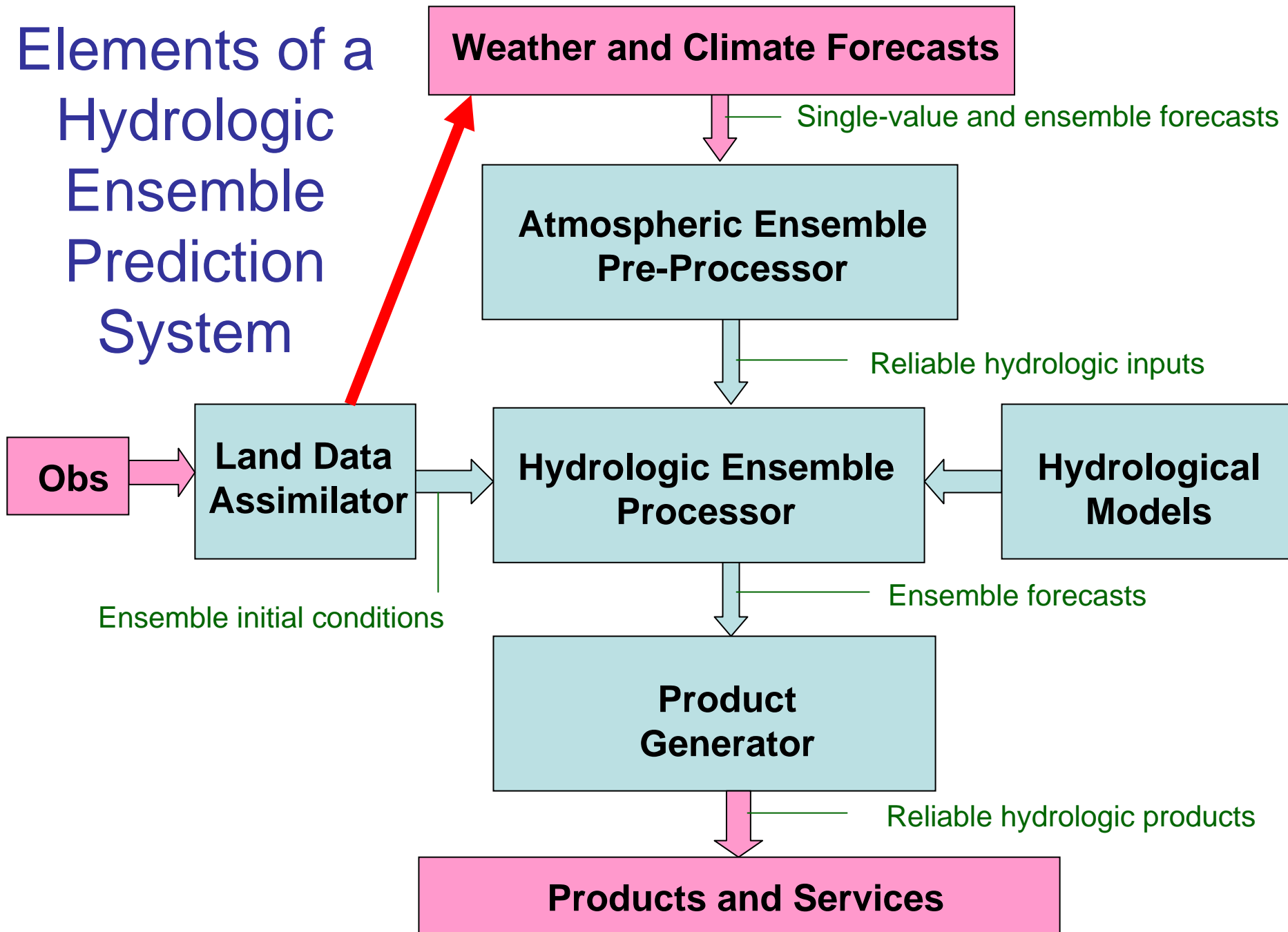


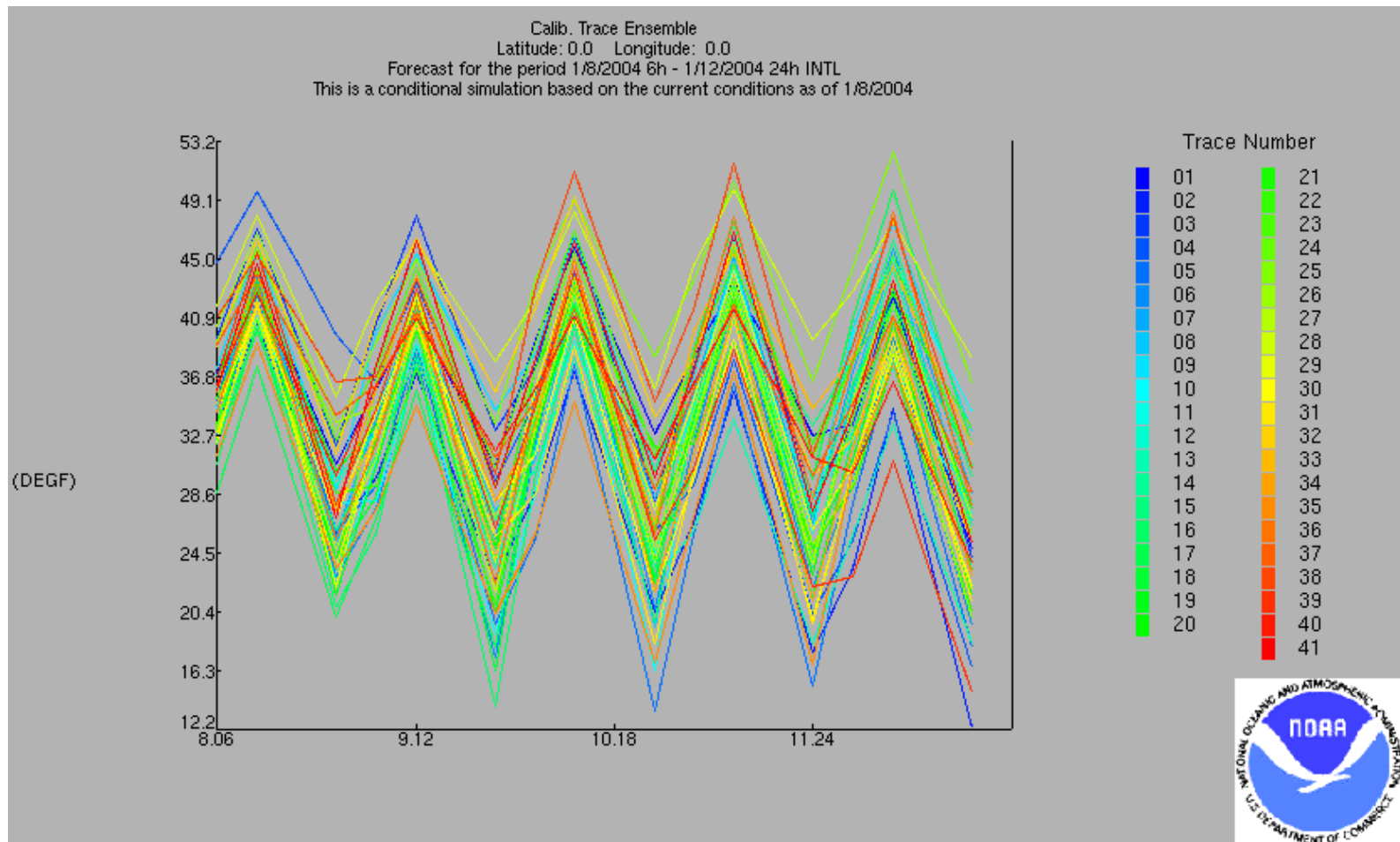
# National Weather Service Ensemble Streamflow