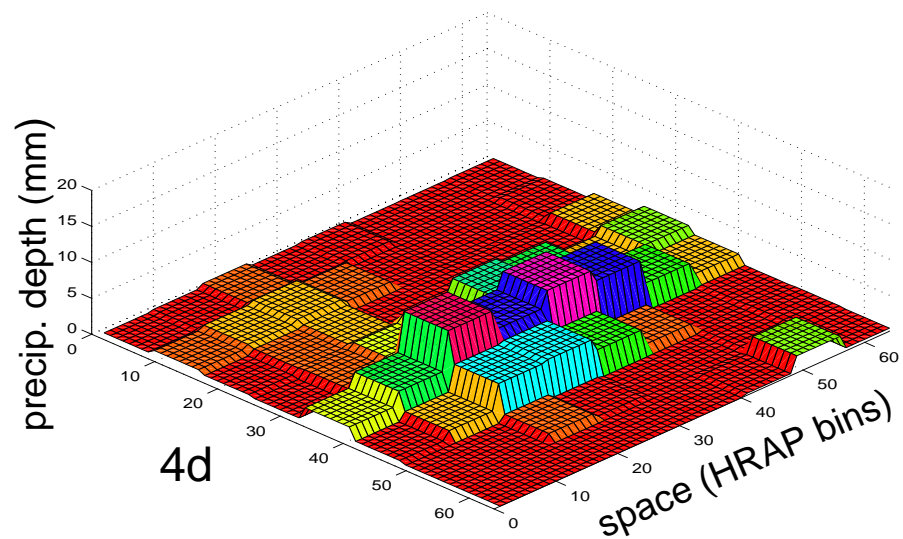
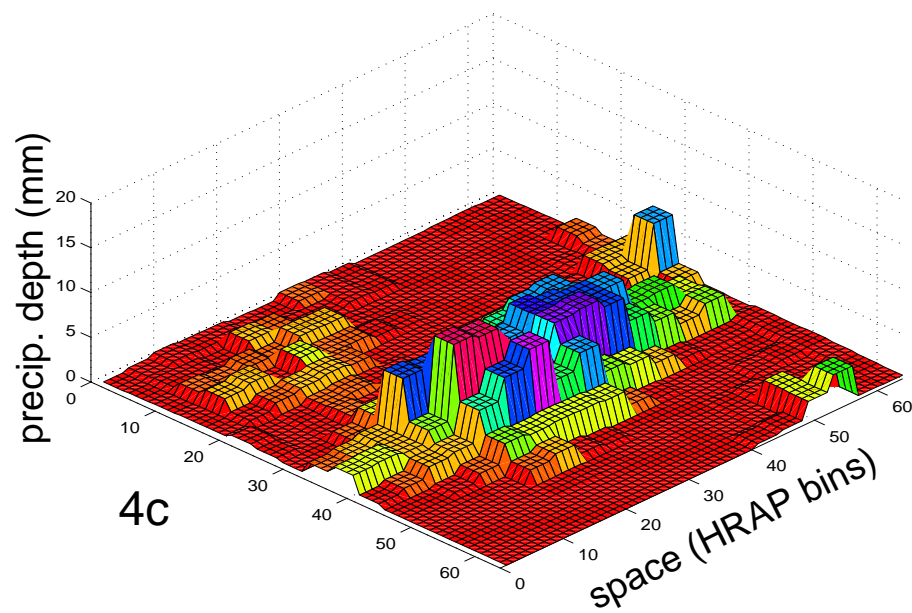
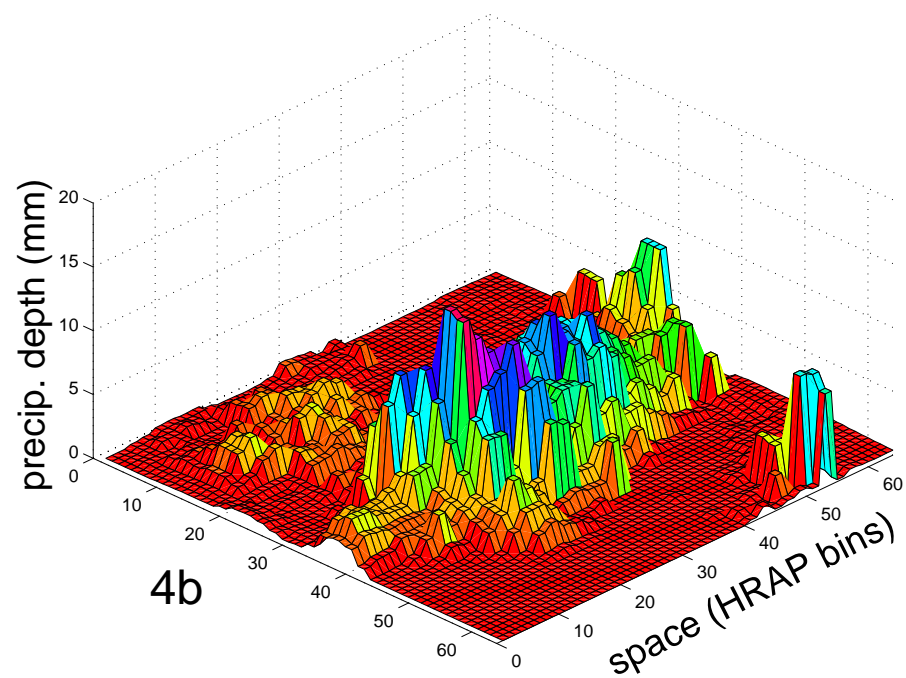
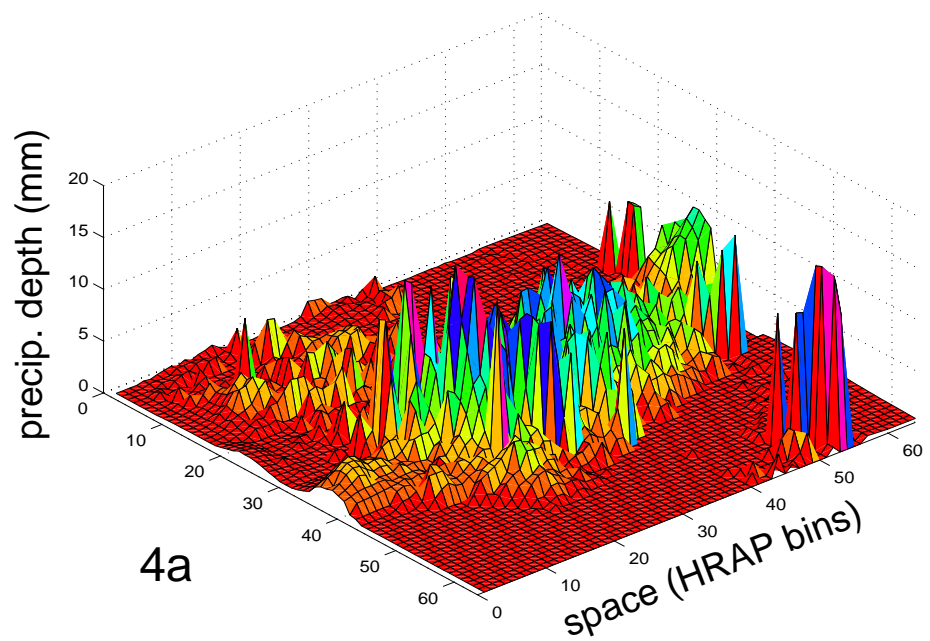


