

HEPEX Status Report

1st Pan-GEWEX Workshop

Frascati, Italy

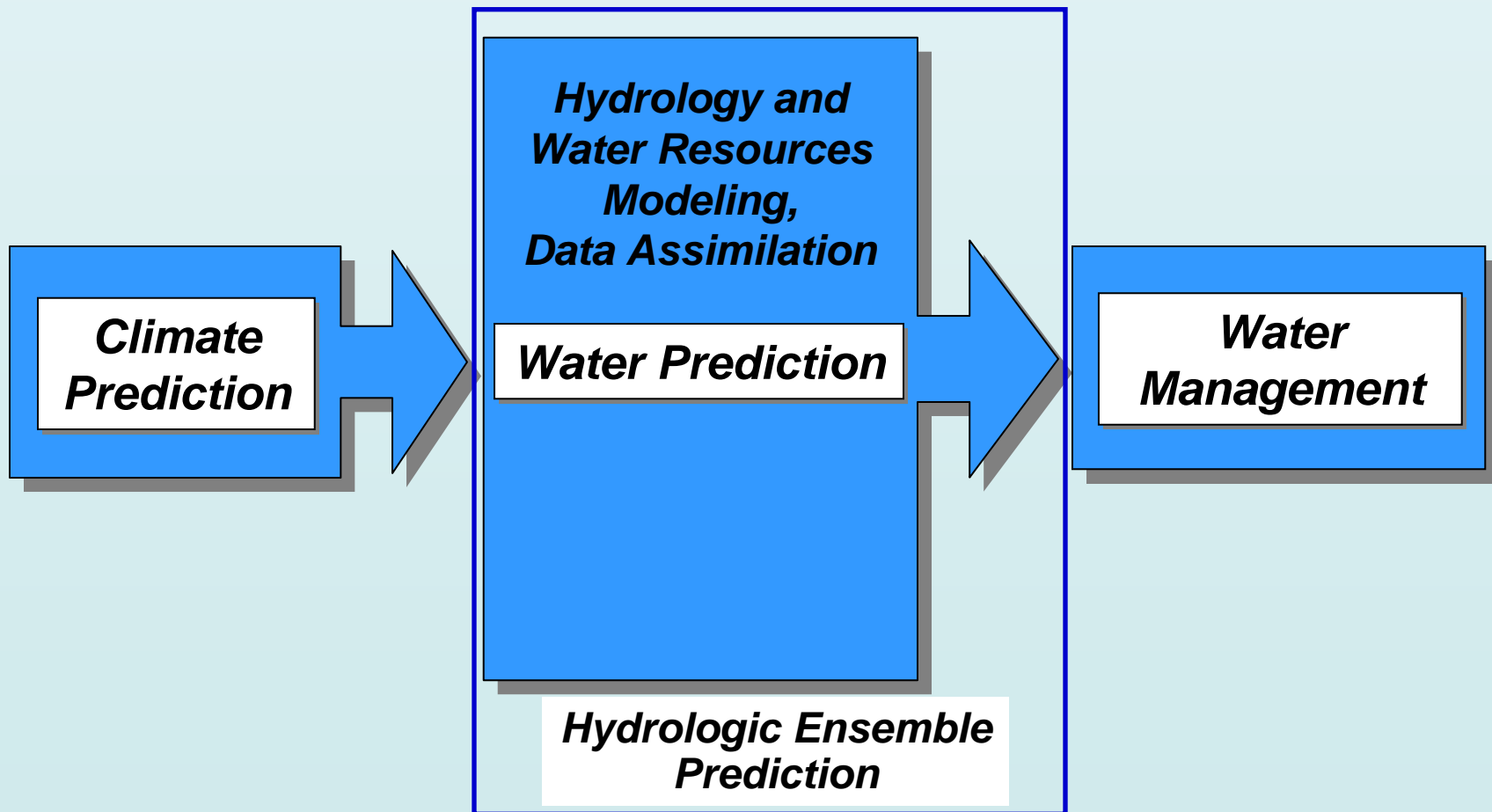
October 9-13, 2007

Hydrological Ensemble Prediction Experiment (HEPEX)


HEPEX aims to demonstrate how to produce reliable hydrological ensemble forecasts that can be used with confidence to make decisions for emergency management, water resources management and the environment



From Climate Prediction to Water Management



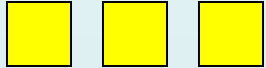


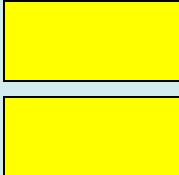
Three Basic Elements of HEPEX

- Testbed Projects 
- Supporting Data Sets
- Components of a Community Hydrologic Prediction System (CHPS)

Recent HEPEX Accomplishments

- Users are Participants
- 2nd Workshop, NCAR, July, 2005
- WEB Site
- BAMS article in review
- HESS special issue in review
- Implementation Strategy completed
- 8 Existing Testbed projects
 - Annual reports
 - Shared/supporting data sets
 - CHPS components

What Have We Learned?

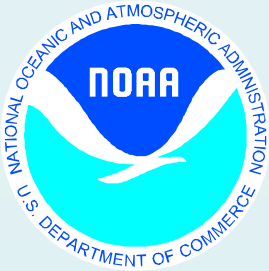
- Need to pre-process weather and climate forecasts (bias & uncertainty corrections) 
- Uncertainty is space and time-scale dependent 
- Weather and Climate forecasts contain information useful for water resources applications 
- Weather and Climate ensemble re-forecasts are required (>20yrs)
- Major work needed to produce reliable hydrologic ensemble forecasts 

Where is HEPEX Going?

- Continued collaboration with GEWEX/HAP
- Strengthened ties with THORPEX and WMO/HWR
- Development of Community Ensemble PreProcessor (CEPP) for forecast lead times from 1hr to 1yr
- Continue existing activities
 - Testbeds
 - Data set development
 - CHPS components
 - Workshops, meetings, publications
- User Involvement
 - Operational hydrological applications
 - Waterpower conference, July, 2007, Chattanooga, TN
- 3rd Workshop, Italy - June, 2007
- Potential new testbed projects
- Proposed AGU Chapman Conference - Brazil 2007

Issues

- Relationships between HEPEX and HAP are vital to both GEWEX and HEPEX. These need to be articulated and a shared understanding of them developed among participants in both GEWEX and HEPEX.
- Potential relationships between HEPEX and other parts of GEWEX (e.g. CEOP and GLASS) should be considered.



