



Ensemble Forecasting Meeting

ABRFC Experiences

OHD - April 21, 2004

William E. Lawrence

DOH - ABRFC



ABRFC Background



- Why did ABRFC participate?
 - Customer requirement limited for long range probabilistic information, but high for short range probabilistic information
 - Major floods on mainstem Arkansas typically last 7 days
 - Typical flooding is on the order of 1 to 3 days.
 - ABRFC expects to use a total suite of probabilistic forecasts to satisfy customer demand.



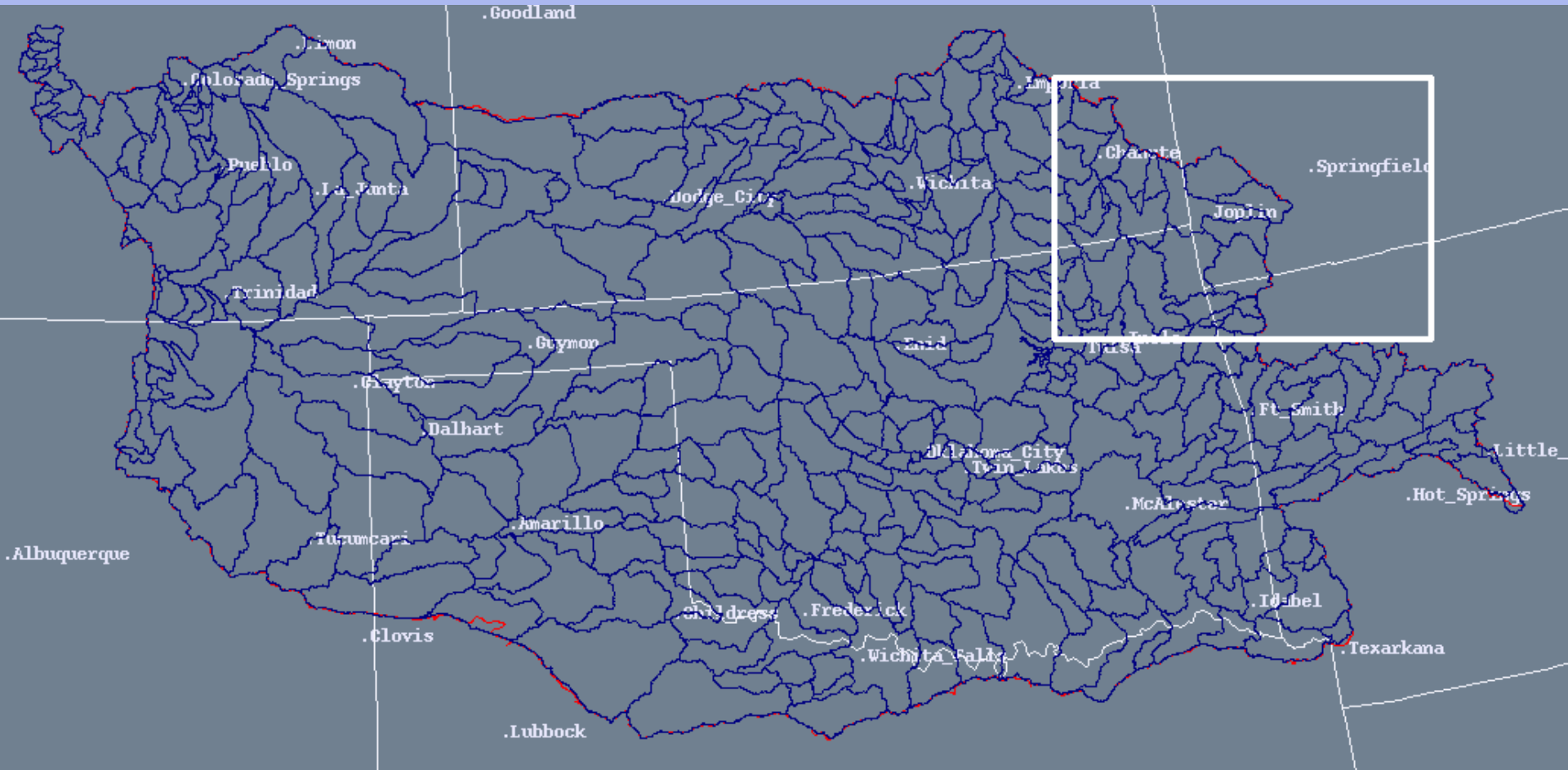
ABRFC Experiences



- Began involvement in late 2002.
- First runs made in May, 2003.
- Selected 5 basins in Southwest Missouri.
- Wide selection of rainfall events; average annual rainfall equals 42 inches.
- Made first report on results to Probabilistic forecasting workshop held at Kansas City MO, Aug 2003.
- OHD provided several changes to software during the fall of 2003.



Project Area



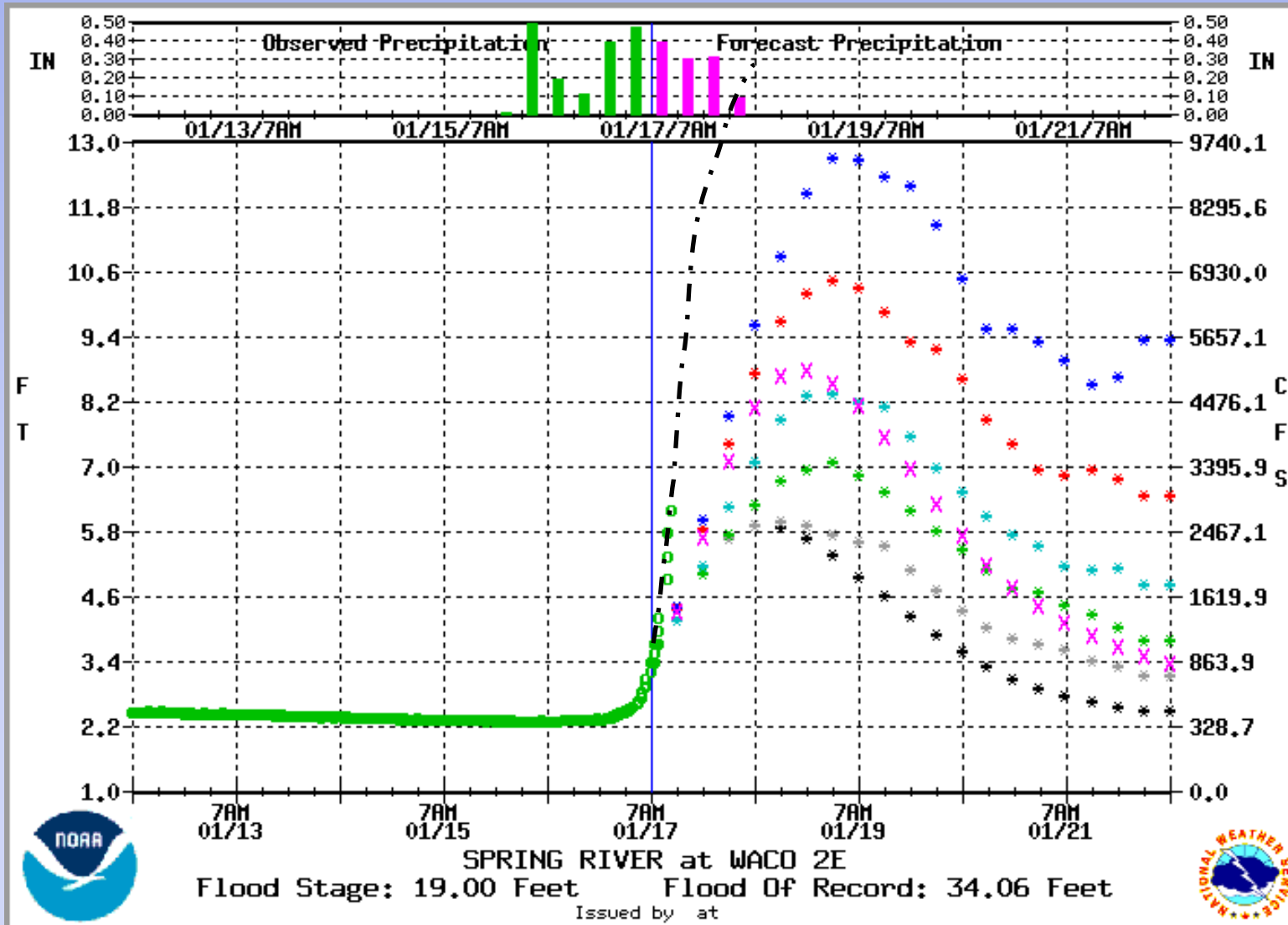


Study Basins





Example 1 – Under forecasted likely due to hydrologic uncertainty (a)