Prediction

John Schaake

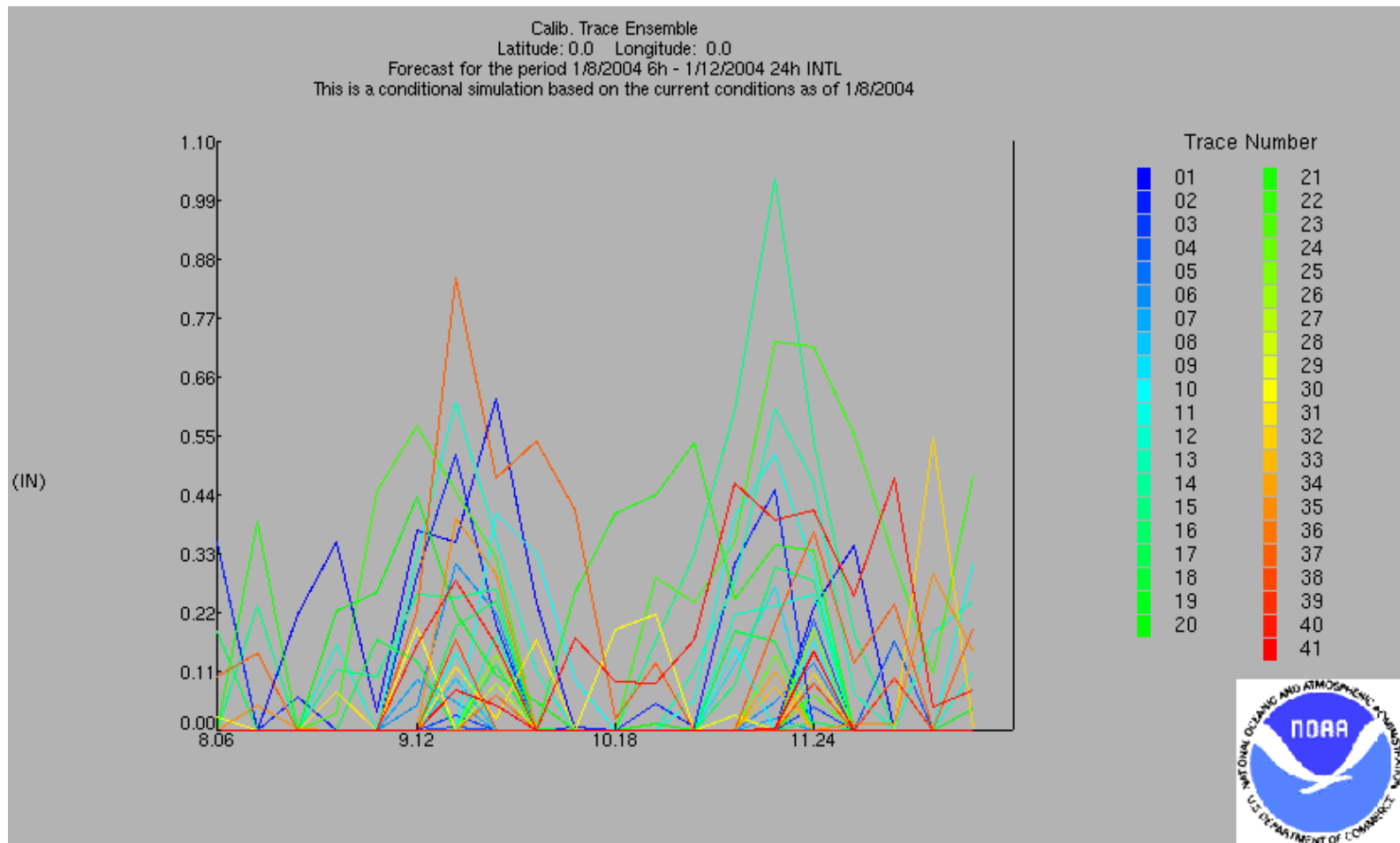
# Elements of a Hydrologic Ensemble Prediction System