Thank
You

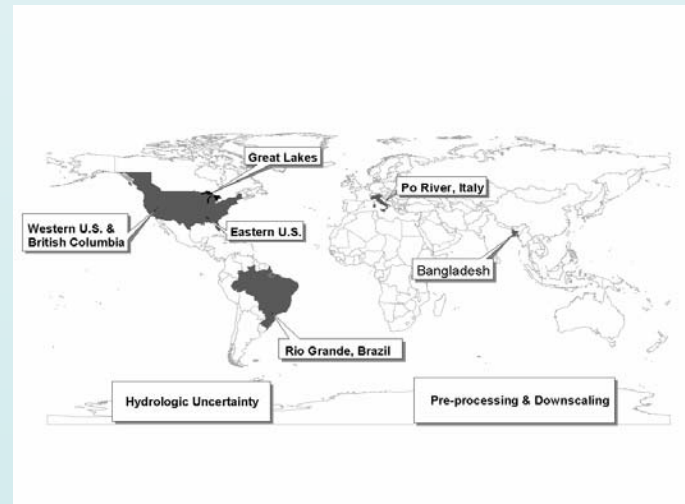


Water Predictions
for
Life Decisions

HEPEX
Hydrologic Ensemble Prediction EXperiment

HEPEX Testbed Projects

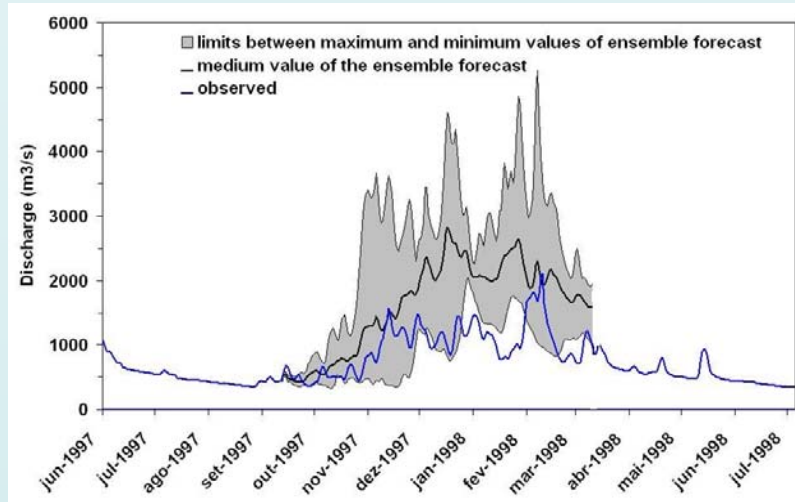
- Europe
 - EU-JRC Ispra, Pan-European Flood, Po River
- Canada/U.S. – Great Lakes
- Brazil
- SE U.S.
- Western U.S./B.C.
- Bangladesh
- PreProcessing / Statistical Downscaling
- Hydrologic Uncertainty / Data Assimilation



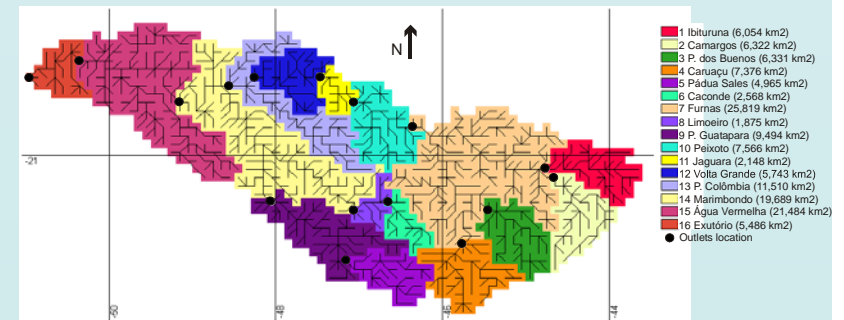
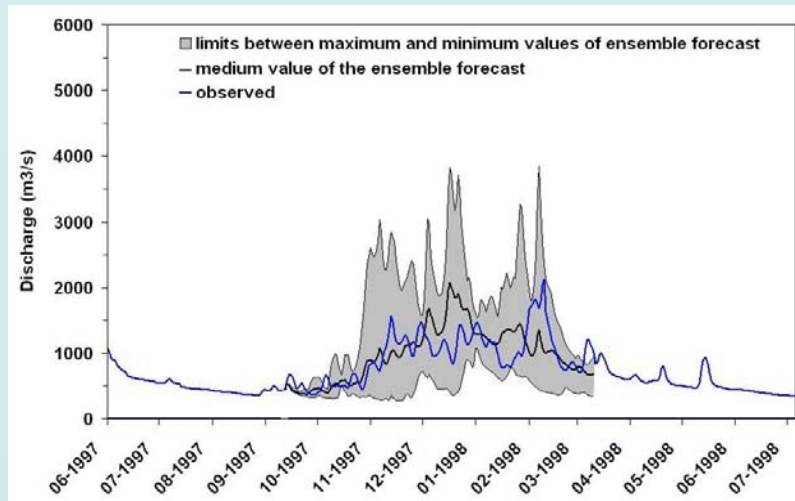
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Figure 13 – Long-term flow forecasts (up to lead-time 6 months) obtained from rainfall forecasts given by the CPTEC AGCM model (a) without statistical correction of rainfall forecasts using cumulative probability distributions, (b) with statistical correction. Forecasts start on 1 October 1997, for the outfall from the Furnas sub-basin.