Streamflow Forecast Legend

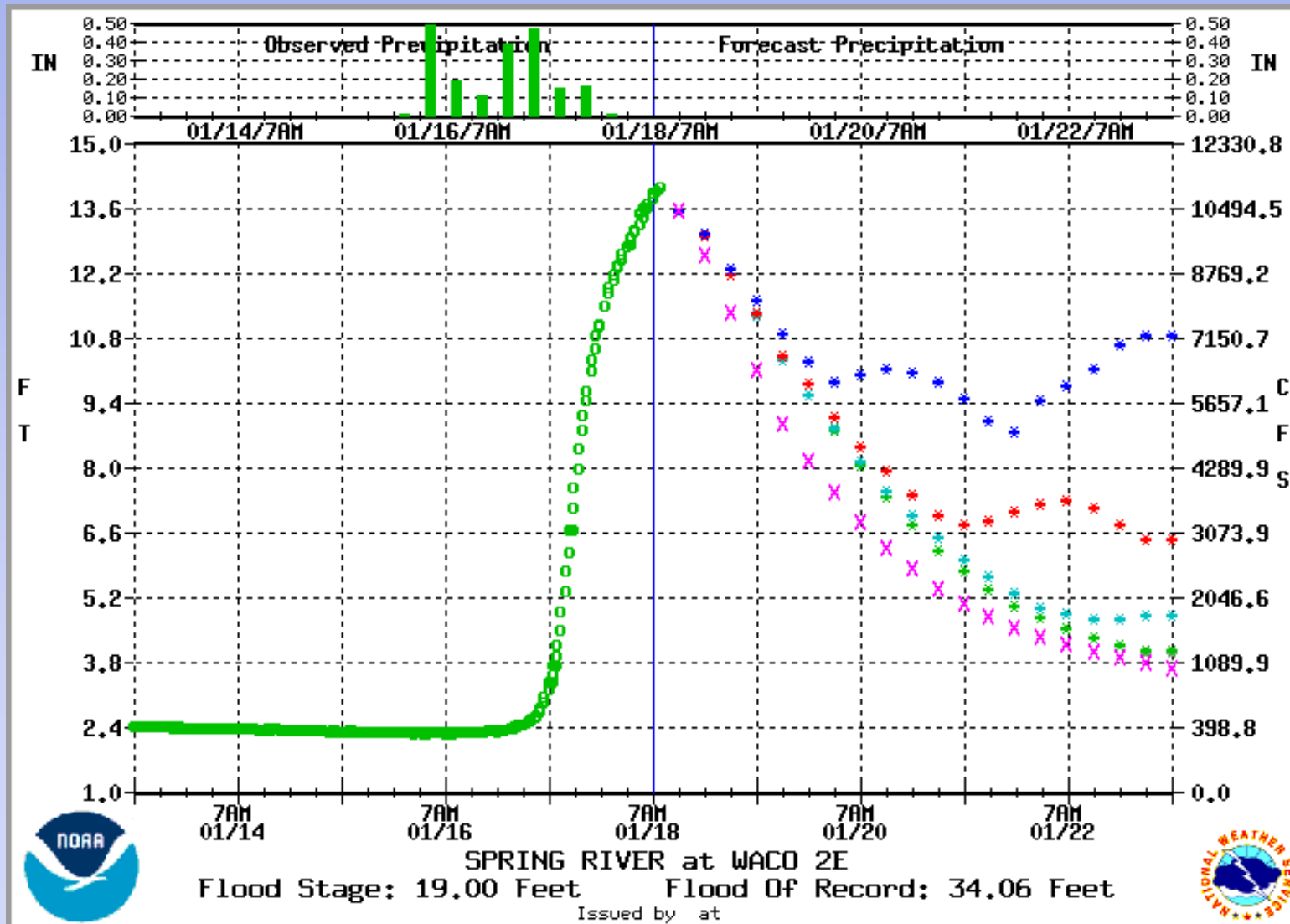
- 2% Exc. P
- 10% Exc. P
- 25% Exc. P
- 50% Exc. P
- 75% Exc. P
- 90% Exc. P
- Deterministic

Exc. P: exceedance probability

Observed

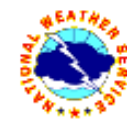
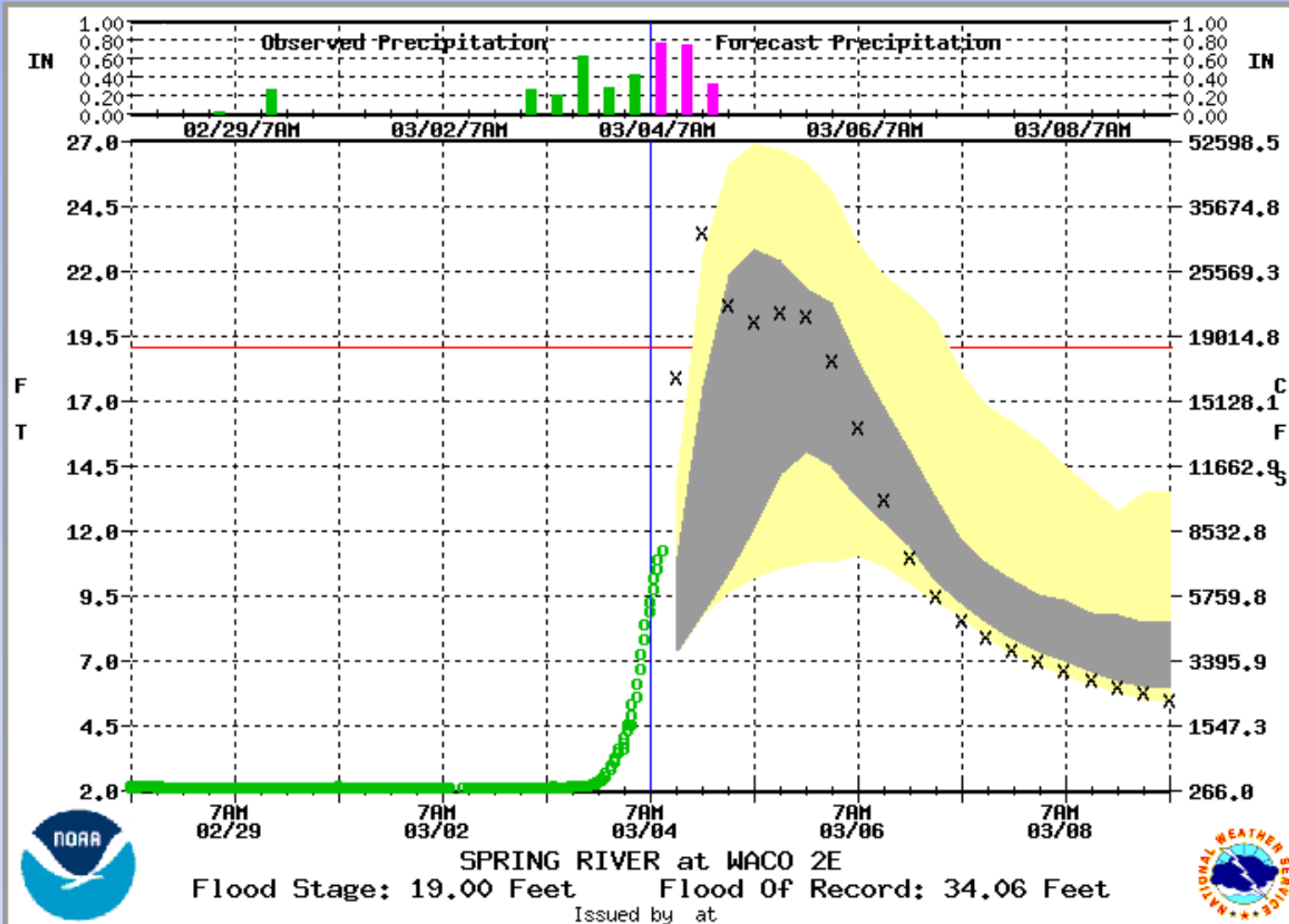