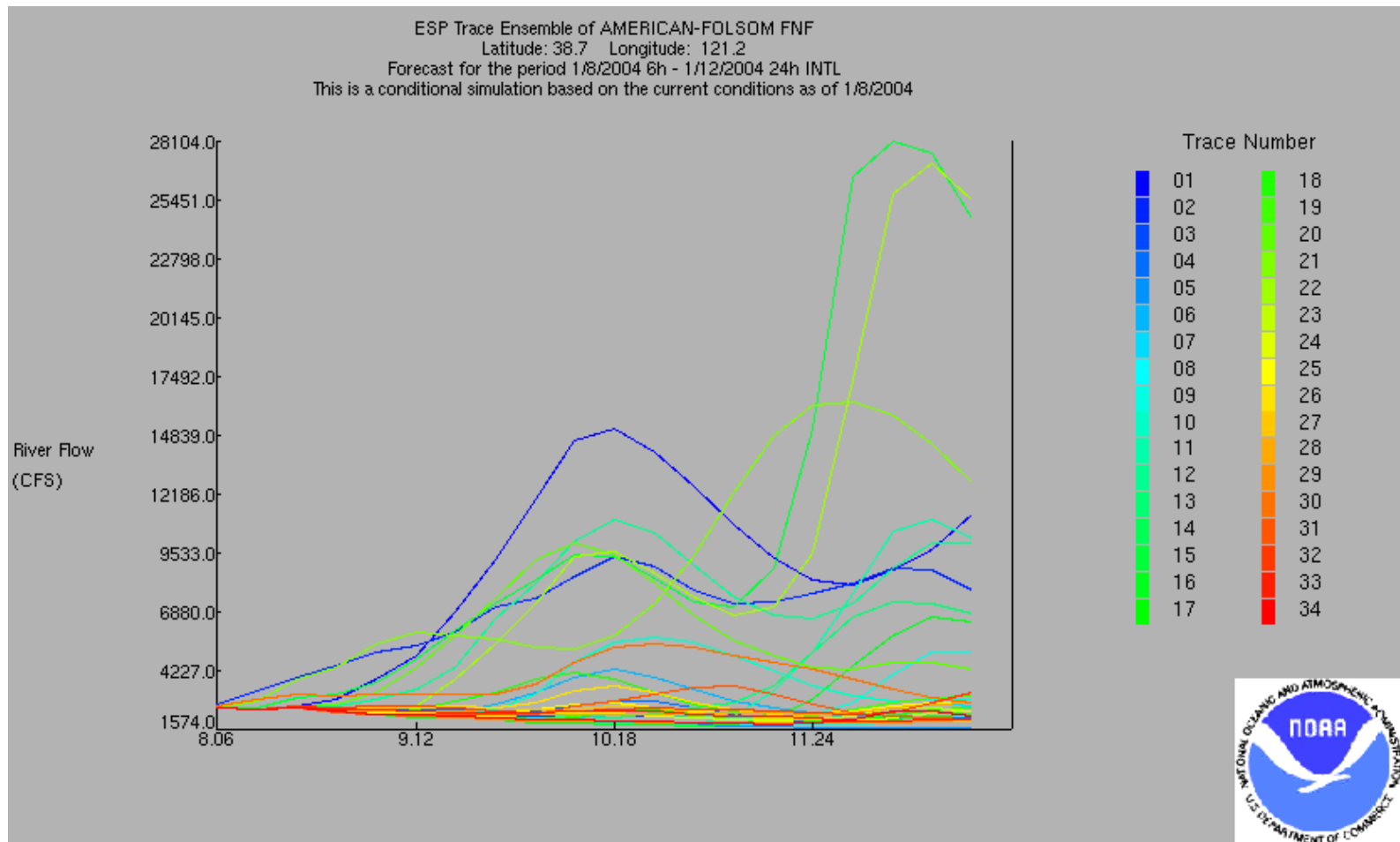
# Ensemble Temperature Forecast

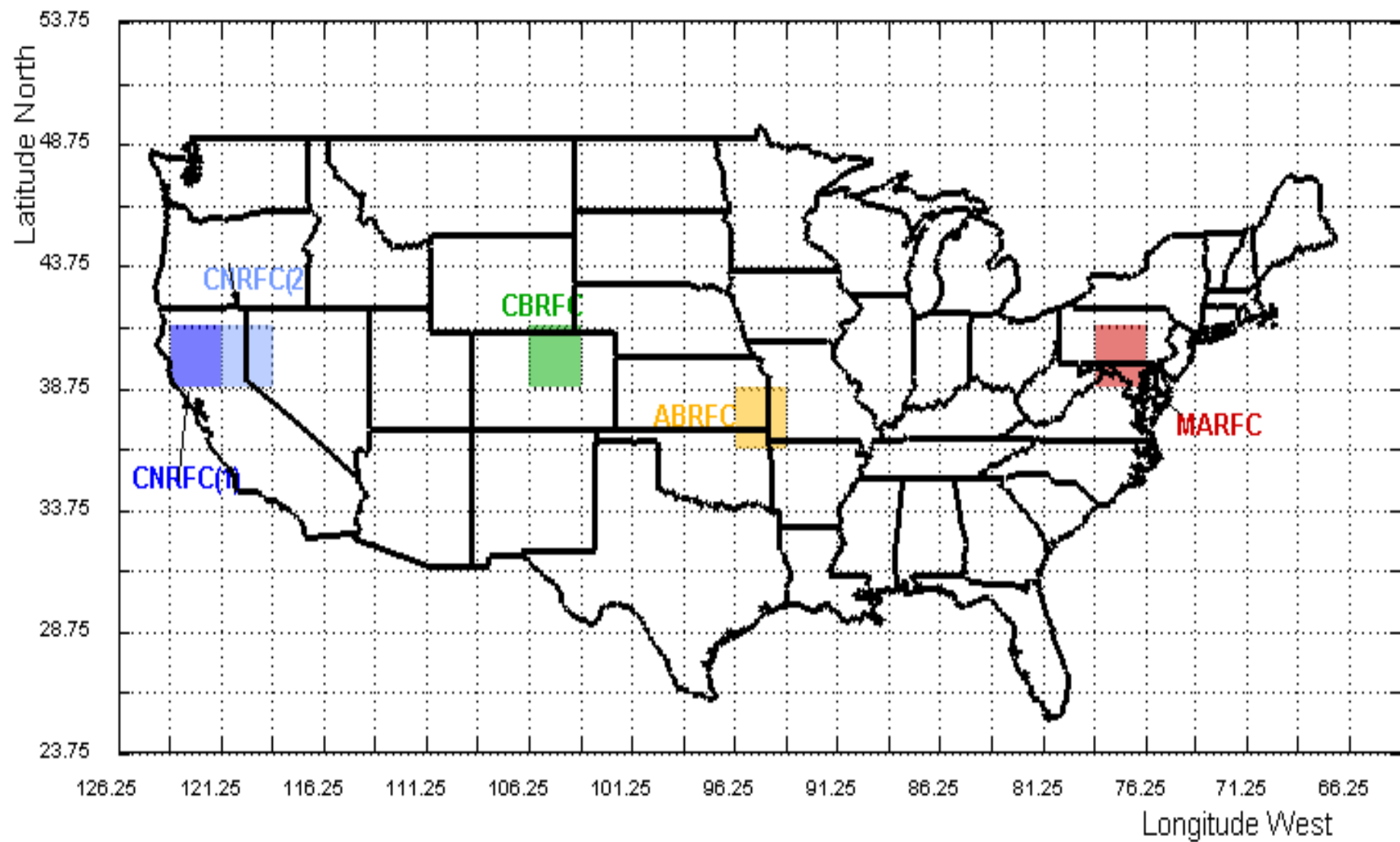


# Ensemble Precipitation Forecast



# Ensemble Streamflow Forecast



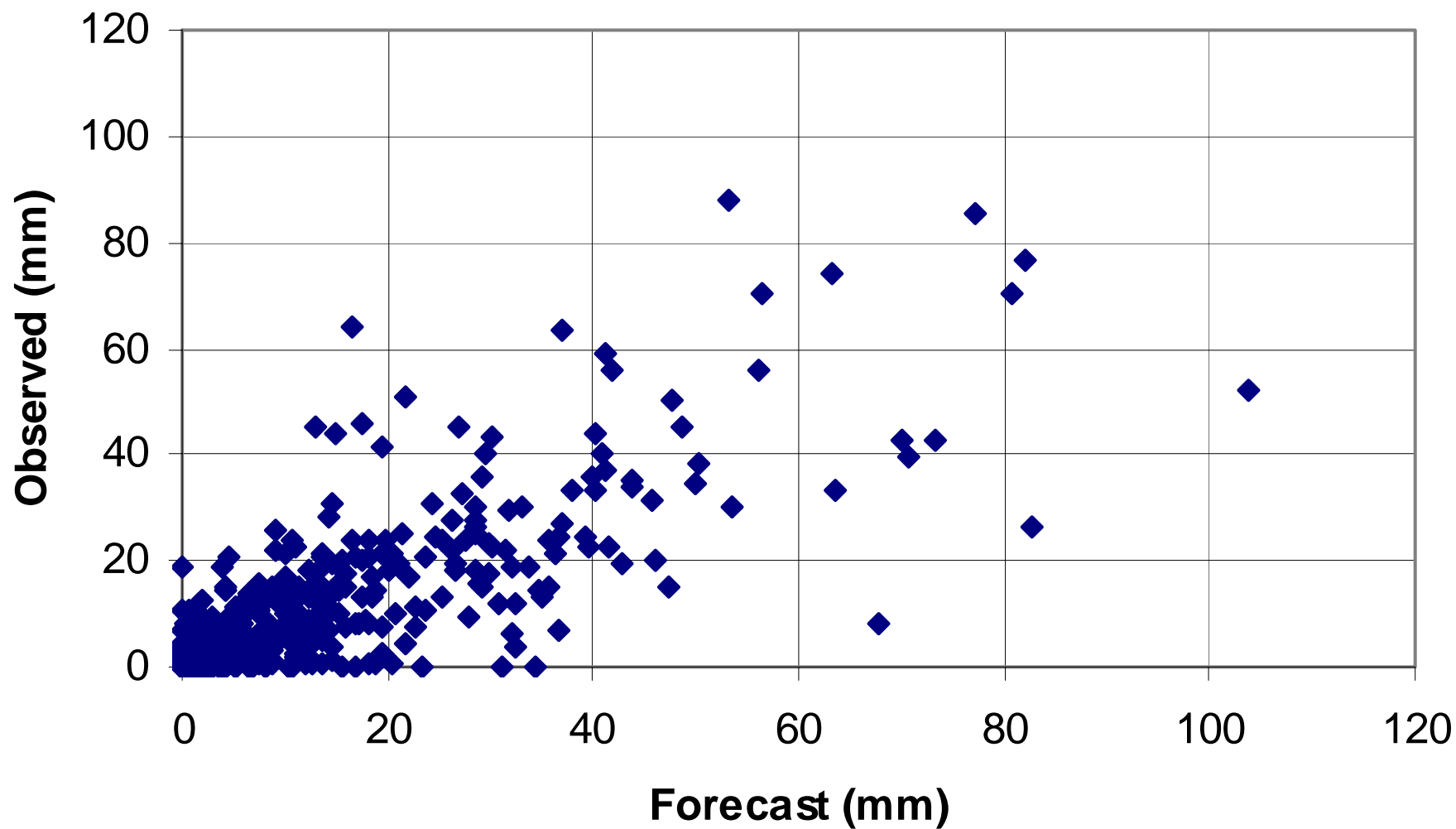


# Preprocessor Operations Concept

- Create ensemble forecasts for NWRFS basin segment
- Use single-value forecasts
  - RFC (1- 5 days)
  - GFS (1-14 days)
  - Climate (1-120 days)
- Account for temporal for scale-dependency
- “Augment” parameter estimates for RFC forecasts