(a)



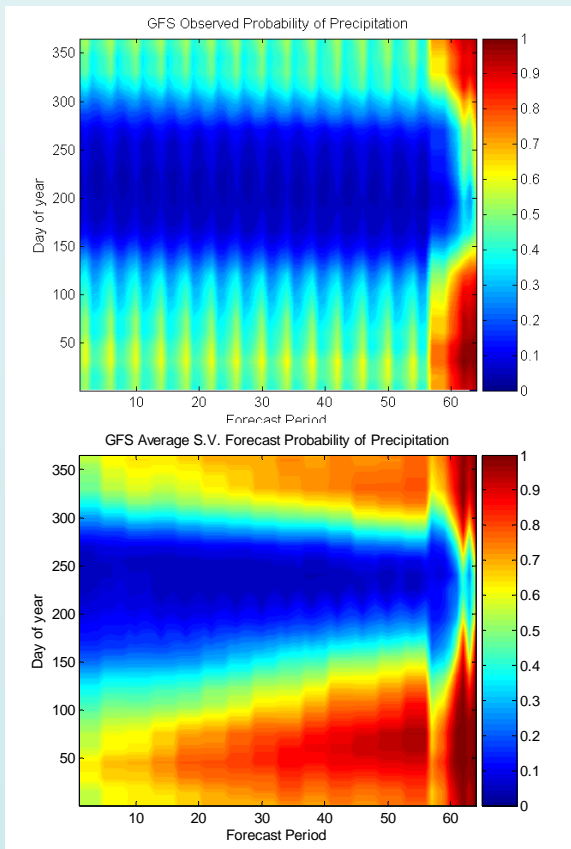
(b)



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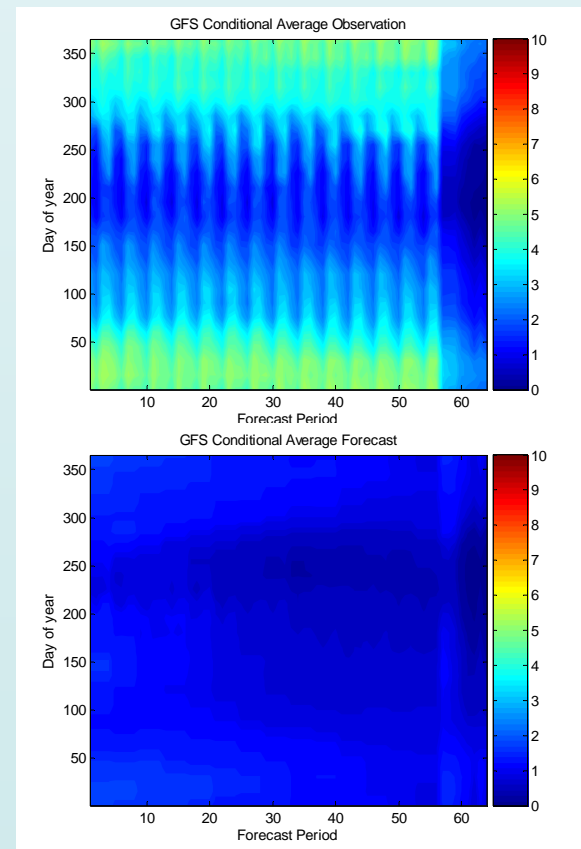
Some EPP Parameters North Fork American River

Observed POP



Forecast POP

Observed CAVG



Forecast CAVG

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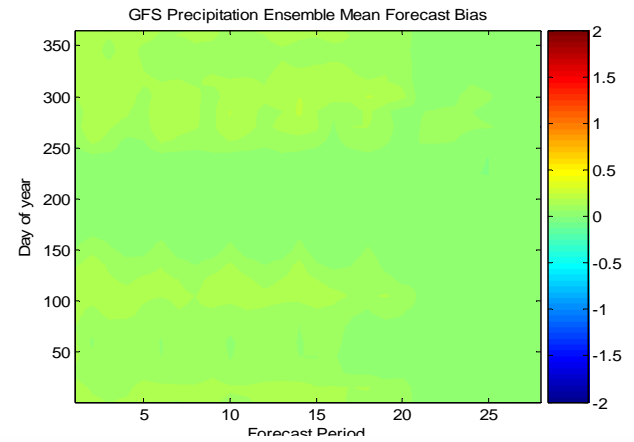
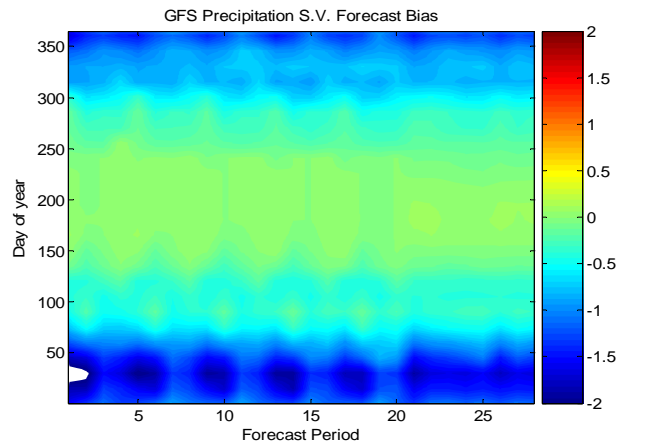
GFS Precipitation Forecast Verification North Fork American River

Raw Forecasts

Ensemble Mean

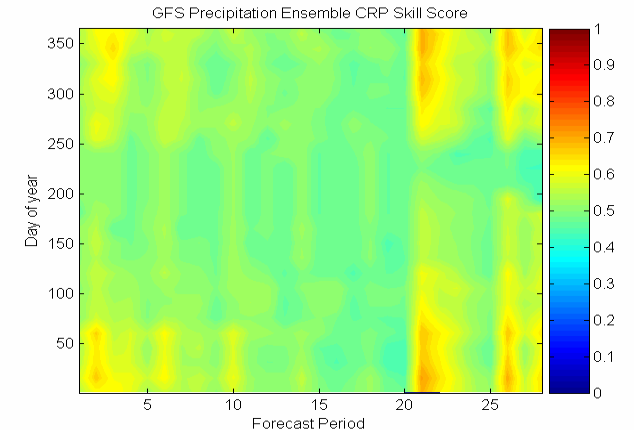
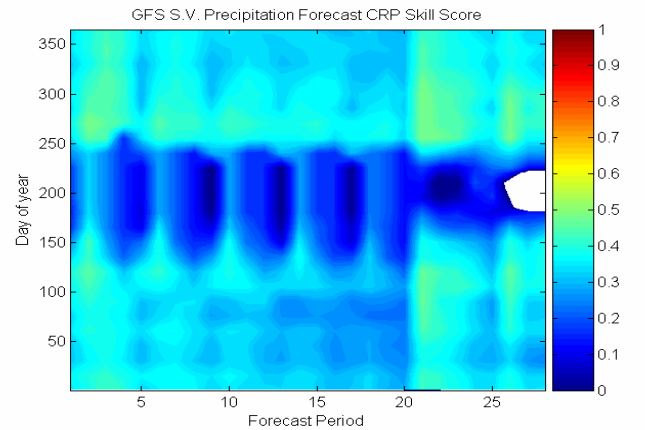
Bias

