HEPEX Seasonal Streamflow Forecast Intercomparison Project

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Background: benefits of seasonal prediction

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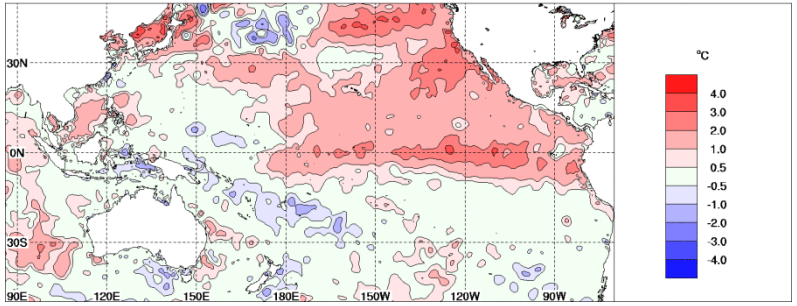
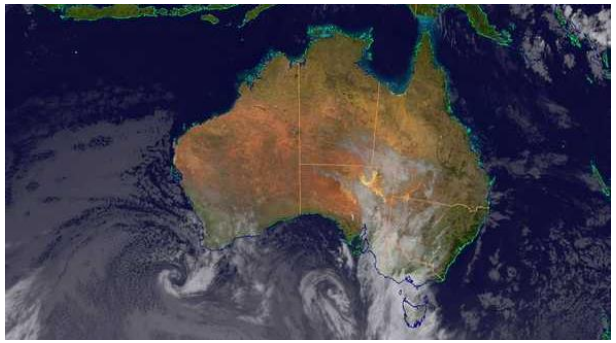
Background: sources of predictability

Atmosphere/ocean obs



Physics/dynamics - GCMs



Catchment/soil moisture

Snow/glacier melt

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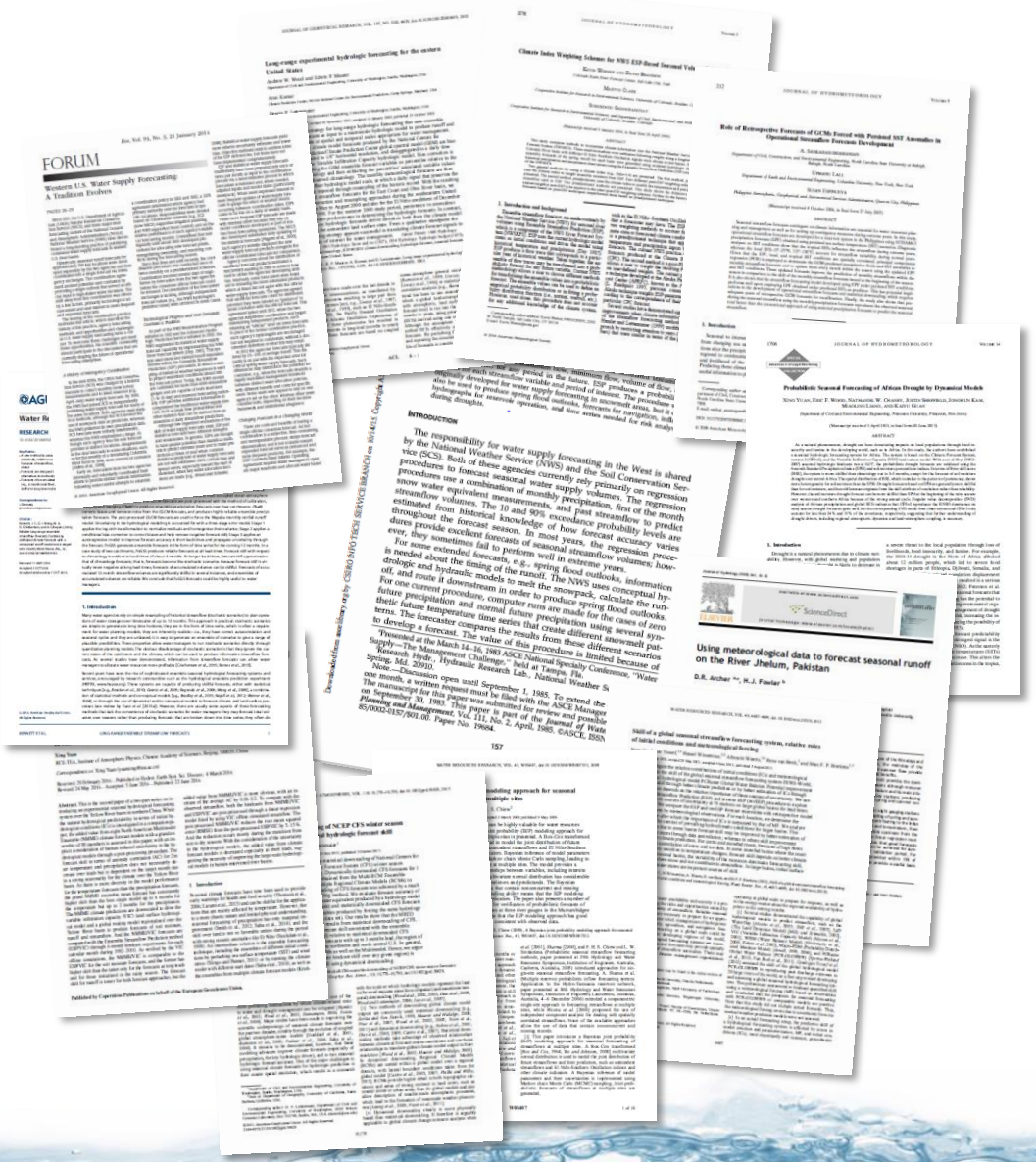
Background: ensemble methods