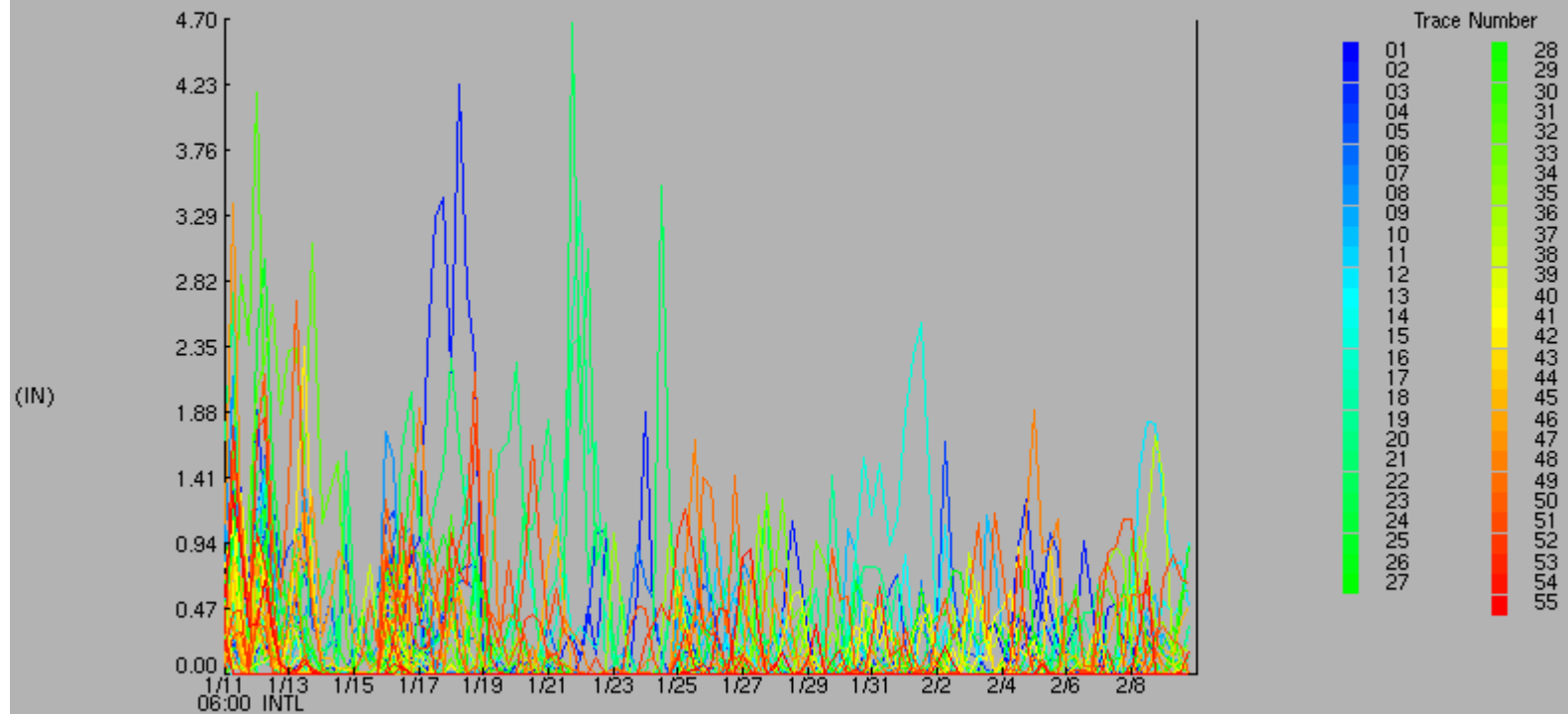
# Observed vs Forecast Precipitation

## Winter Season - CBAC1HU

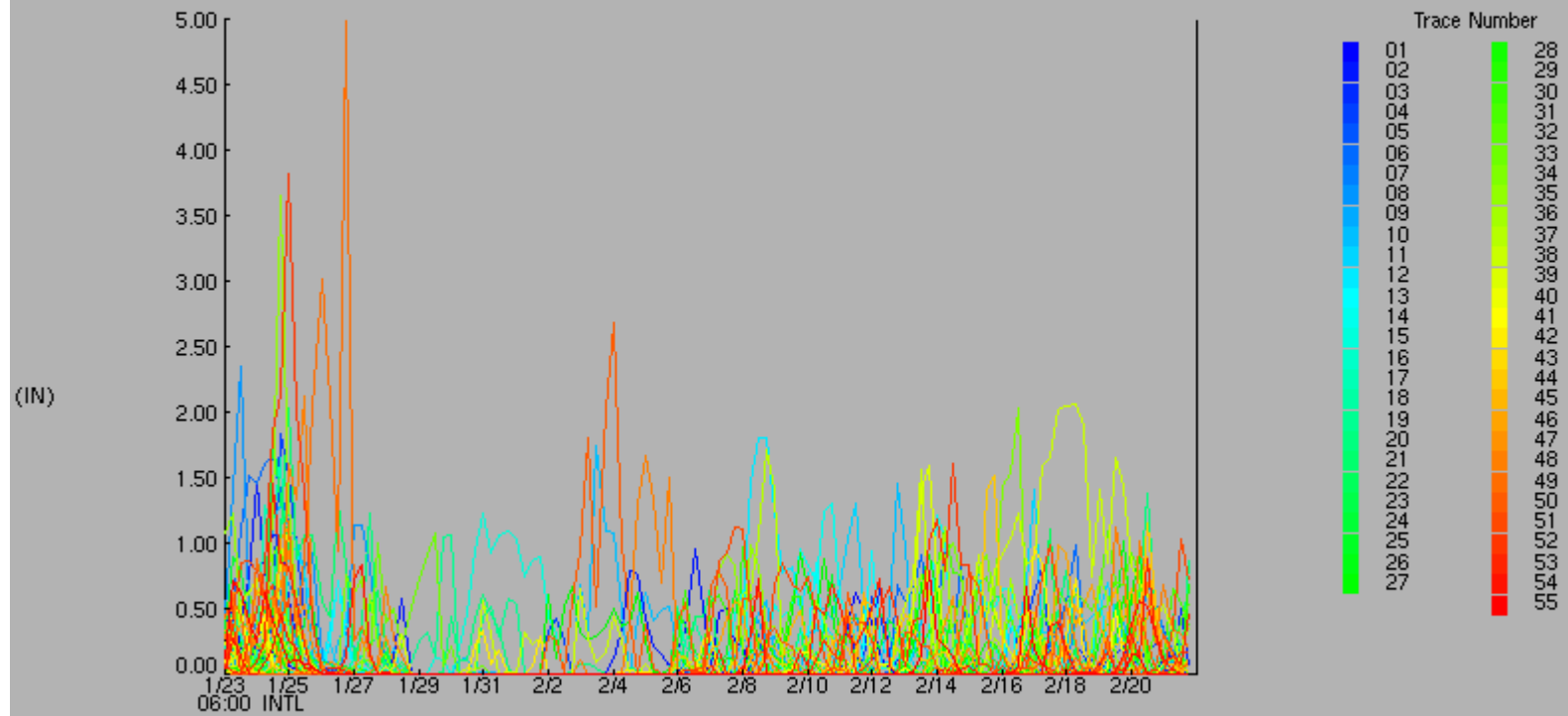




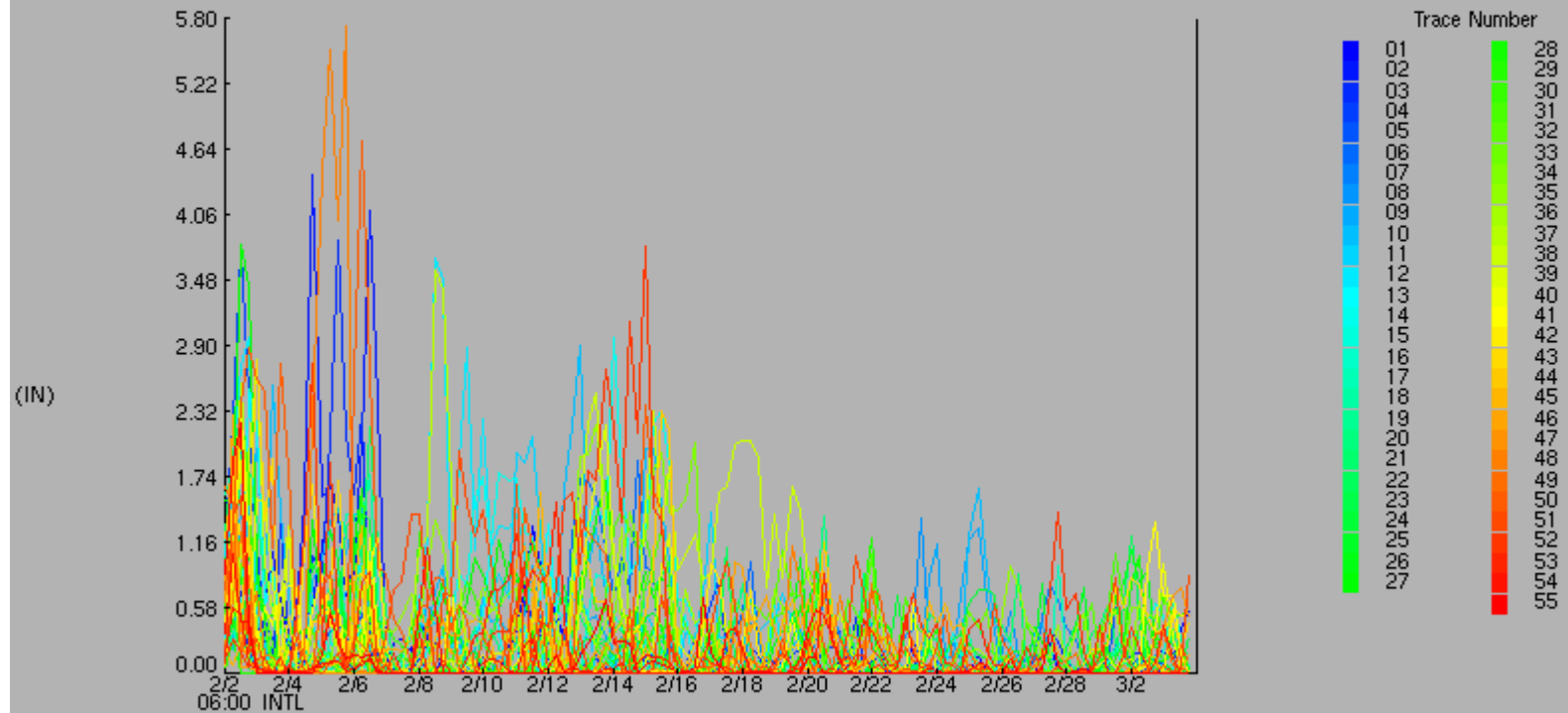
Calib. Trace Ensemble  
Latitude: 0.0 Longitude: 0.0  
Forecast for the period 1/11/2005 6h - 2/9/2005 24h INTL  
This is a conditional simulation based on the current conditions as of 1/11/2005