Day of Year



CRPSS

Day of Year

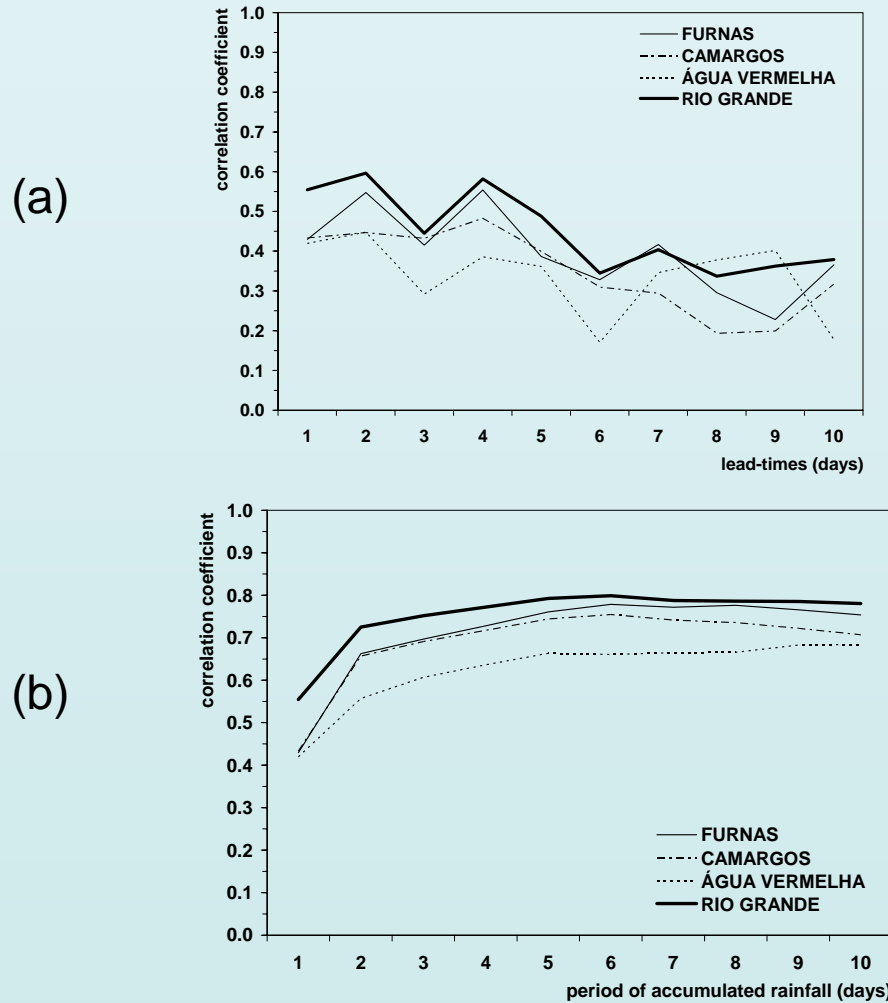


Forecast Period

Forecast Period

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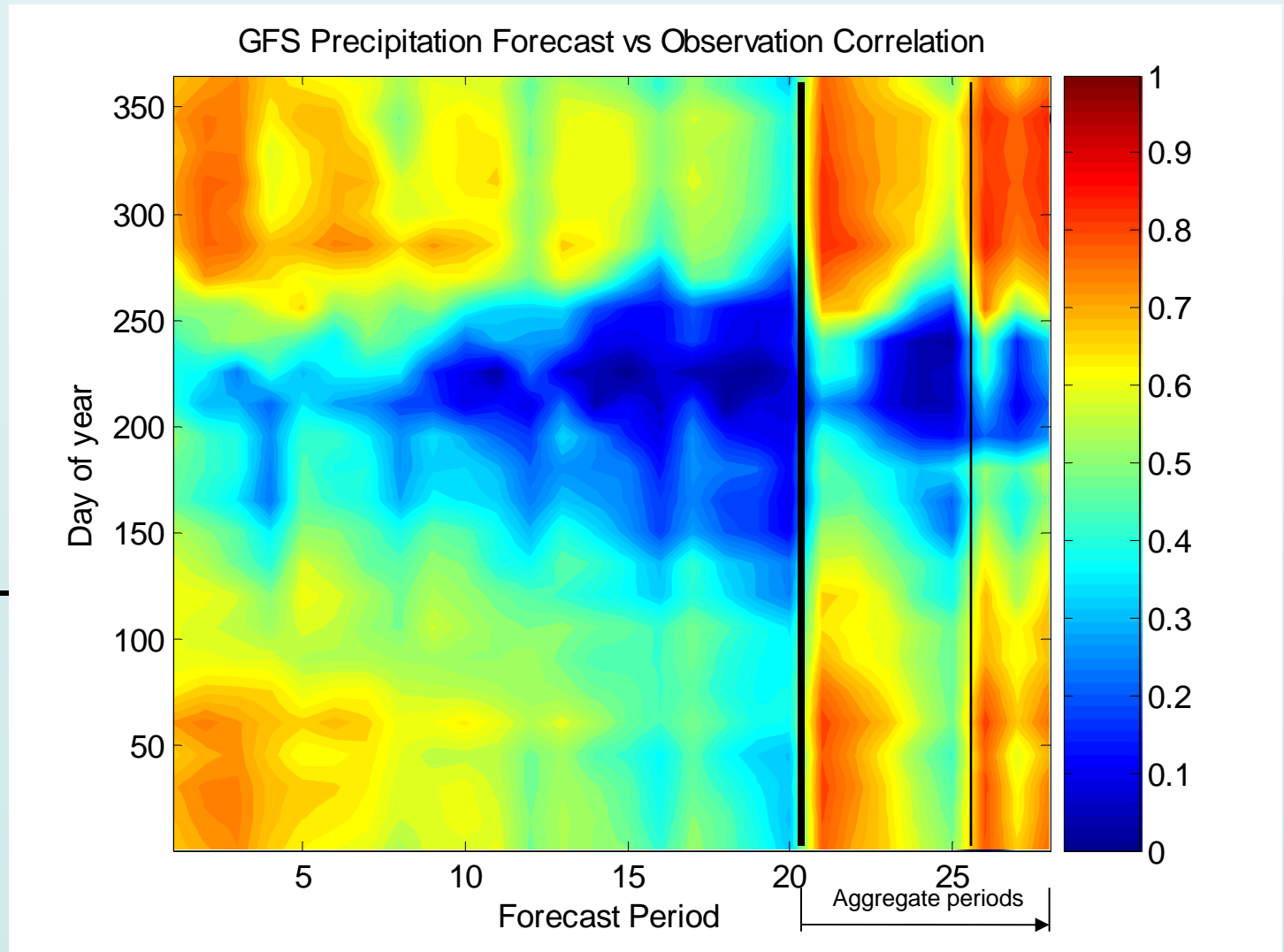
Figure 6 – Evaluation of the quality of rainfall forecasts given by the 40km-grid ETA model, for the whole of the Rio Grande basin, and for some sub-basins: (a) correlation coefficient as a function of lead-time; (b) correlation coefficient as a function of length of period over which rainfall is accumulated.