Example 1 – Under forecasted likely due to hydrologic uncertainty (b)



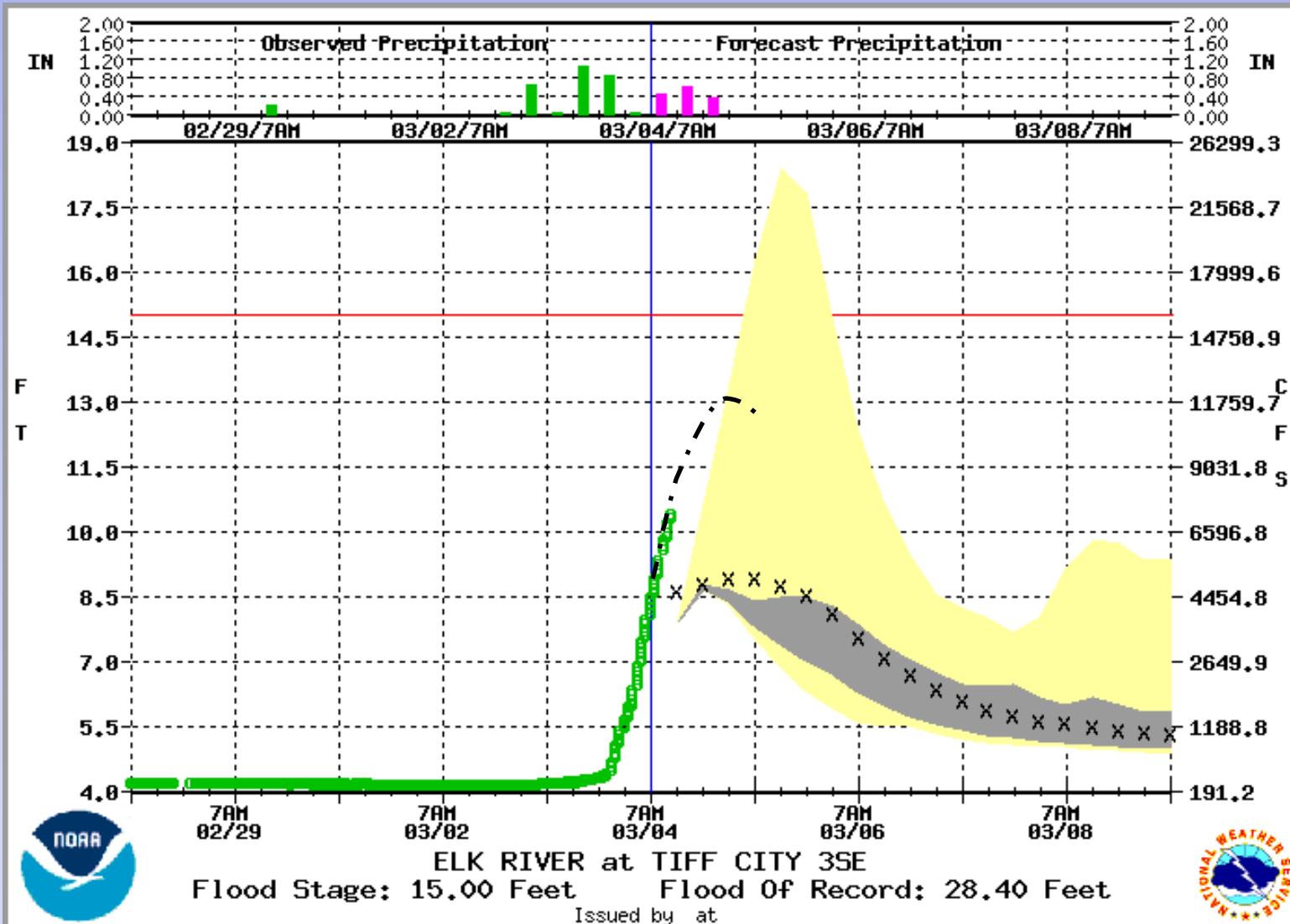


New look to forecast hydrograph





Example 2 – Another under forecast (a)



Streamflow Forecast Legend

- 2% - 90% Exc. P
- 25% - 75% Exc. P
- X** Deterministic

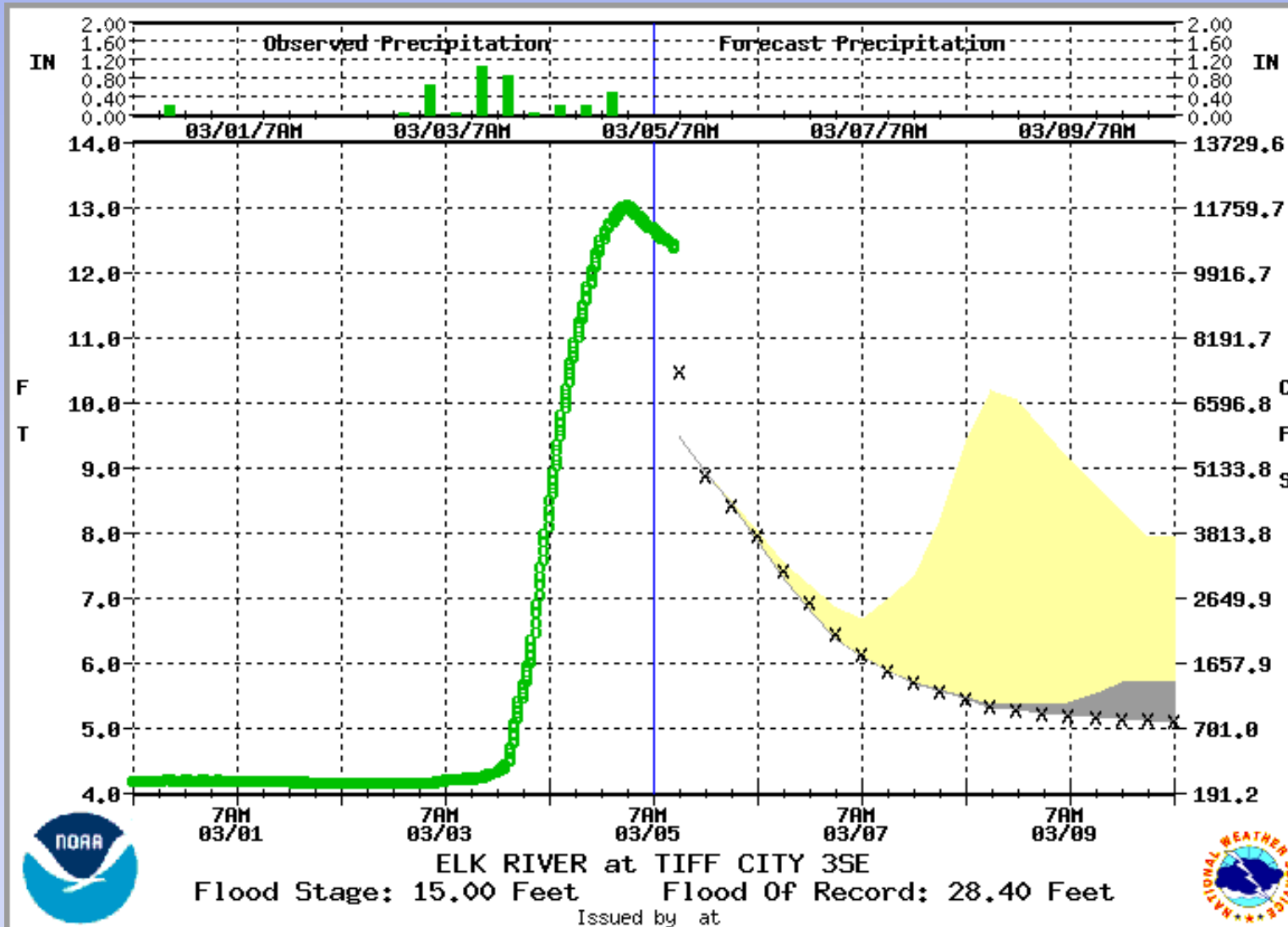
Exc. P:
exceedance probability

- - - Observed





Example 2 – Another under forecast (b)