# **Statistical Re-scaling and Downscaling Project**





John Schaake  
3<sup>rd</sup> HEPEX Workshop  
Stresa, Italy  
June 27-29, 2007

# Outline

- Science Issues
- Accomplishments
- Future Activities

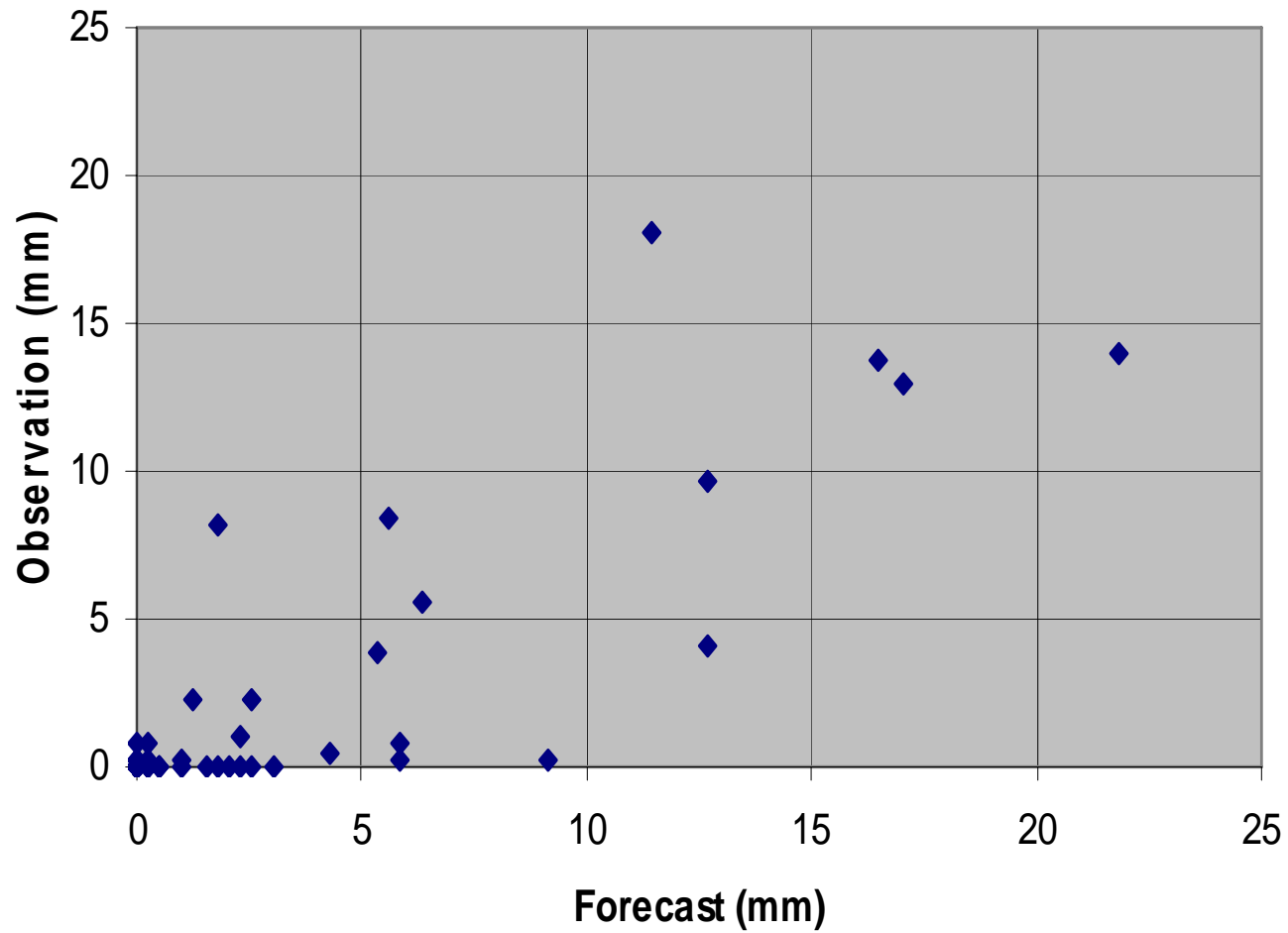


# Weather and Climate Forecasts

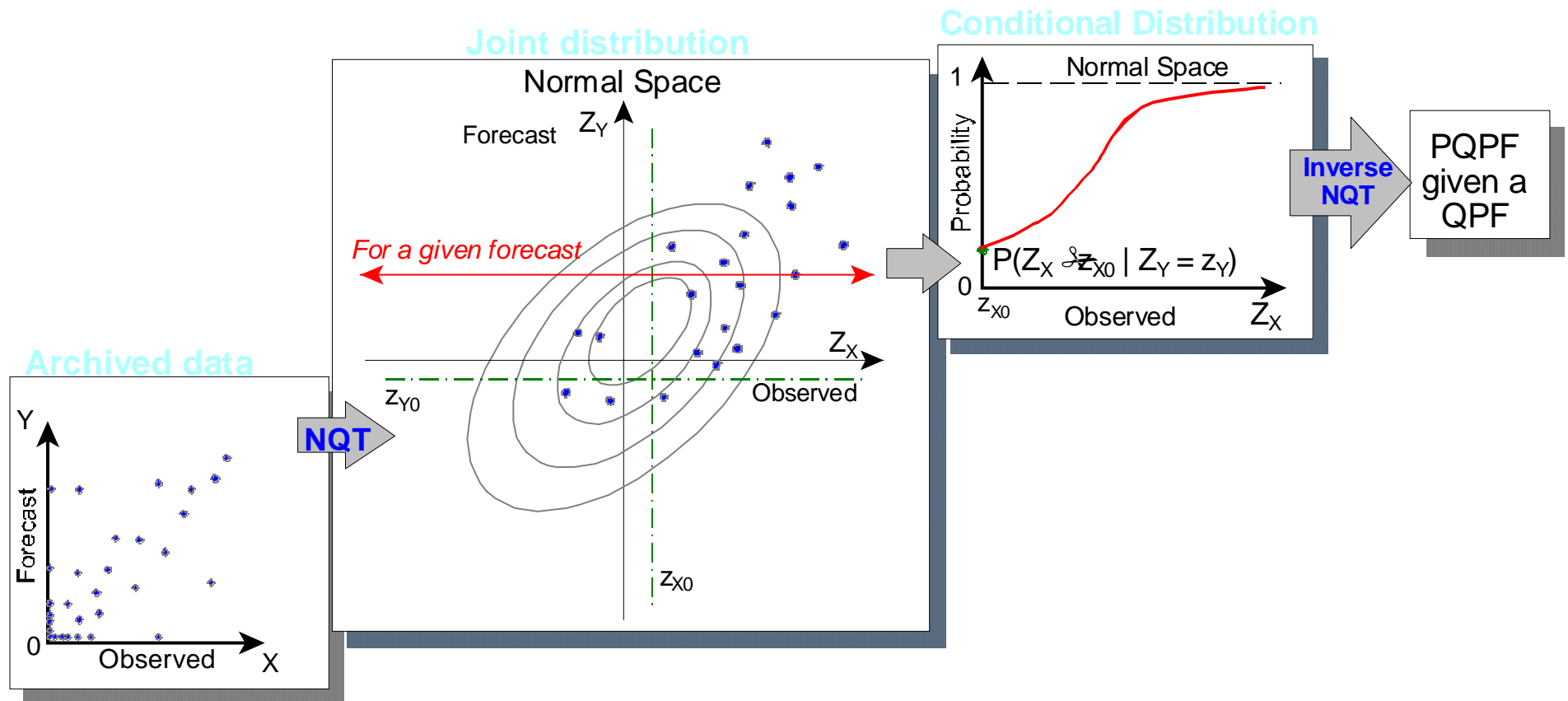
- Need to pre-process weather and climate forecasts
  - Bias correction  
  - Conditional uncertainty correction (spread)
- Uncertainty is space and time-scale dependent  
- Weather and climate ensemble re-forecasts are required (20+ yrs) for EPP calibration and to make hydrologic hindcasts for users