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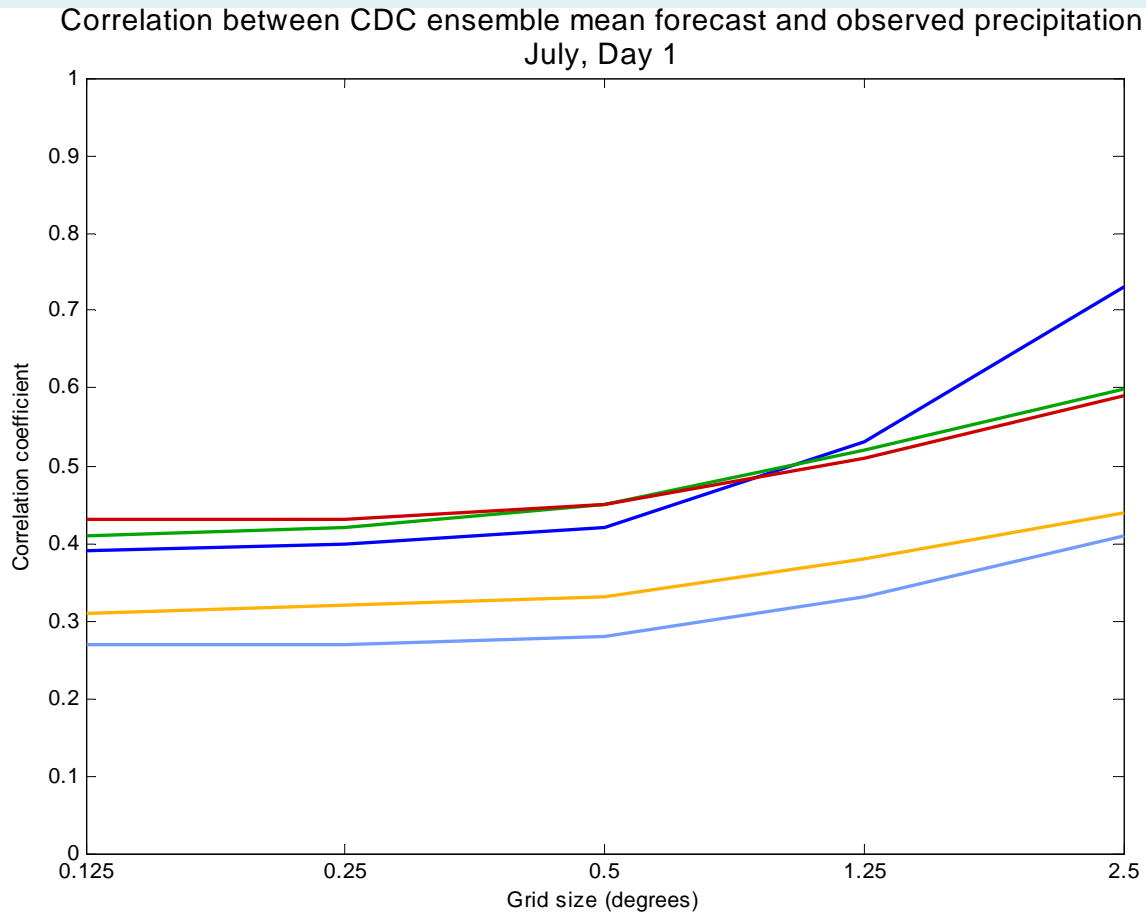
Correlation Coefficient GFS Precipitation Forecast vs Observation North Fork American River