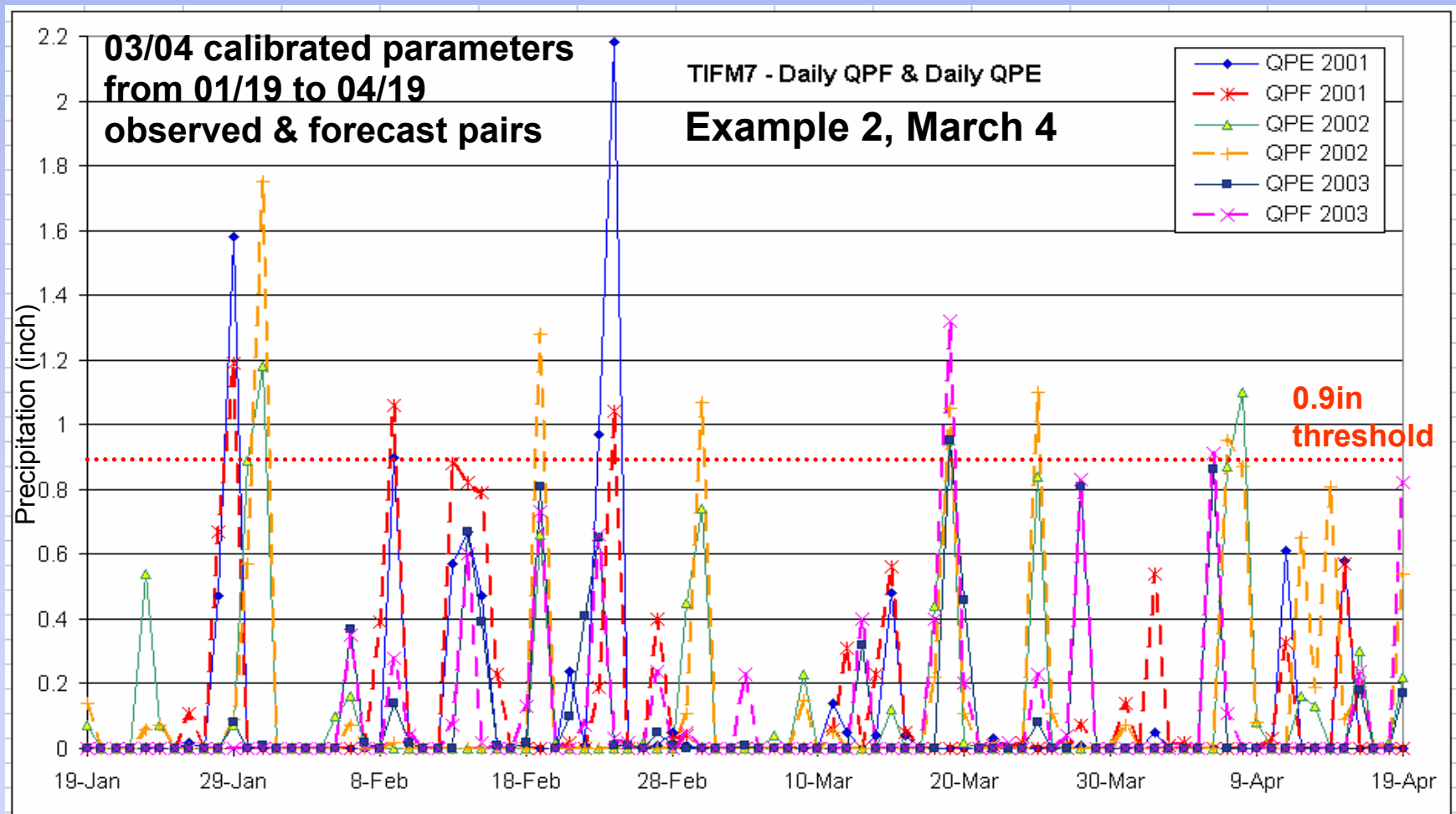


Calibration of Joint Distribution Parameters



For each time step, calibration on a 91-day window centered on the given day

Daily QPE/QPF high events present in the 3 years archive
=> calibration parameters appropriate for high event estimation





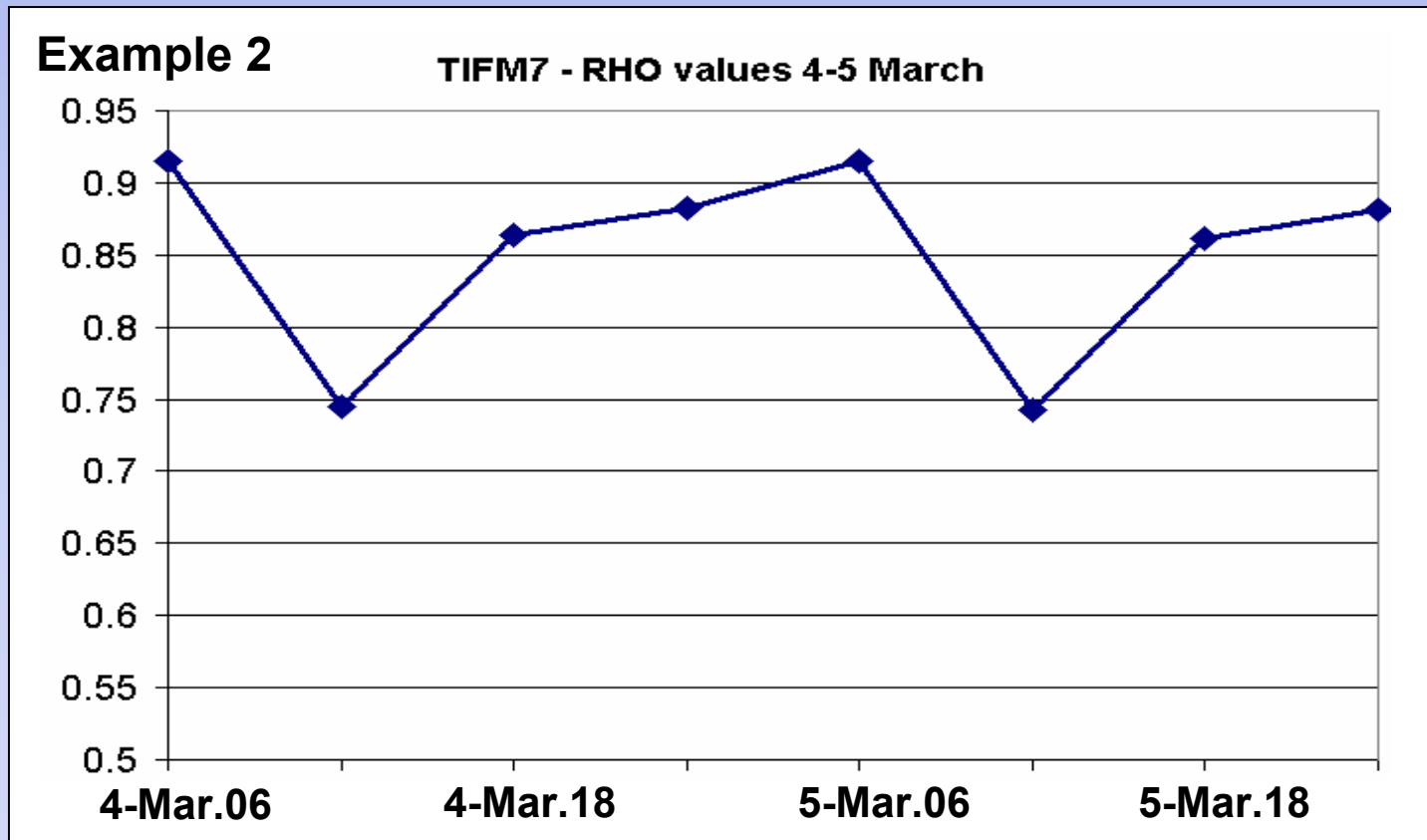
Joint Distribution: Parameter RHO



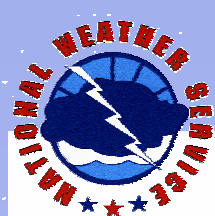
RHO: correlation parameter between forecast and observed values
=> measure of the forecast skill

RHO \rightarrow 0: unskilled forecast => PQPF distribution close to smoothed climatology

RHO = 1: perfect forecast => PQPF distribution is the single value of bias-adjusted QPF



