

CBRFC AHPS PROJECT

**MRF Ensembles in ESP
Days 1 - 14**

**Ensemble Meeting at OHD
April 21, 2004**

CBRFC AHPS PROJECT

Description, Goals, Objectives
Dave Brandon

Science:Downscaling, Ensemble
Creation
Martyn Clark

Application and Verification
Kevin Werner

Players-A Cooperative Effort



CIRES-Cooperative Institute for Research in Environmental Sciences (University of Colorado)



Martyn Clark (Science)

Subhrendu Gangopadhyay (Science)



CDC – Climate Diagnostics Center

Jeffrey Whitaker (Computer/Model/Ensembles)

Andrea Ray (Coordination)



CBRFC-Colorado Basin River Forecast Center

Kevin Werner (Operations/Verification/Computer)

Steve Shumate (Computer/Informix DB)

Cass Goodman (Computer/WEB Page)

Jeff Smith (Operations)

Dave Brandon (Administration/Technical Support)



OHD – Office of Hydrologic Development

John Schaake (Science)

Big Picture

Produce a seamless suite of probabilistic flow forecasts.

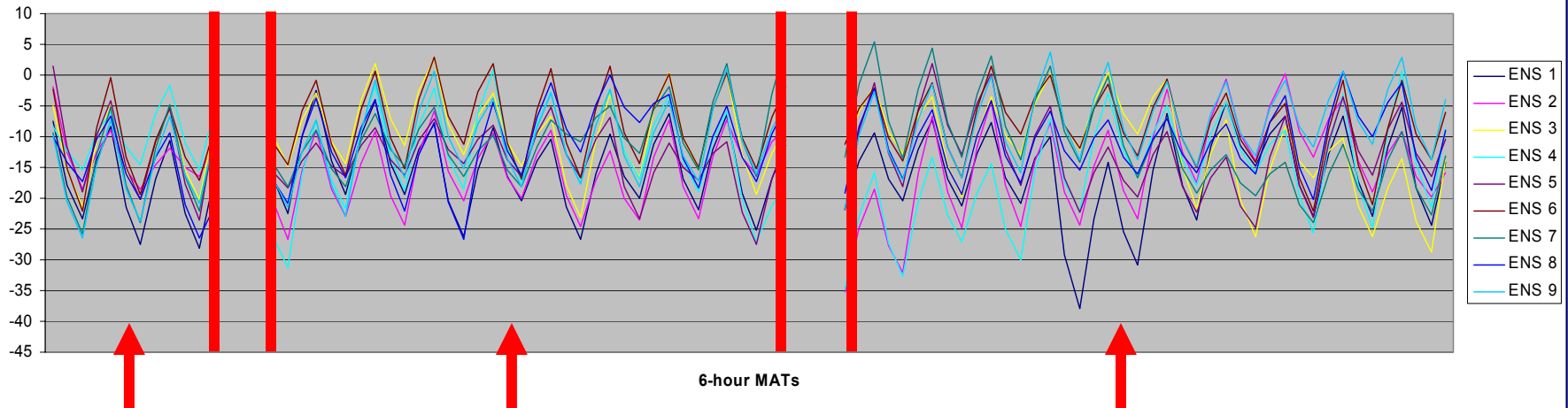
Create a seamless suite of ensemble inputs for use in ESP using the 'best' models for the particular time period.

Learn from each other

- build upon our knowledge**
- avoid duplication**
- fast track into operations.**

Example of Creating a Seamless Suite of MATs

Unconnected MAT Ensembles
From Three Sources/Models Before 'Shuffling'

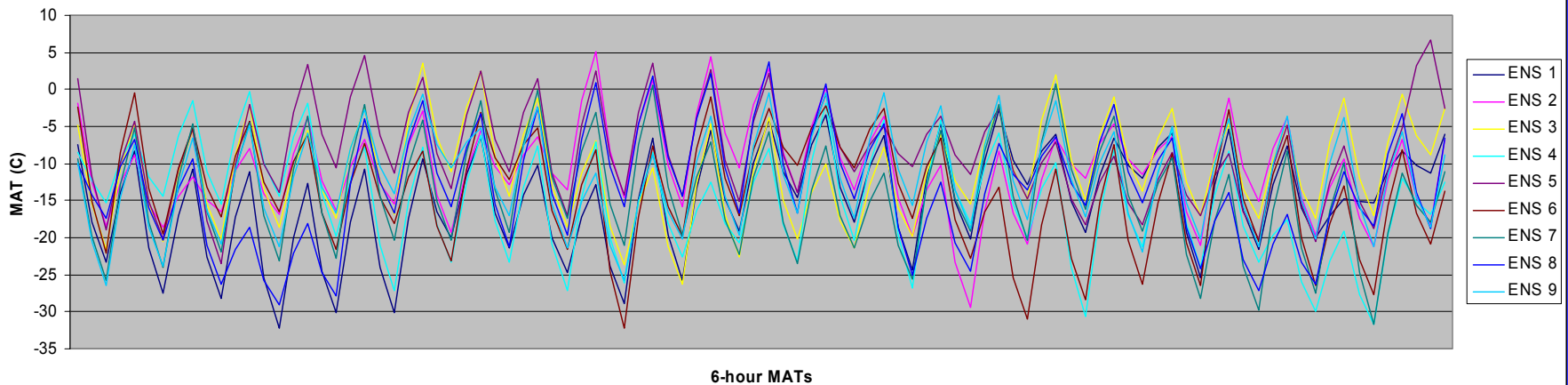


**SHORT TERM
DAY 1-3 HAS/HPC**

**MEDIUM RANGE DAY 4-14
MRF**

**LONG RANGE DAY 15 – 365
CPC PRE-ADJUSTMENT/ OTHER**

Seamless Suite of MAT Ensembles
From Three Sources/Models After 'Shuffling'



History of CBRFC Project

Historical user concern of incorporating numerical models into river forecasts

Peak flow enhancement for our friendly fish during snowmelt

Focus on “problem of the day”

Heck! We need an AHPS project!