# Joint Distribution of Forecasts and Observations

## MNVN4RTN (Raritan Rver, NJ)



# Use Single-value Forecast (e.g. Ensemble Mean) to Construct Forecast CDF

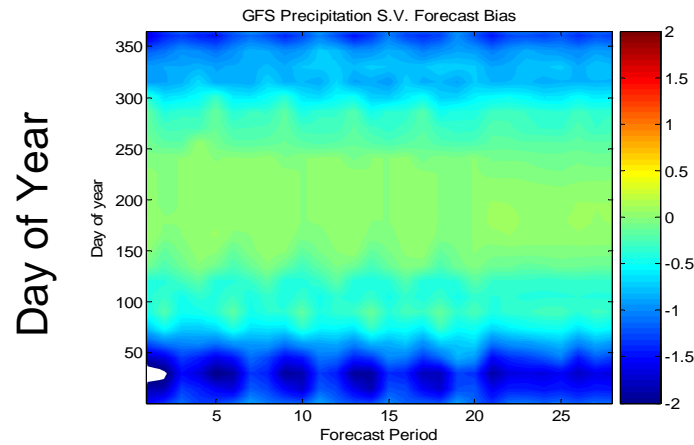


# Construct Ensemble Members

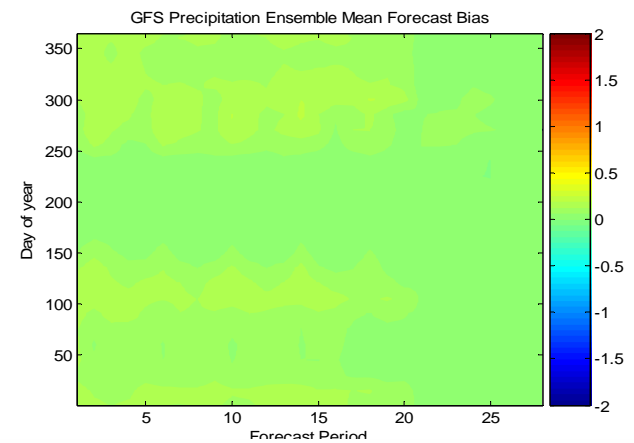
- Start with climatological ensemble of historical observations
  - $X(t,k)$  [ $k=1, nmem$ ;  $t=1, ndt$ ]
- Define a set of “events”
  - Each 6-hr time step,  $t=1, ndt$
  - Aggregate periods
- Create forecast CDF for each “event”
- Sample CDF to get member values
- Use “Schaaake Shuffle” to assign member values to ensemble members
  - Constrain aggregate value of  $X(t,k)$  to be equal to CDF sample ensemble member value for each aggregate event
  - Process events in increasing order of forecast skill