At 12CEN:
lower RHO
=> more spread of PQPF



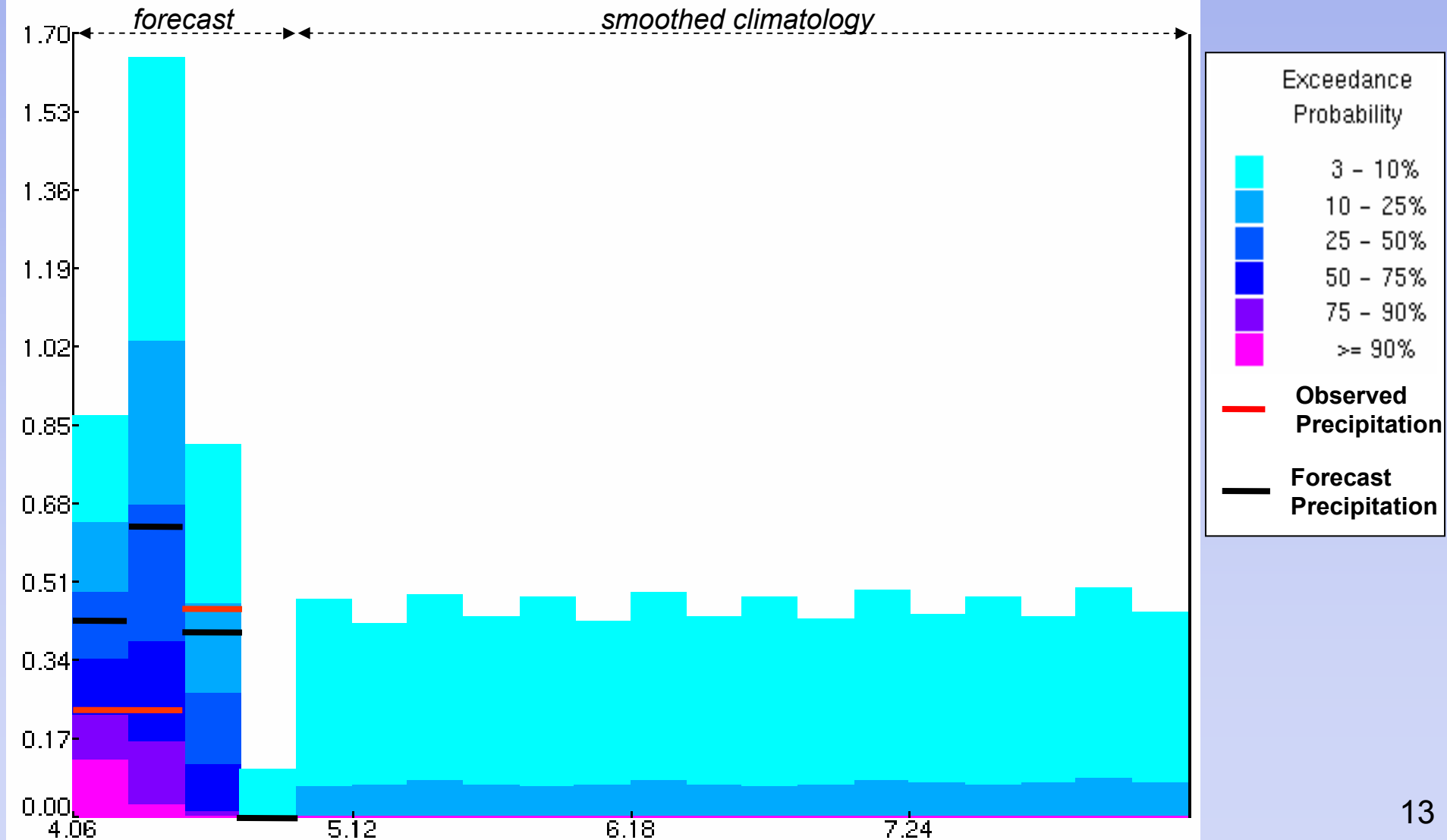
PQPF with QPF & QPE: Example 2, March 4

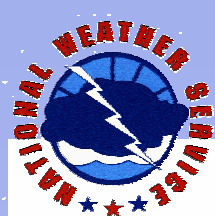


6 Hour Calib.Chances of Exceeding River Levels on the TIFM7
Latitude: 0.0 Longitude: 0.0

Forecast for the period 3/4/2004 6h - 3/8/2004 24h INTL

This is a conditional simulation based on the current conditions as of 3/4/2004





PQPF with QPF & QPE: Example 2, March 5



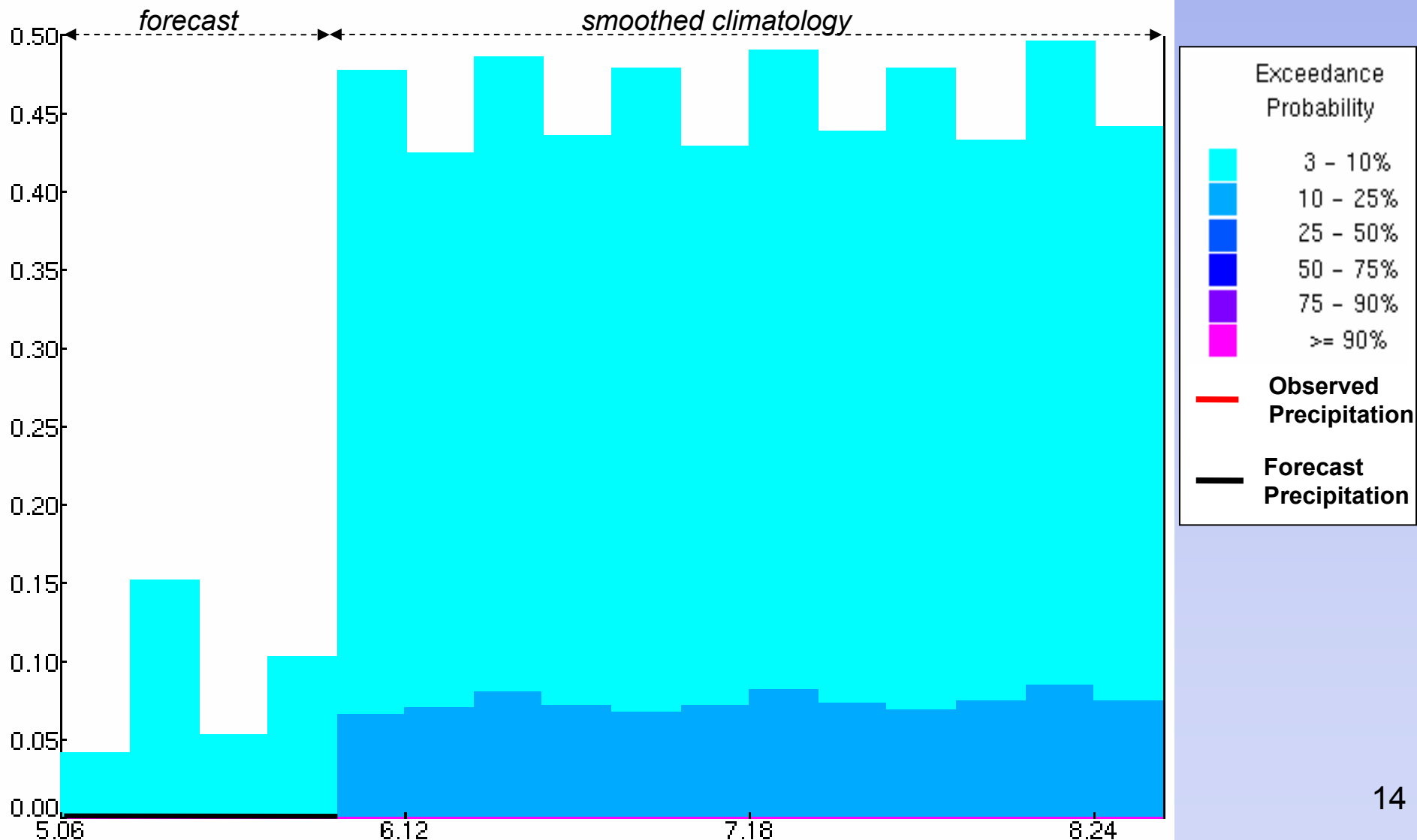
6 Hour Calib. Chances of Exceeding River Levels on the