Goals

Introduce probabilistic 14 day meteorological forecasts (ensembles) into the Ensemble Streamflow Prediction system.

Capture and display the uncertainty.

Verify the process.

Method

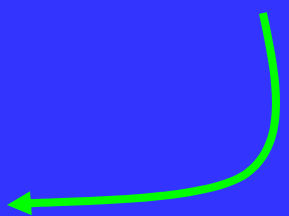
**Medium Range
Forecast Model**

**Downscale to
Model Variables**

**Mean Areal
Temperature and
Precipitation
Ensembles**

ESP Model

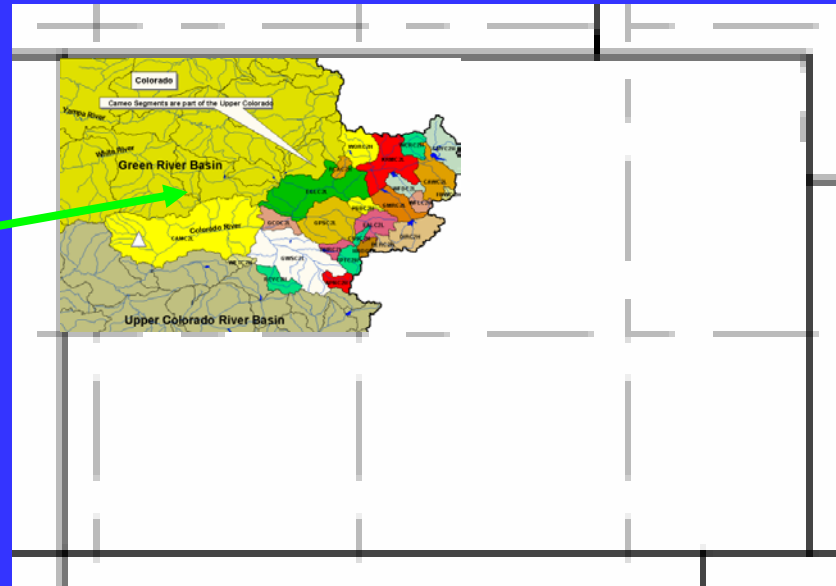
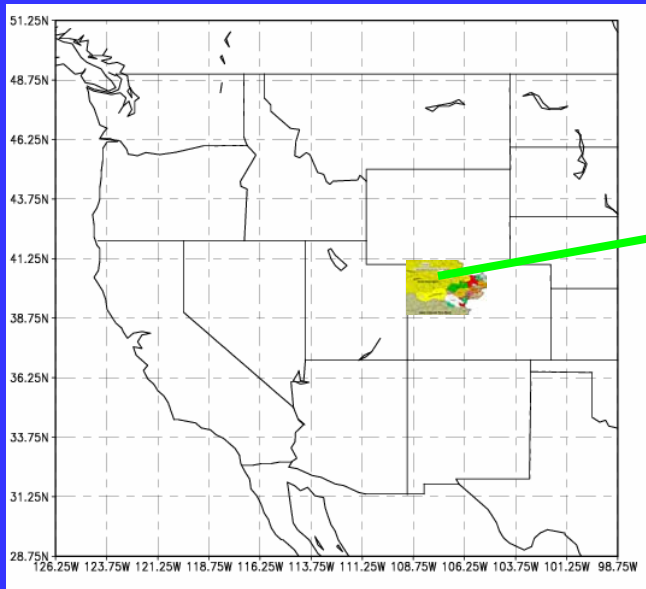
**Probabilistic River
Forecasts**



Medium Range Forecast (MRF) Model

- **Global Meteorological Model**
- **Many Atmospheric Variables**
- **Frozen Version**
- **Run Daily at CDC**
- **~150km Spatial Resolution**

MRF Spatial Resolution



WAY TOO LARGE!

Need to Relate to a Basin...

A Few Questions Arose

Downscaling Method?

How to Correct Model Bias?

Points or Lumps?

**How to Preserve Co-Variability
& Temporal Persistence?**

How to construct the ensembles?

How do you verify the process?

How do you manage the data?

Published Papers

**Incorporating Medium Range Numerical Weather Model Output into the Ensemble Streamflow Prediction System of the National Weather Service.
(Journal of Hydrometeorology)**

**An Analysis of Weighting Schemes Using Climate Indices for Seasonal Volume Forecasts Produced From The Ensemble Streamflow Prediction System Of the National Weather Service
(Journal of Hydrometeorology)**

**The Schaake Shuffle: A method for Reconstructing Space-Time Variability in Forecasted Precipitation and Temperatures
(Journal of Hydrometeorology)**

**Effects of Spatial and Temporal Aggregation on the Accuracy Of Statistically Downscaled Precipitation Estimates in the Upper Colorado River Basin
(Journal of Hydrometeorology)**