Forecast
Uncertainty
Depends
on both
Lead-Time
and
Aggregation-
Time



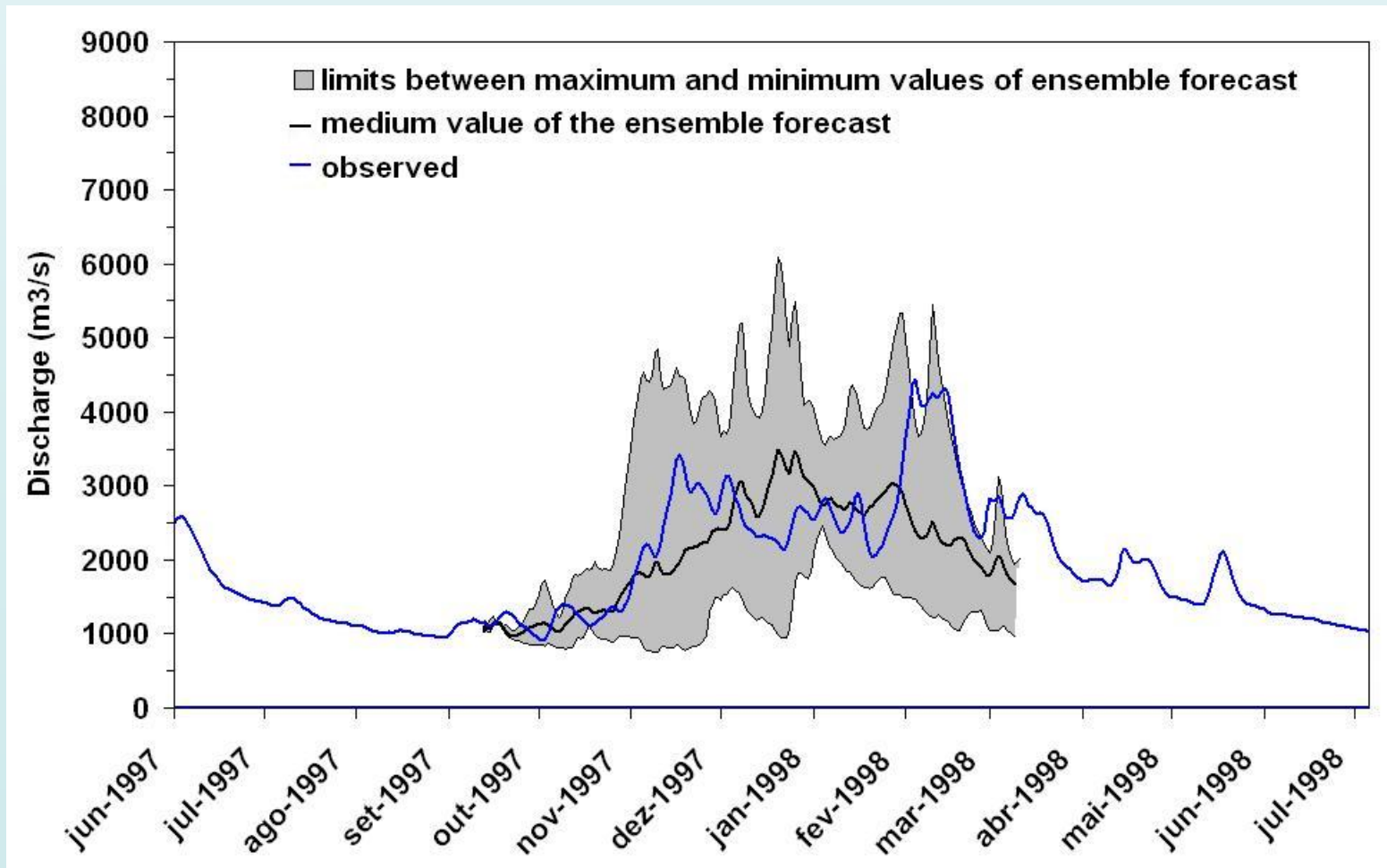
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Effect of Spatial Scale on 24hr Forecast Skill (July – 5 locations)



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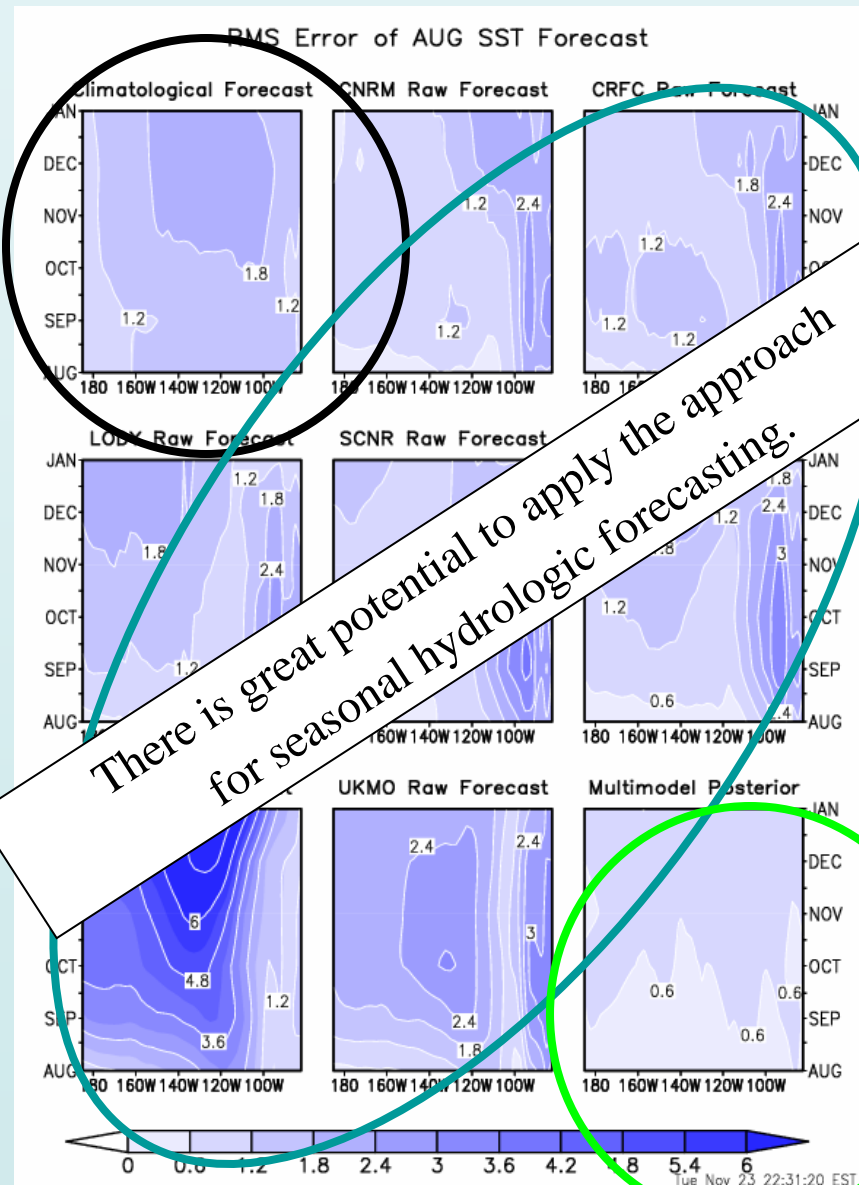
Figure 14 – Long-term flow forecasts (up to lead-time 6 months) obtained from rainfall forecasts given by the CPTec AGCM model