TIFM7

Latitude: 0.0 Longitude: 0.0

Forecast for the period 3/5/2004 6h - 3/8/2004 24h INTL

This is a conditional simulation based on the current conditions as of 3/5/2004





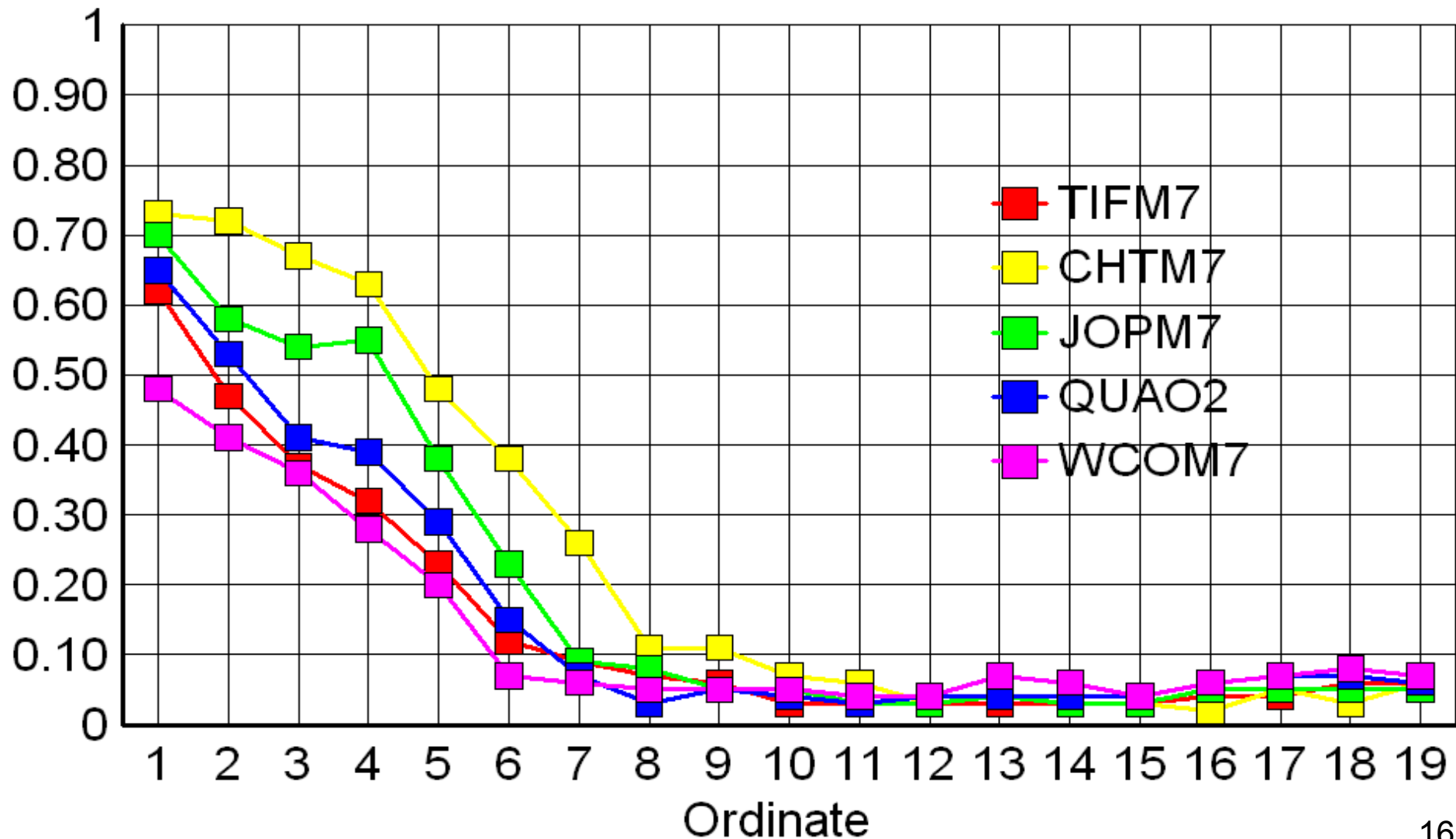
Verification of Short Term Forecasts



- Ran verification statistics for period of October 15th, 2003 until April 7, 2004 (175 days, or 48% of a year)
- Several large rainfall events included as well as sustained dry periods.
- Determined reliability statistics for each ordinate of xsets forecast to see if it varied by time period.
- Had ESPADJQ technique turned on during entire period.
- Results varied from point to point, but showed we need additional work on algorithm as distinct biases were evident.
- Unsure of why distinct differences between forecast points.