# GFS Precipitation Forecast Verification North Fork American River

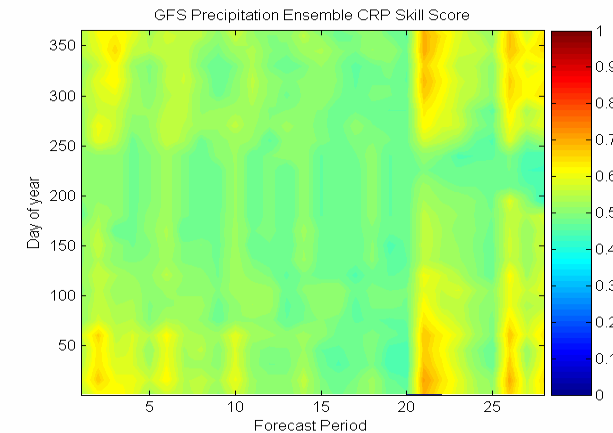
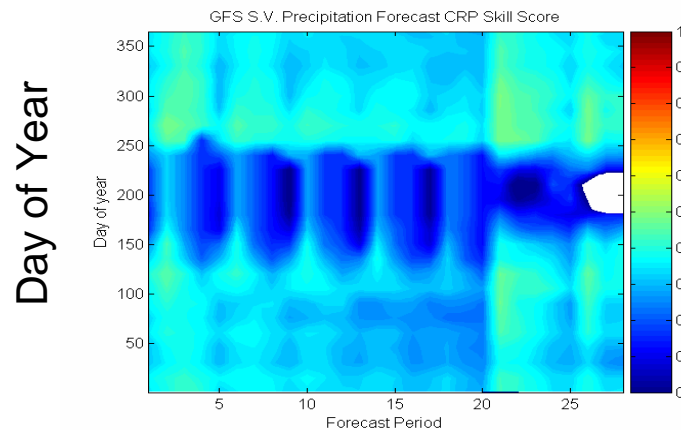
Raw GFS Ensemble Mean



GFS EPP Prototype



CRPSS



Forecast Period

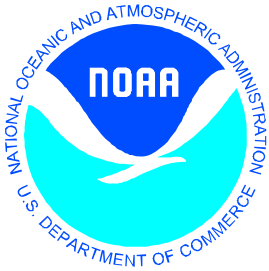
Forecast Period

# Some Present Limitations

- Atmospheric ensemble forecasts do not reliably account for uncertainty – This is our biggest problem!
- Ensemble reforecasts from fixed forecast model are required
- RFC short range forecasts have been archived only for last few years
- GFS re-forecasts are for “old” version of GFS
- SREF forecasts are not used
- Multi-model options are needed
- Flow-dependent/Regime-dependent uncertainty is needed
  - Objective Flow/Regime classification procedures are needed
- Cannot do hindcasts for monthly probability shifts (no archive)
- Existing CFS – GFS gap (weeks 3 – 6)
- Seasonal probability shift archive begins only in 1995 (not long enough)

# Future Activities

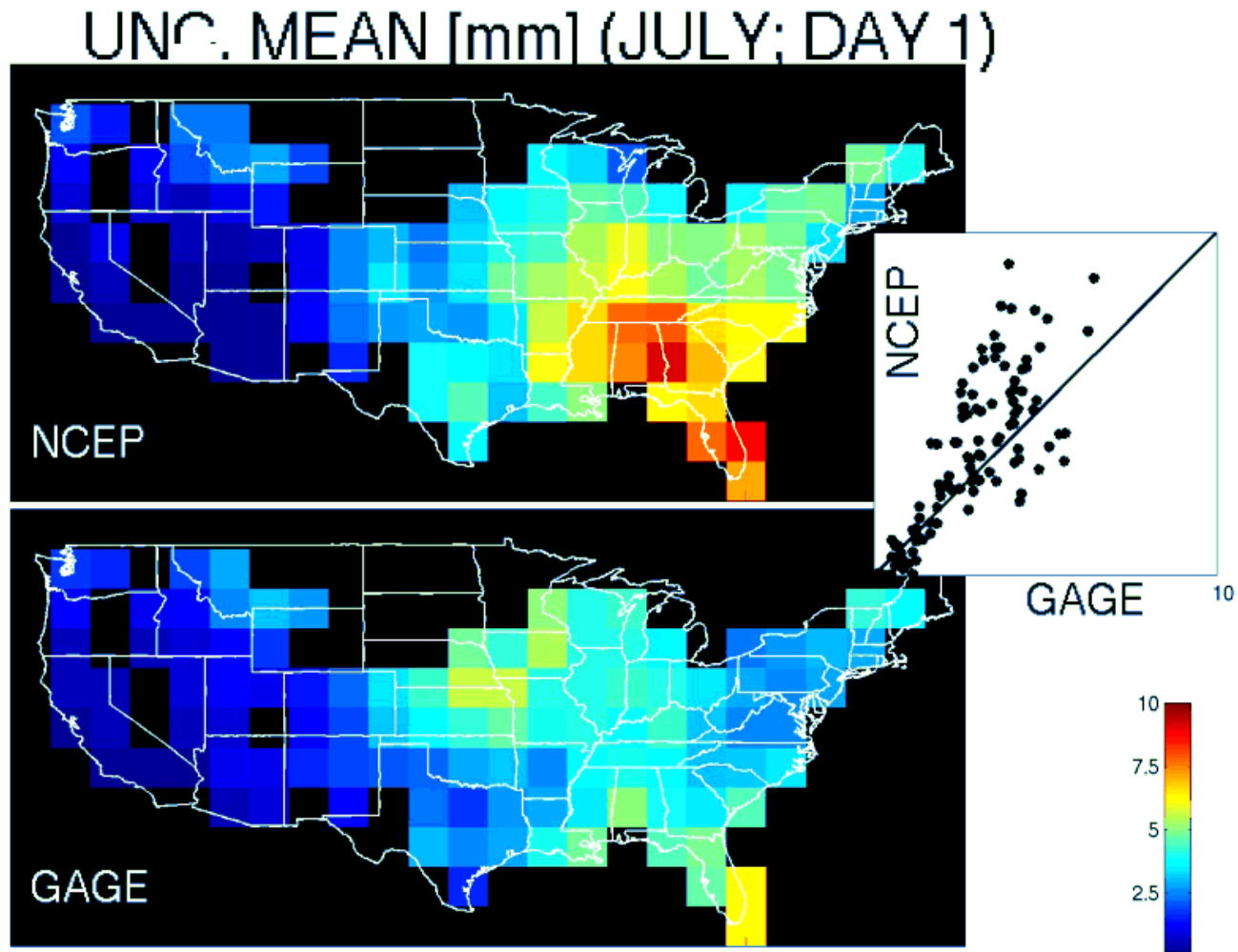
- Gridded Ensemble Pre-Processor
  - Joint effort with NCEP, HEPEX, THORPEX
  - National “coarse” space-time grid operated at NCEP
  - Local (RFC/WFO) “fine” grid and basin applications
- Multi-model functionality
  - Integrate RFC, HPC, SREF, GFS, CPC and other forecasts into multi-model EPP
- Quantify requirements for weather and climate hindcasts (e.g. Simulation Experiments)
- Improve ability to make hydrologic hindcasts using weather and climate forecasts without “long” archives – a contribution to THORPEX/TIGGE
- Collaboration with other HEPEX test bed projects
- HEPEX intercomparison projects
- Supporting data sets for HEPEX



