Ensemble Streamflow Prediction





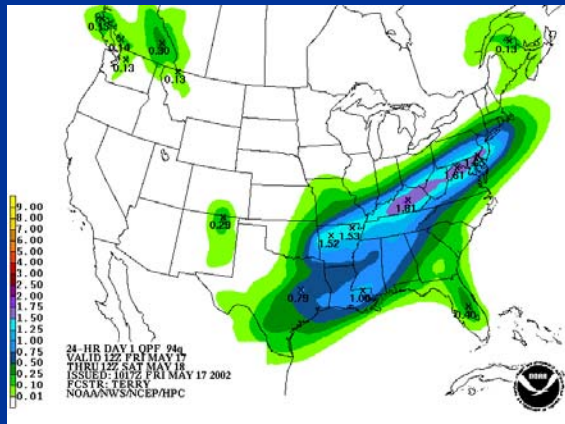
ESP Use of Weather and Climate Forecasts

Historical
MAT and MAP

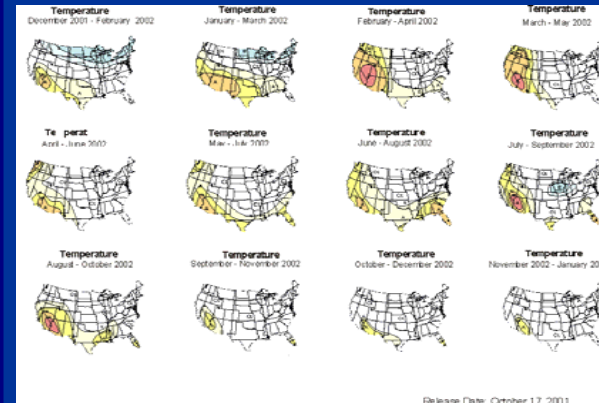
Adjustment
System

Adjusted Historical
MAP and MAT

Weather Forecasts



Climate Forecasts





ESP Pre-Adjustment Technique

CPCPreAdj

Initial Parameters

Contributing Region:

Initial Date (m/d/y):

1-5 Day Forecast

Start Day Start Month

Temp Min Anomaly (degF)

Temp Max Anomaly (degF)

Precipitation Total (inches)

6-10 Day Forecast

Start Day Start Month

Temperature

Precipitation

Seasonal Forecast

Initial Period:

| Period | Precipitation | | Temperature | |
|----------------------|--|-----------------------------------|--|-----------------------------------|
| | Category | Probability (%) | Category | Probability (%) |
| Apr 2005 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
| Apr - Jun (AMJ) 2005 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
| May - Jul (MJJ) 2005 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
| Jun - Aug (JJA) 2005 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
| Jul - Sep (JAS) 2005 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
| Aug - Oct (ASO) 2005 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
| Sep - Nov (SON) 2005 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
| Oct - Dec (OND) 2005 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
| Nov - Jan (NDJ) 2005 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
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| Mar - May (MAM) 2006 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |
| Apr - Jun (AMJ) 2006 | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> | <input type="text" value="climatology"/> | <input type="text" value="0.00"/> |

1-5 Day

Long-range

6-10 Day



Thank You