Return

Example: SST Forecast

- Seasonal SST forecast from ECMWF DEMETER project
 - 7 climate models
 - 6 months forecast starting August
 - 9 ensembles from each model
 - 20 years (1980-1999)
- RMS error of all SST forecast initiated at August
- Forecast over Equatorial Pacific
- Multi-model posterior always has the smallest RMS error

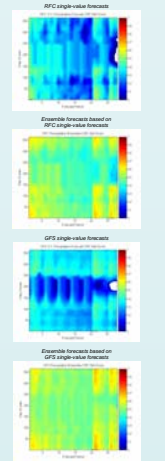


National Weather Service Hydrologic Ensemble Pre-Processor (EPP) GFS Subsystem

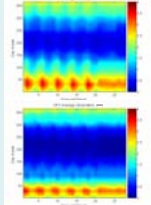
J. Schaake, R. Hartman, J. Demargne, L. Wu, M. Mullusky, E. Welles, H. Herr, D. J. Seo, and P. Restrepo



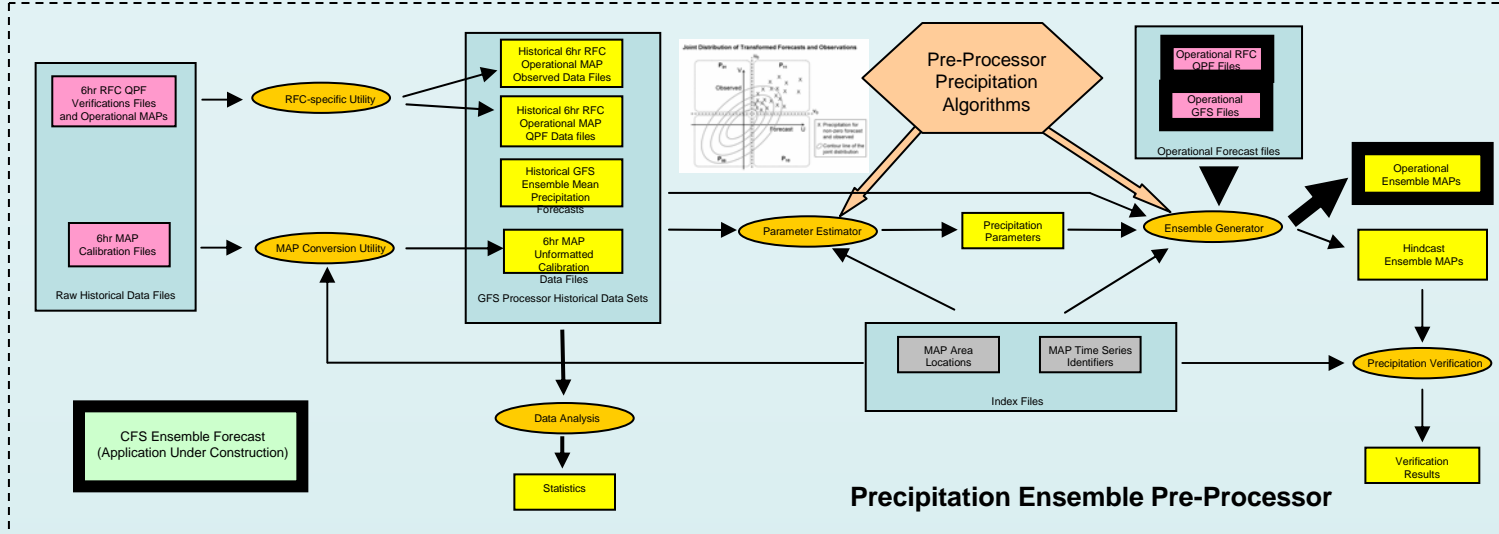
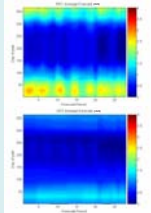
Continuous Rank Probability Skill Score (CRPSS) for 6-hour precipitation forecasts



Average observed values of 6-hour precipitation corresponding to RFC and GFS forecasts

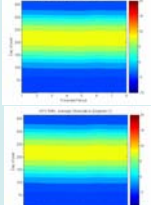


Average forecast values of 6-hour precipitation for RFC and GFS

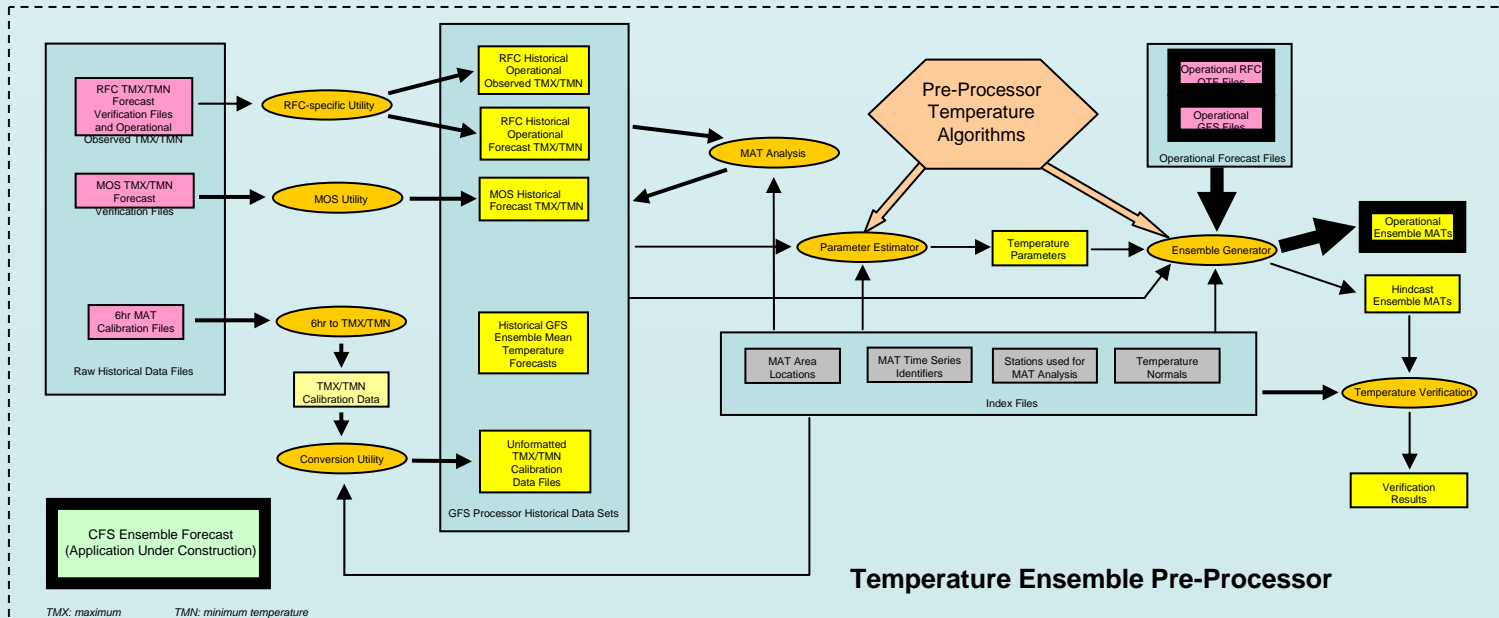
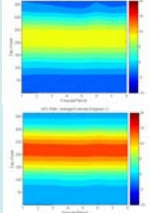