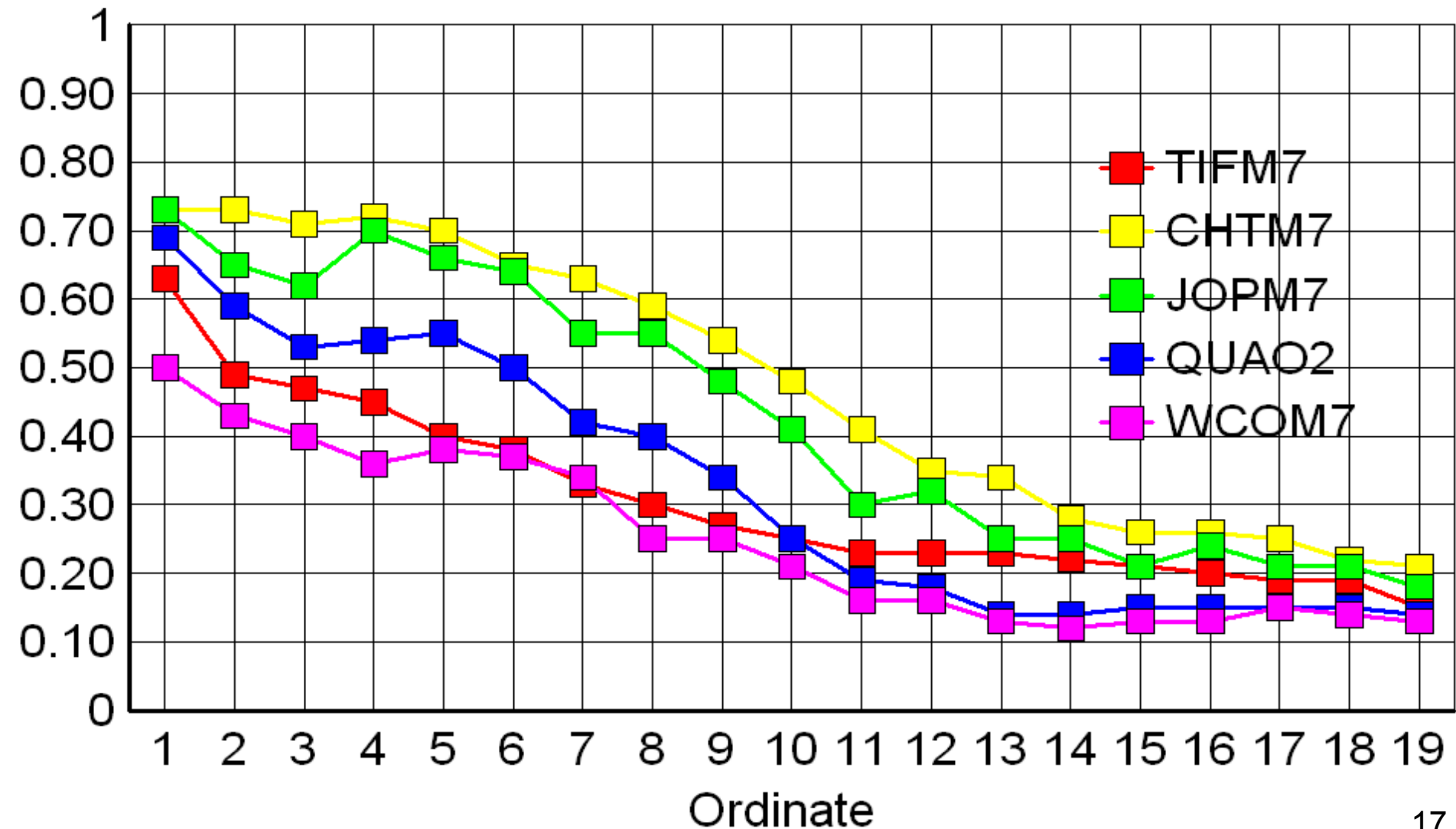
All points 10/15/03-4/7/04

2 percent exceedance by Ordinate



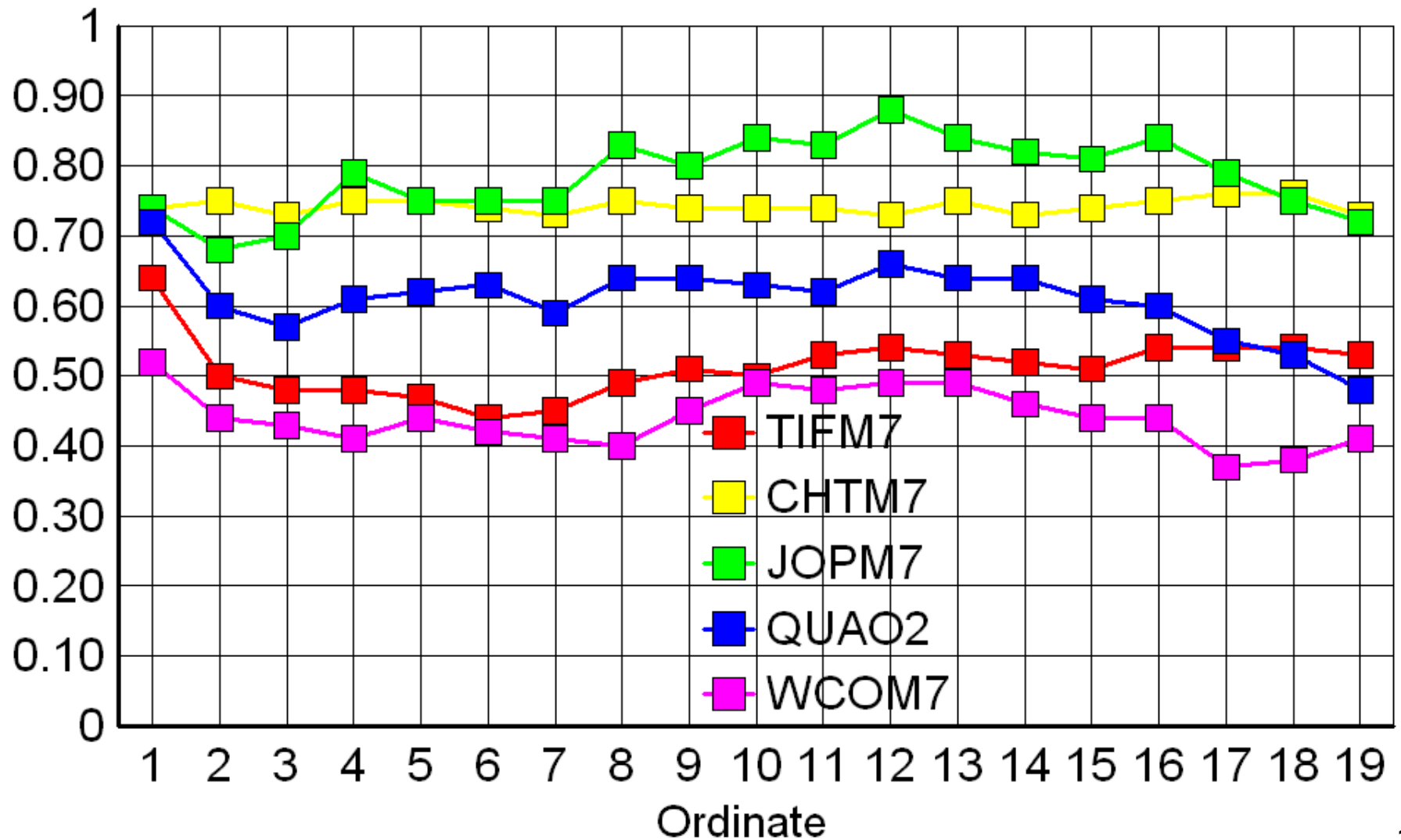
All points 10/15/03-4/7/04

10 percent exceedance by Ordinate



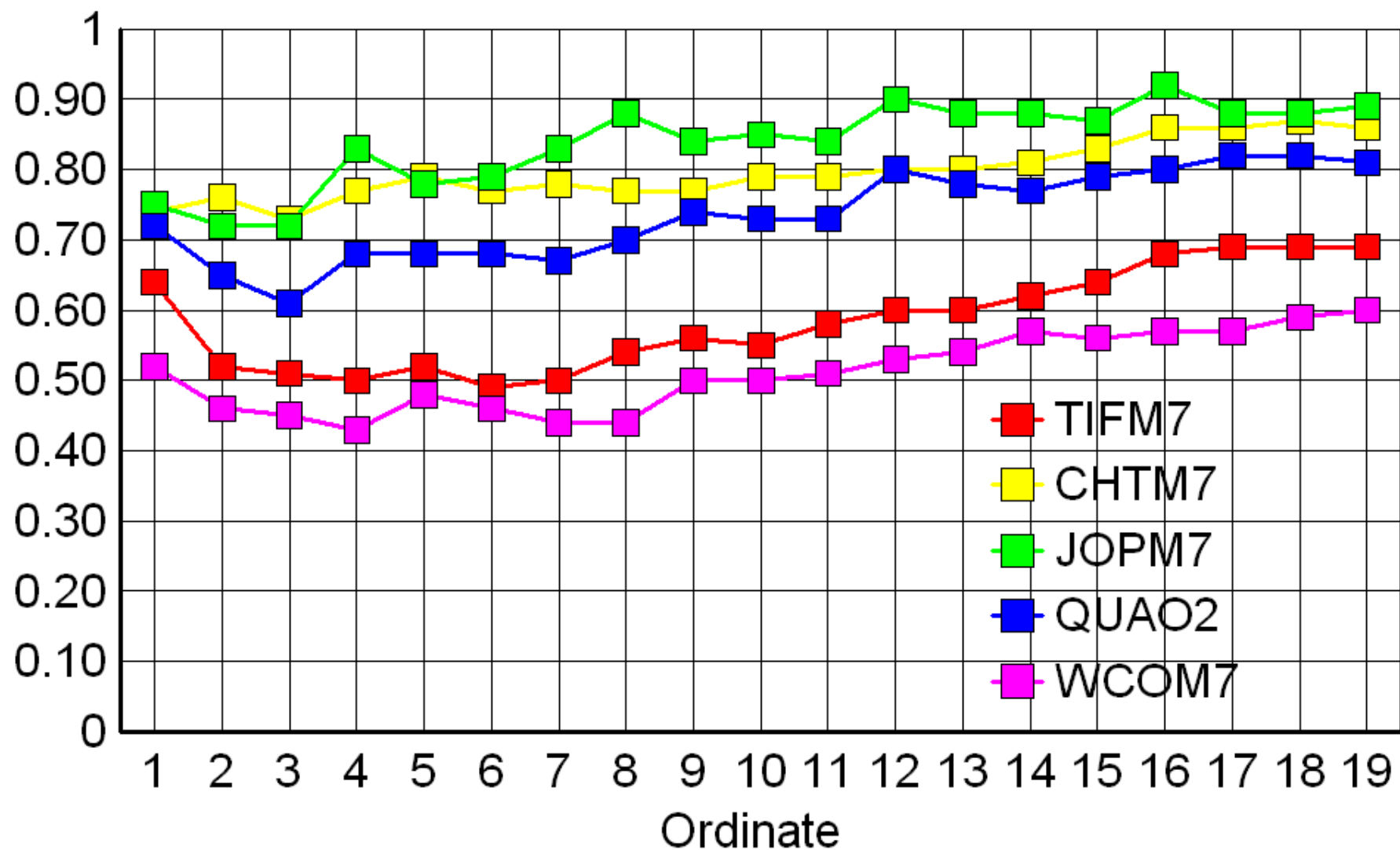
All points 10/15/03-4/7/04

25 percent exceedance by Ordinate



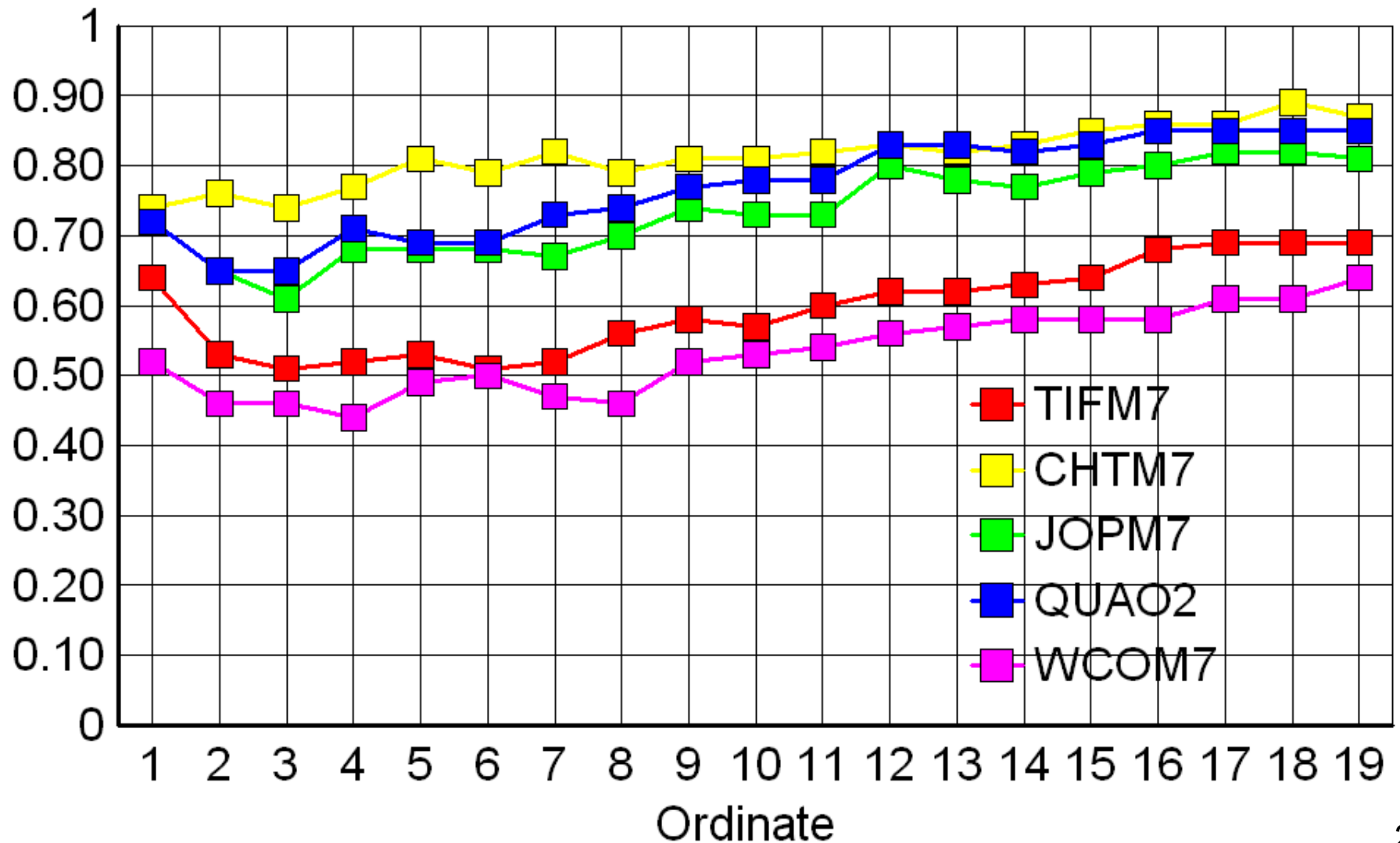
All points 10/15/03-4/7/04

50 percent exceedance by Ordinate



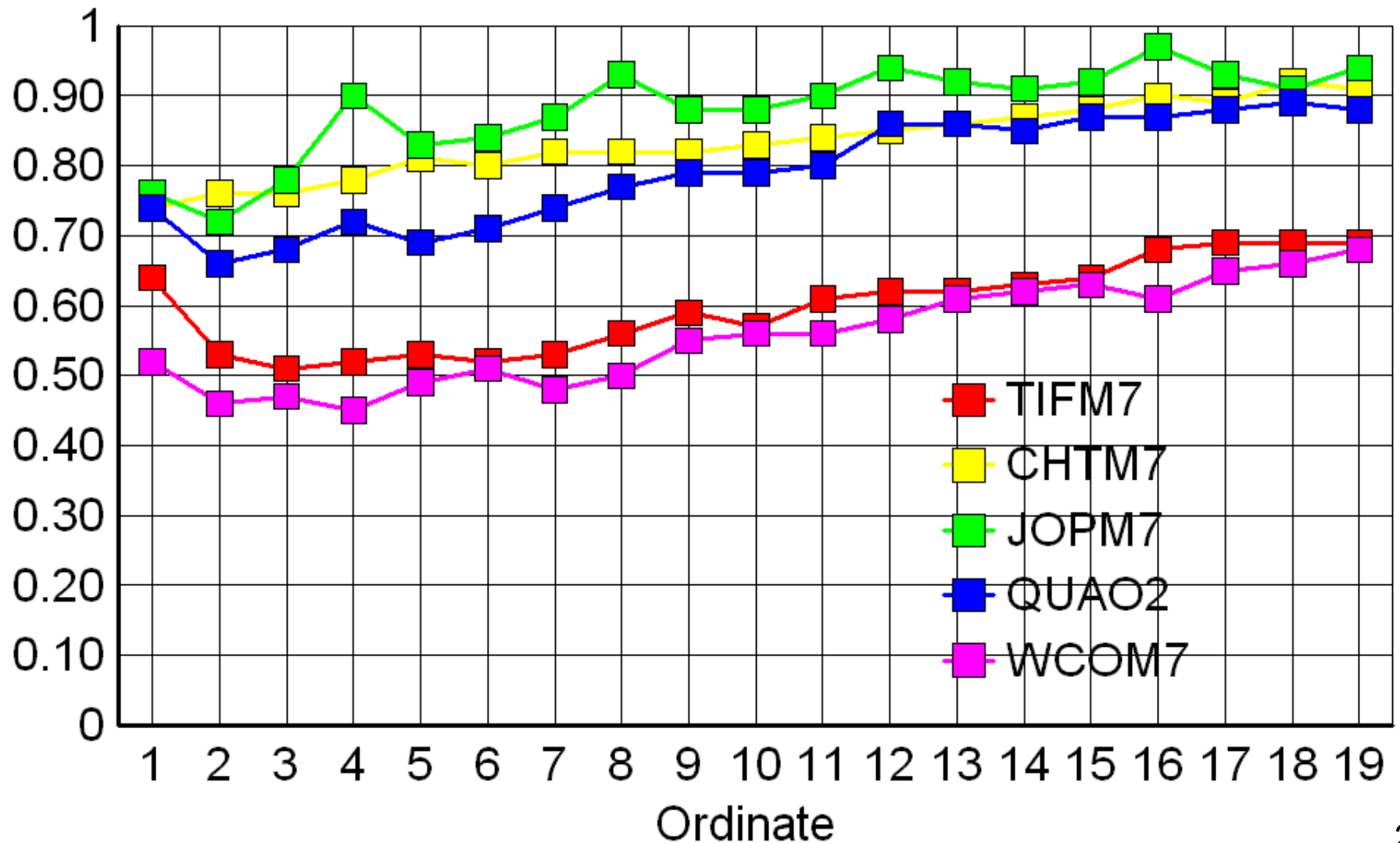
All points 10/15/03-4/7/04

75 percent exceedance by Ordinate



All points 10/15/03-4/7/04

90 percent exceedance by Ordinate





Conclusions

- Hydrologic based uncertainty is not currently accounted for, and needs to be added.
- Algorithm needs to be refined as strong biases shown for all points verified.
- Patterns are evident in verification trends, but what do they mean??



Future work, other studies

- Continue to run short term probabilistic forecasts, adding any enhancements from OHD.
- Continue to document results.
- Participate in AHPS funded project to determine QPF reliability with HPC.
- Output from AHPS project may be 5, 25, 75 and 90% probability QPFs for all 5 basins in OHD test.
- Will produce 5 different forecasts with these QPFs and run verification.
- Can compare reliability charts of two methods.
- Easier to explain procedure to our customers.