- ESP methods used since the 1970s (Day 1985)
- Proliferation of methods in recent ~decade
  - Often developed in isolation
  - A range of verification methods/metrics
  - Often highly region-specific
- Difficult to know the state of the science



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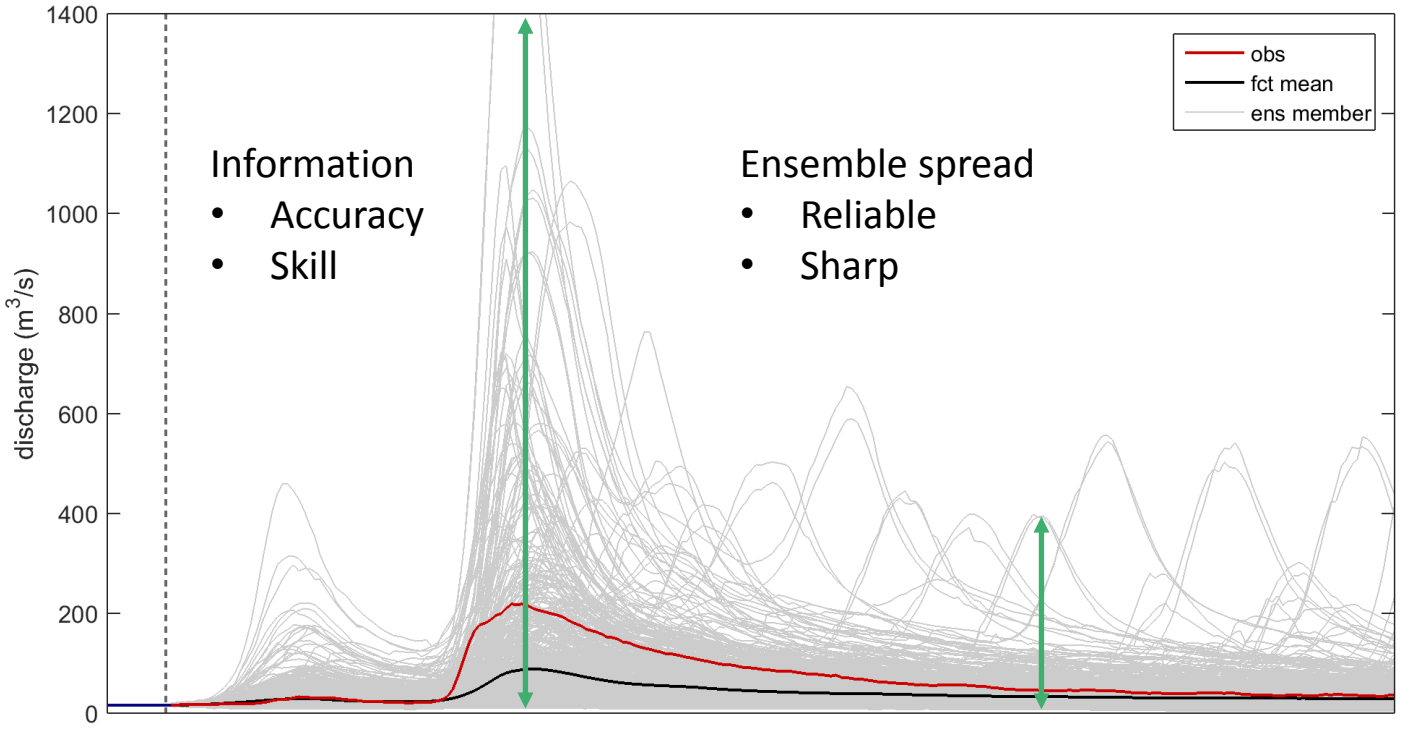
Seasonal streamflow intercomparison project goals