Thank  
You

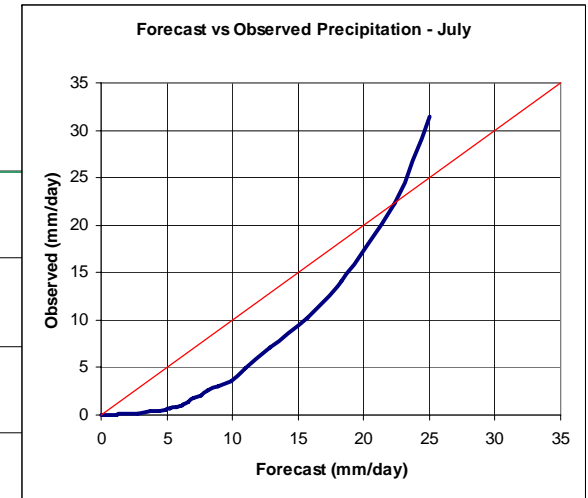
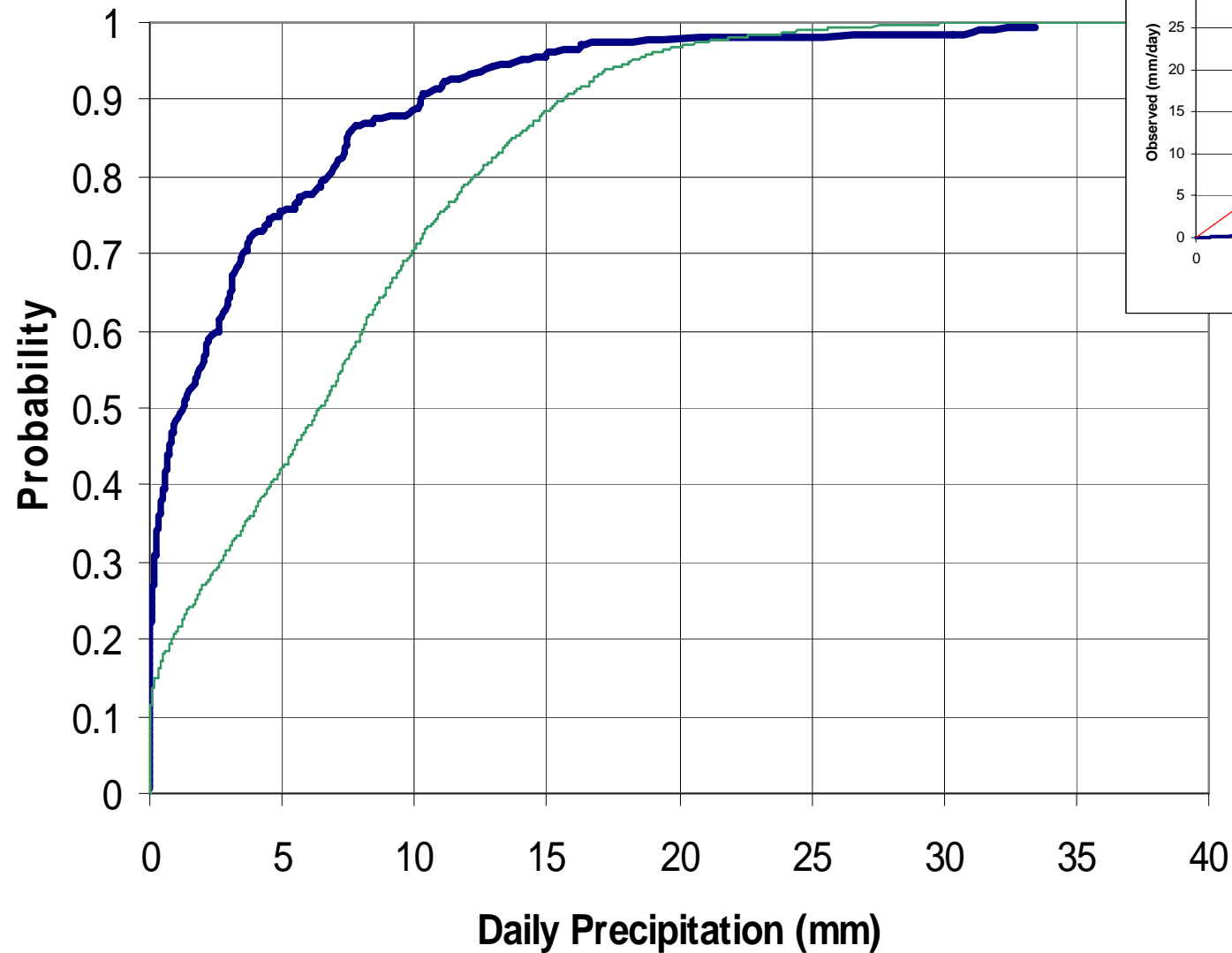


