Towards timelier, sub-seasonal to seasonal streamflow forecasts in Australia to better meet user needs

2016 HEPEX Workshop
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8 June 2016
Seasonal streamflow forecasting in Australia

Seasonal streamflow forecasting in Australia

Upgrading the service to better meet user needs

- Sub-seasonal forecasts
  - Forecast in the first month
  - Monthly breakdown
- Timelier forecast release
  - Forecasts currently released at least 7 days late
The Bayesian joint probability (BJP) modelling approach

• Catchment + climate predictors → Streamflow predictands

• Issues
  • Heteroscedasticity
  • Zero value
  • Data

• The BJP solution
  • Transformations
  • Censored data
  • A joint probability model, with Bayesian inference
The BJP approach can be used to produce sub-seasonal and timelier forecasts

- 23 catchments
- Leave-five-years-out cross-validation
- 1982-2011
Sub-seasonal to seasonal forecasts

• We can take advantage of BJP to:
  • Jointly forecast several months ahead
  • Obtain ensemble time series output
• Monthly forecasts can be accumulated to seasonal totals
Skill of sub-seasonal to seasonal forecasts

Monthly skill

Seasonal skill
Current forecast release process

- Current BJP models rely on delayed monthly data sets
- 0-month lead time forecasts

**Current forecast release process diagram**

- **Check data streams**
  - D-2
  - D0
  - **Start of forecast period**
- **Gather predictor data QC**
  - D0
- **Generate forecasts**
  - D+5
- **Develop communications / website**
  - D+7
- **Release**
How to release timelier forecasts?

• Allow for N-day lead forecasts
• Establish predictors using 28-day sliding windows
• Derive streamflow and climate predictors from daily data
Reliability of timelier forecasts

Reliability with lead time
Skill of timelier forecasts

0-days lead time

7-days lead time
Skill of timelier forecasts

Change in CRPS skill score as lead time increases

![Box plot showing the change in CRPS skill score as lead time increases. The x-axis represents lead time in days (1 to 21), and the y-axis represents CRPS skill score difference. The plot indicates that the skillful cases show a decrease in CRPS skill score as lead time increases.]
What is the optimal forecast lead time?

• The forecast release schedule should allow for:
  • Forecast preparation
  • Communication
  • User comprehension and use
• The N-days lead time system will allow flexibility
Conclusion

• The BJP model is robust for producing sub-seasonal forecasts
  • Ensemble time series forecasts
  • Seasonal forecasts through accumulations

• Timelier forecasts are possible
  • Use only daily streamflow and SST
  • Reliability is maintained
  • Small-moderate reductions in skill over 1-2 weeks

• Likely to transfer to operations through 2017
Thank you

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