- Test and compare seasonal hydrological forecasting systems in varied hydro-climatic zones
- Encourage reproducibility of results and share methods
- Identify unique sources of skill in different forecasting systems
- Publically available sets of ensemble hydrological re-forecasts
- Learn from each other, share and improve techniques and expertise related to seasonal streamflow prediction

Seasonal streamflow intercomparison project methods

- Each participant provides data/predictors for one catchment
- Forecast methods from all participants are tested on all catchments
- Establish and apply consistent verification methods/metrics



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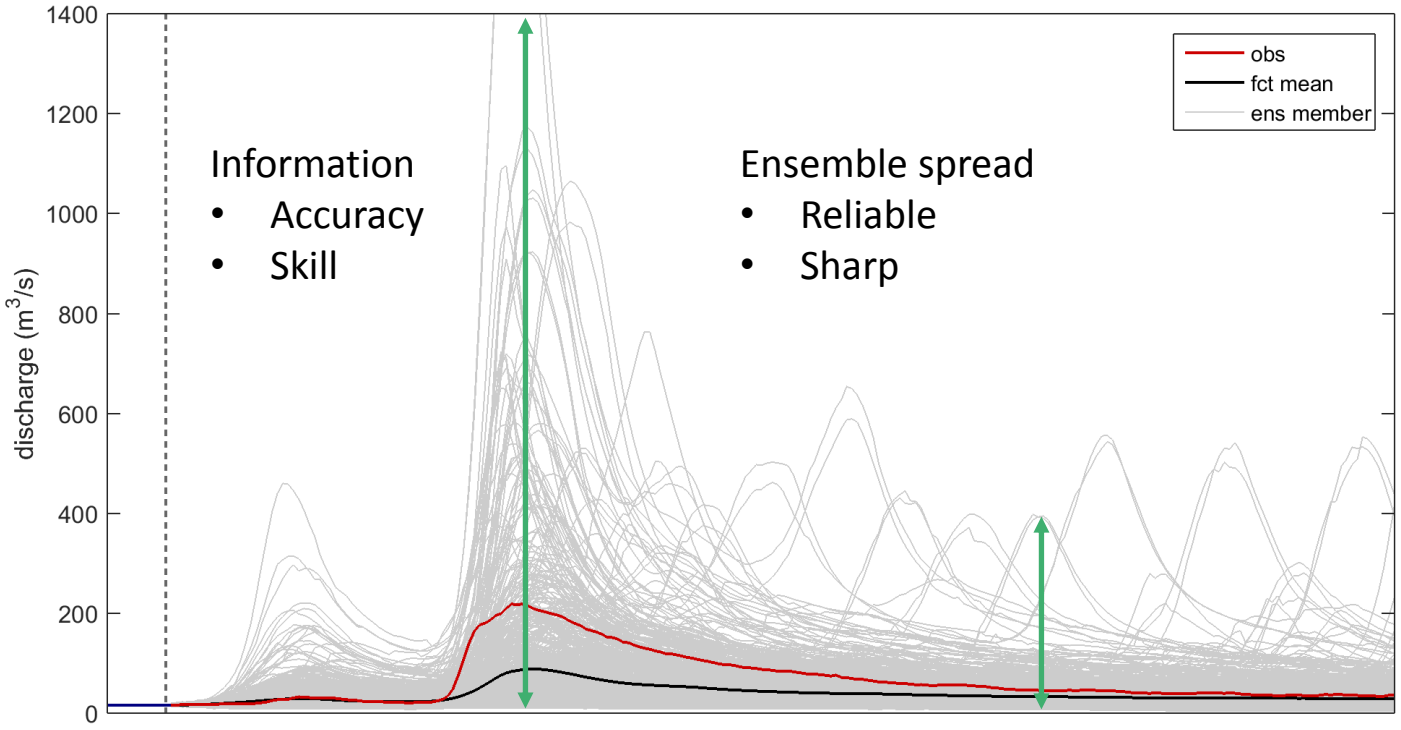
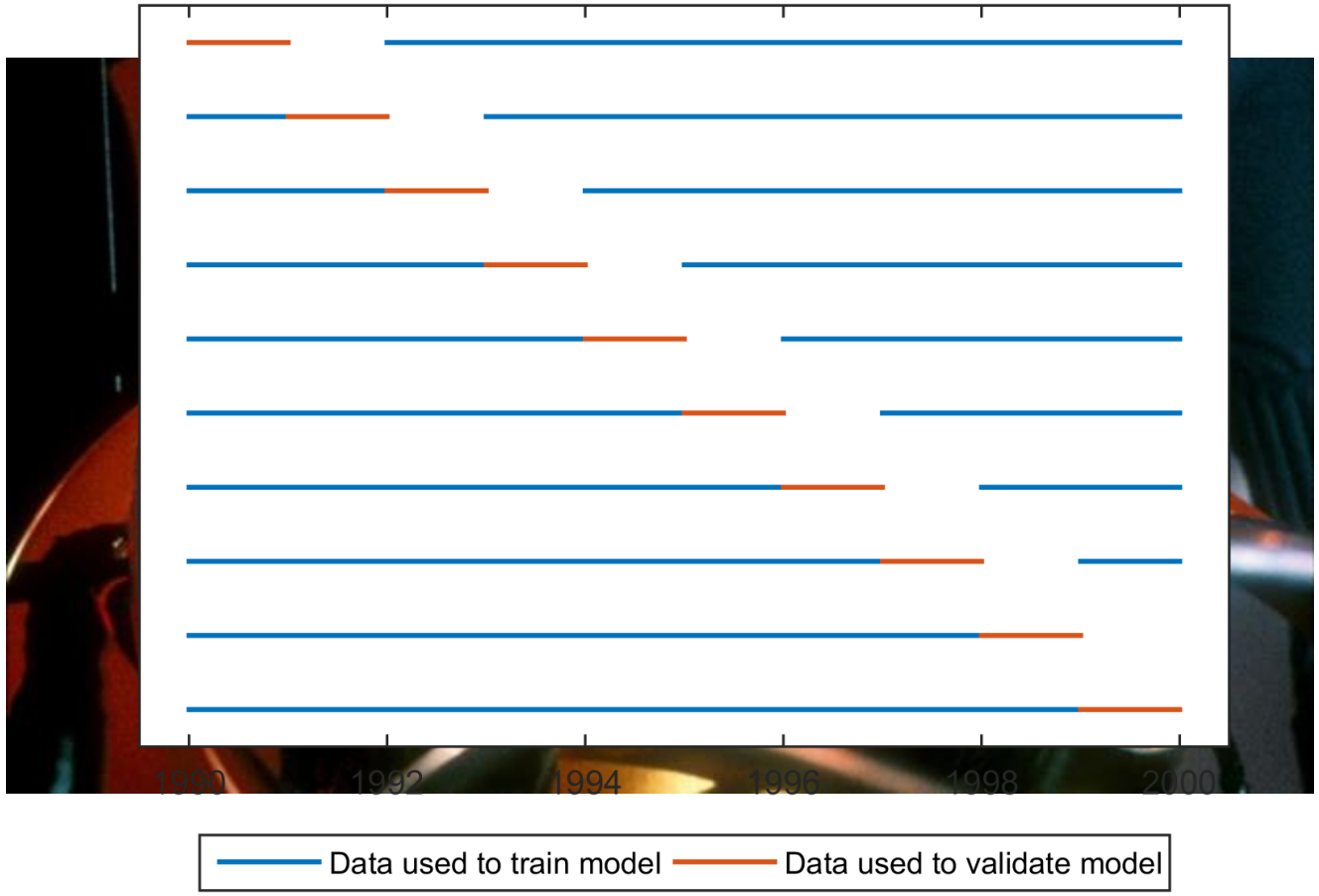
Seasonal streamflow intercomparison project metrics