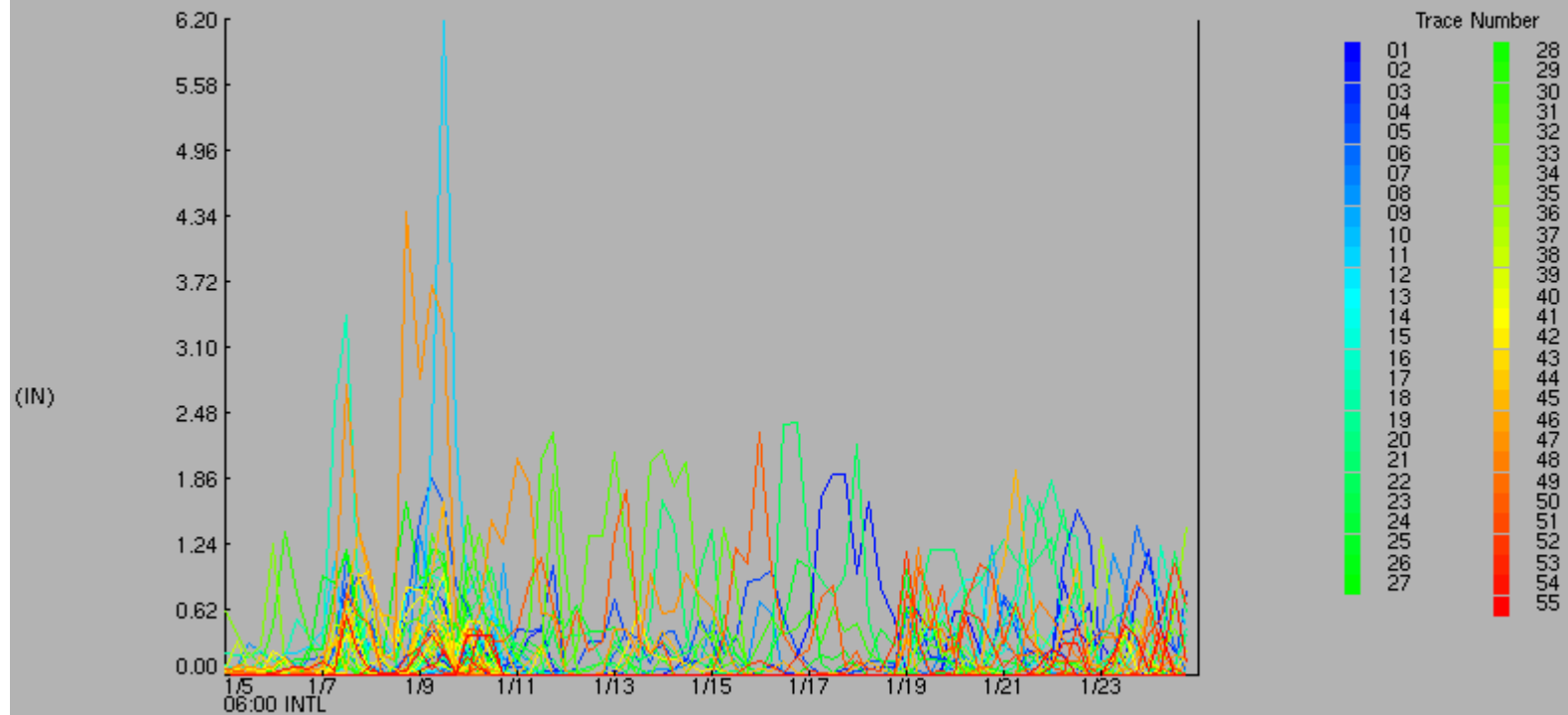
Calib. Trace Ensemble  
Latitude: 0.0 Longitude: 0.0  
Forecast for the period 1/23/2005 6h - 2/21/2005 24h INTL  
This is a conditional simulation based on the current conditions as of 1/23/2005