Precipitation Ensemble Pre-Processor

Average observed values of daily minimum temperature corresponding to RFC and GFS forecasts

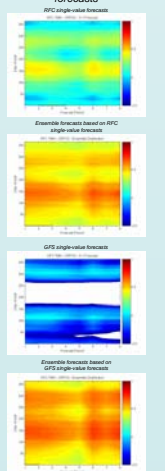


Average forecast values of daily minimum temperature for RFC and GFS



Temperature Ensemble Pre-Processor

Continuous Rank Probability Skill Score (CRPSS) for daily minimum temperature forecasts

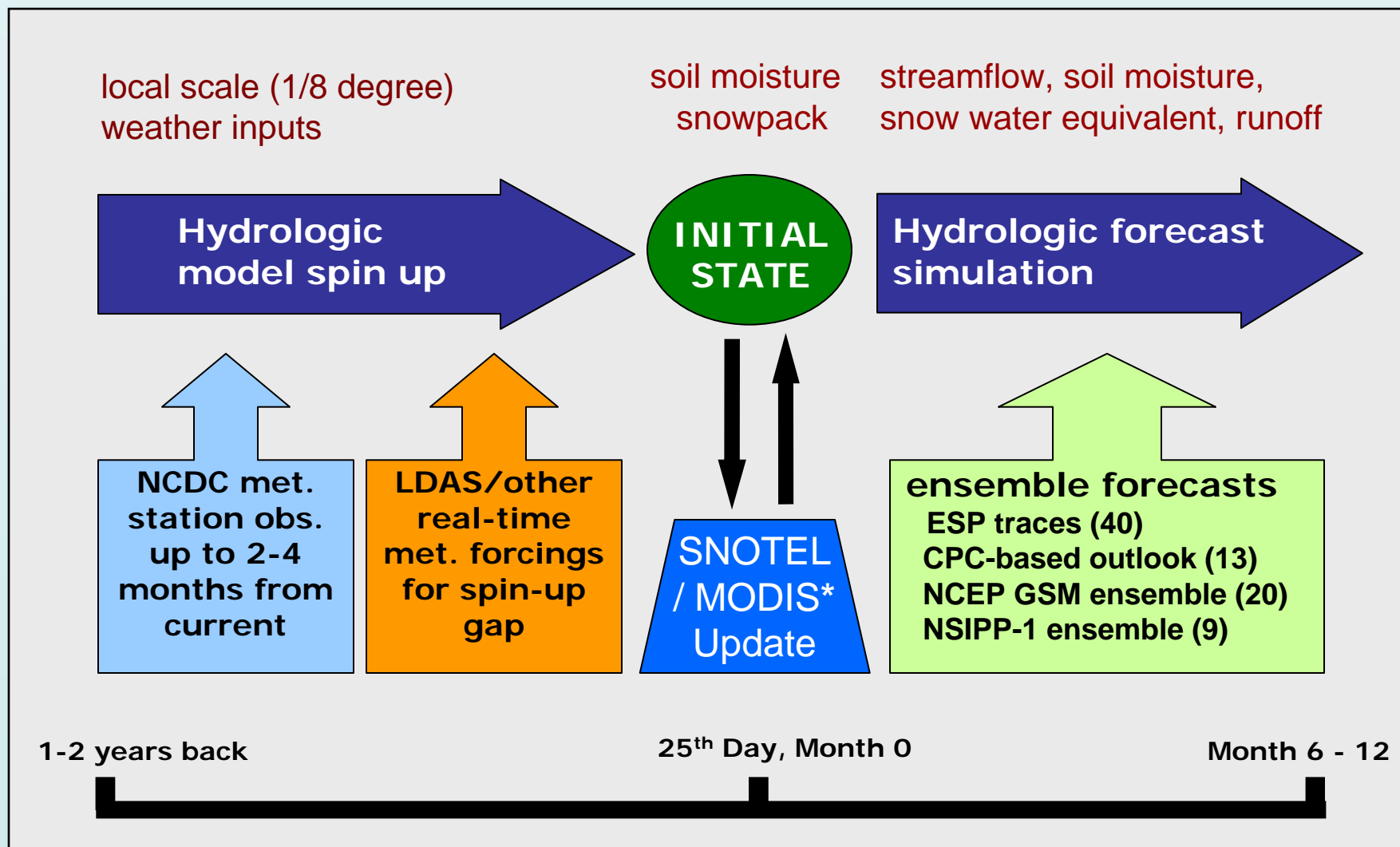


TMX: maximum temperature
TMN: minimum temperature

Return



Forecast System Overview



* experimental, not yet in real-time product