- Error scores: RMSE, CRPS
- Bias
- Reliability: probability integral transforms
- Sharpness: average width of confidence intervals

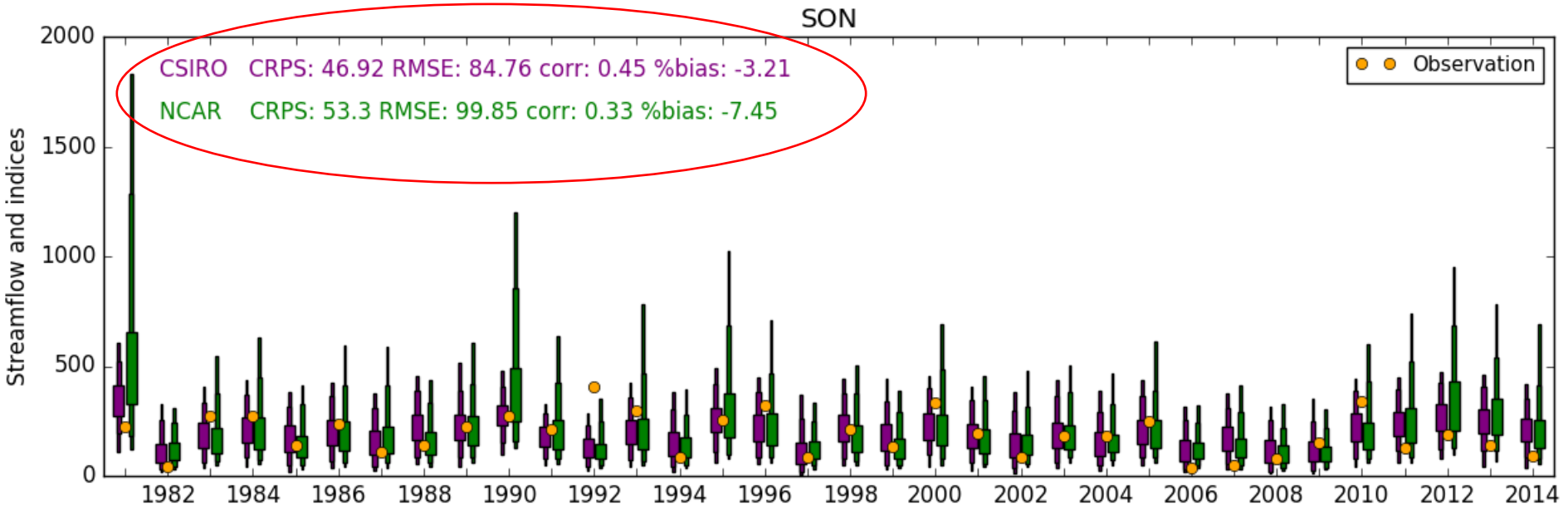


Methods: cross-validation

- Testing for future performance
- Retrospective forecasts 1981-2014
- Leave-3-years-out cross-validation