Calib. Trace Ensemble  
Latitude: 0.0 Longitude: 0.0  
Forecast for the period 2/2/2005 6h - 3/3/2005 24h INTL  
This is a conditional simulation based on the current conditions as of 2/2/2005



Calib. Trace Ensemble  
Latitude: 0.0 Longitude: 0.0  
Forecast for the period 1/5/2005 6h - 1/24/2005 24h INTL  
This is a conditional simulation based on the current conditions as of 1/5/2005



# Preprocessor - Some Next Steps

- Use as input to ESP (hindcast)
- Apply to grid (LDAS, HRAP, etc)
- Include alternative algorithms
  - Martyn Clark / Lauren Hay
  - Hamill – analog
  - Princeton – Bayesian processor
- Include regime-dependent uncertainty
- Consider ensemble uncertainty information
- Include alternative climate forecasts

# Opportunities for Collaboration

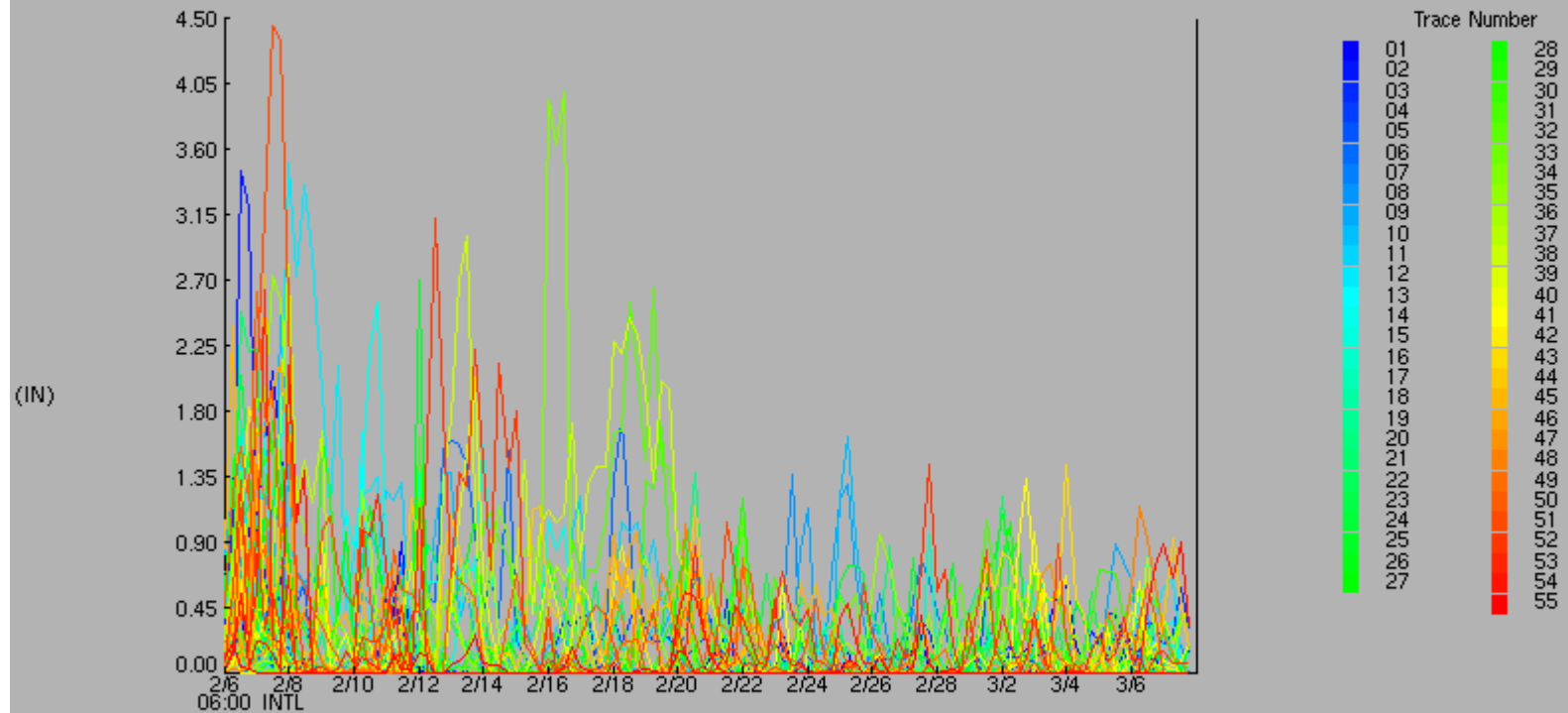
- Ensemble pre-processing
- Data assimilation
  - Optimal initial conditions
  - Initial condition uncertainty
  - Forecaster role
- Hydrologic uncertainty representation
- Hydrologic ensemble processing
- Ensemble post-processing
- Verification
- CHPS components

Thank You





Calib. Trace Ensemble  
Latitude: 0.0 Longitude: 0.0  
Forecast for the period 2/6/2005 6h - 3/7/2005 24h INTL  
This is a conditional simulation based on the current conditions as of 2/6/2005



Calib. Trace Ensemble  
Latitude: 0.0 Longitude: 0.0  
Forecast for the period 2/12/2005 6h - 3/13/2005 24h INTL  
This is a conditional simulation based on the current conditions as of 2/12/2005