# NCEP Global Ensemble Forecasts are Biased



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# Observed vs Global Ensemble Climatologies (July, Lat = 35.0, Lon = 82.5)

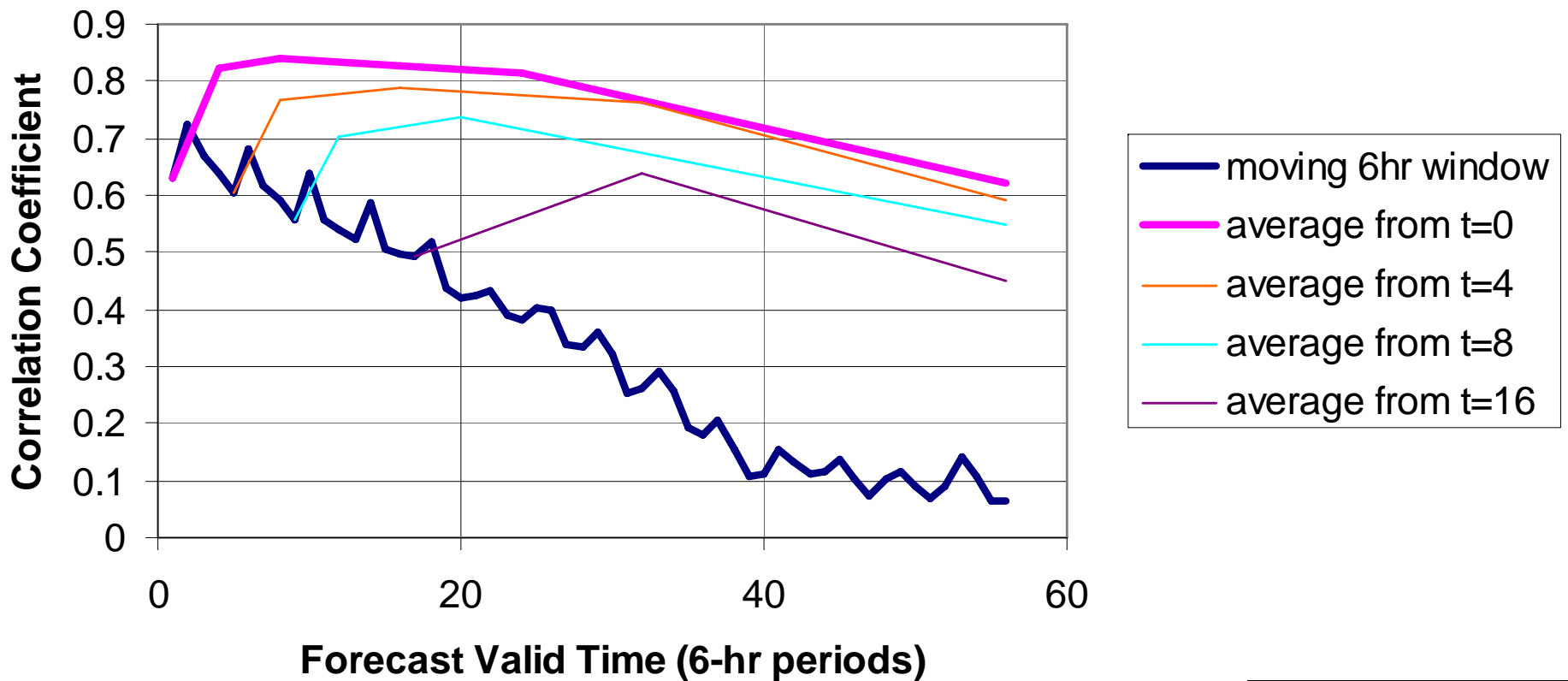


— Observations  
— Global Ensemble

[Return](#)