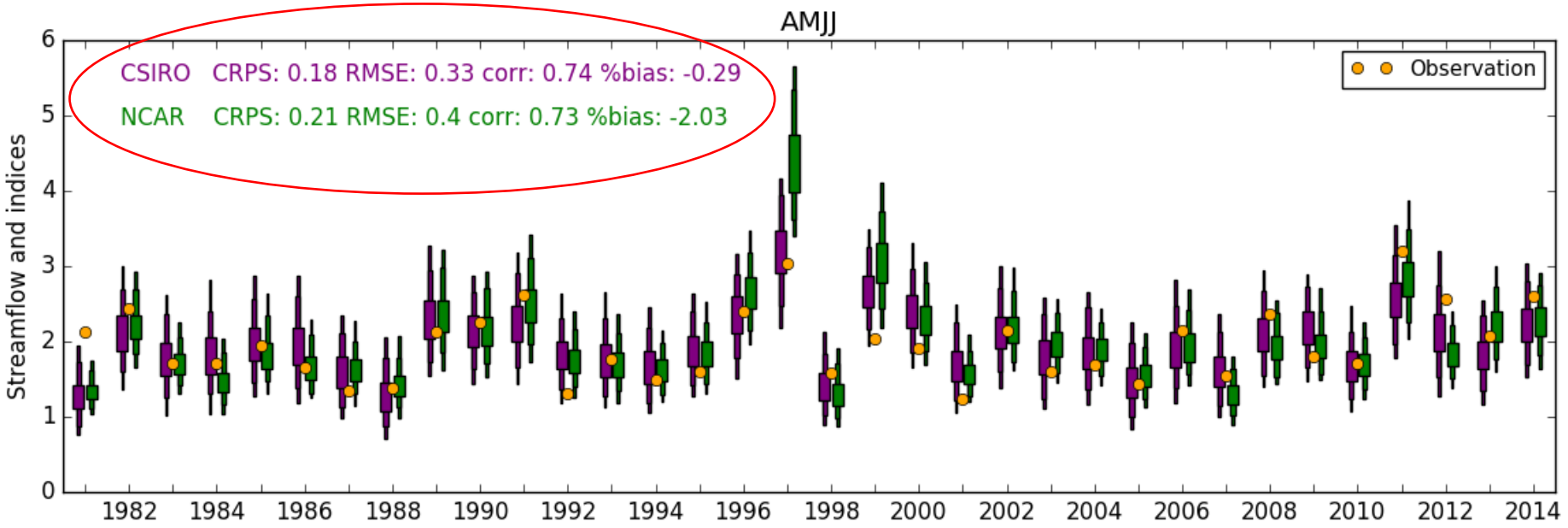


Forecasts for Australia: Murray River Basin



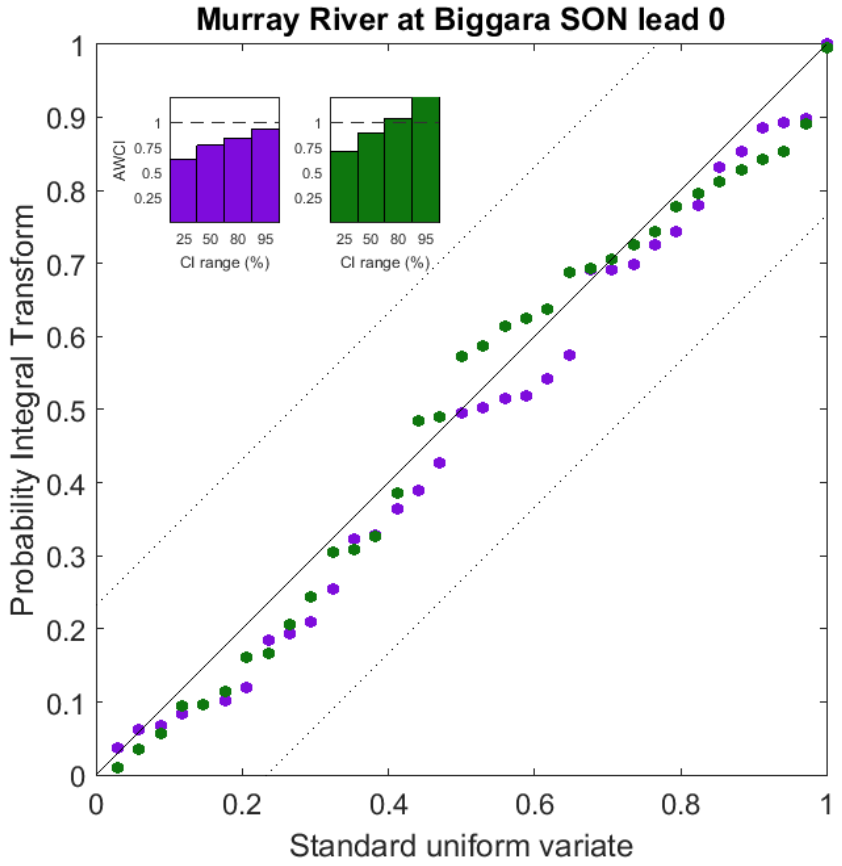
- Example: 0-lead 1-season prediction for Sept-Oct-Nov flow
- CSIRO Approach: BJP using predictors (eg IC moisture, Clim Indices)
- NCAR Approach: Hierarchical regression using same predictors

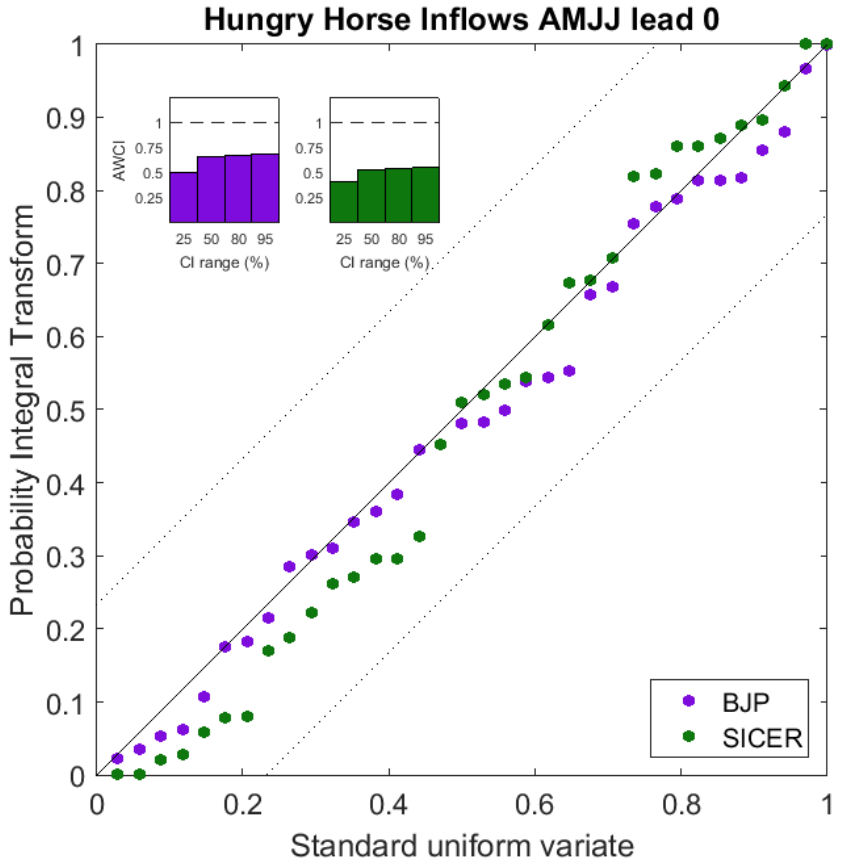
Forecasts for USA: Hungry Horse Reservoir



- Example: 0-lead 1-season prediction for Apr-May-Jun-Jul flow
- CSIRO Approach: BJP using predictors (eg IC moisture/SWE, Clim Indices)
- NCAR Approach: Hierarchical regression using same predictors

Reliability and sharpness





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Timelines

- First year (2016)
  - Define initial protocol for the experiment
  - Identify initial participants and case studies
  - Set up back-end systems and web presence
  - Trial a few basins and techniques
- Second year (2017)
  - Refine experimental protocol based on initial experiences.
  - **Expand the number of participants**, techniques and basins.
  - Adopt rigorous benchmarking and verification.

Website

Case Study Watersheds

A small set of watersheds is being implemented for the intercomparison of seasonal streamflow forecasting approaches. The watersheds are relatively unimpaired 'headwater-ish' basins that are important for water resources management. Each watershed (and including associated data and methods) is contributed by a partner in the project.

Click a **Basin Name** in the table below display the seasonal forecasts.

Watershed	Partner
HHWM8 Hungry Horse Reservoir Watershed	NCAR (US)
MRB Murray River Basin	CSIRO (AU)
UMLVN Umealven River Bain	SMHI (Sweden)
KNGST Thames River at Kingston	CEH (UK)
Return to Main Page	

Basin Description | Forecast Methods | Data | Results | Findings

Hungry Horse Reservoir Watershed (MT, USA)

Host: NCAR (Andy Wood, Pablo Mendoza)

With a largely unimpaired catchment and snowmelt driven runoff seasonality, this basin/reservoir is a key part of the US Federal Columbia River Power System (FCRPS). The multi-objective reservoir releases depend on both short term and seasonal streamflow predictions, and particularly snowmelt runoff season volumes (ie, May-September). Current agency seasonal operational forecasts include both statistical techniques (principal components regression between in situ snow water equivalent and precipitation versus streamflow volume) and the NWS Ensemble Streamflow Prediction (ESP) approach, using simple conceptual watershed models. ESP Forecasts are released daily all year round; and statistical forecasts are released twice monthly between December 15 and July 1. Current operational forecasts do not use future climate information.

More information: Wikipedia

http://www.ral.ucar.edu/staff/wood/ssfip/

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Feedback/Contributions Are Welcome

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