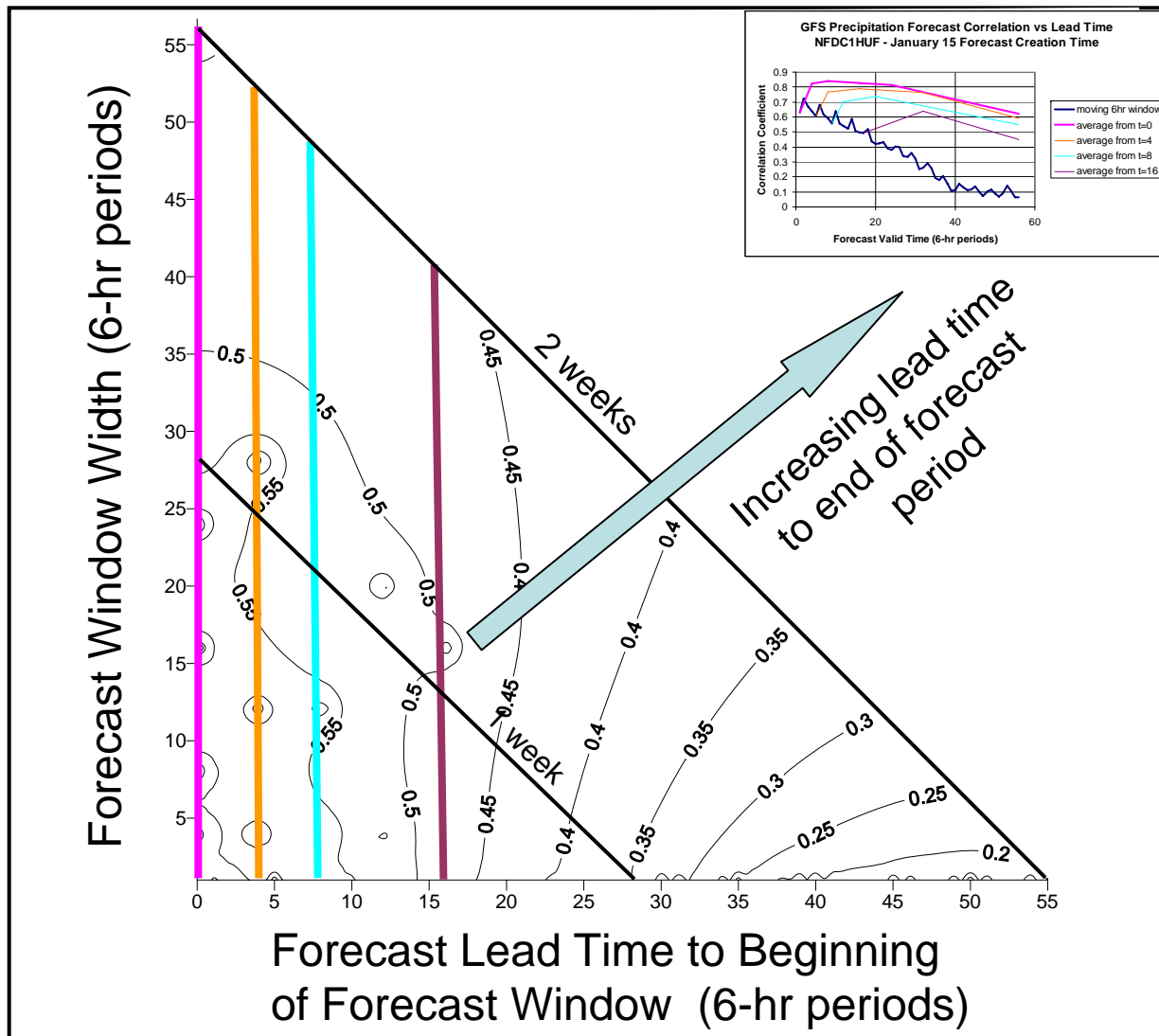
# Temporal Scale Dependency of Precipitation Forecasts

**GFS Precipitation Forecast Correlation vs Lead Time**  
**NFDC1HUF - January 15 Forecast Creation Time**



Return

# GFS Precipitation Forecast Correlation Coefficient: Temporal Scale-Dependency NFDC1HUP – January 15 Forecasts



Return