Seasonal Streamflow Forecasts: Assisting decision-making in water resource management


19 October 2011
APEC Climate Symposium 2011, Honolulu
Presentation Outline

- Potential applications
- The current operational service
- User engagement and how it influenced our service
- Research and development
- Next steps and future developments
Potential applications

- Integrating seasonal forecasts with River Operator and River Manager modelling suite
- Improving water allocation announcements in key irrigation basins
- Enhancing the decision making process for announcing and lifting urban water restrictions
- Optimising water trading between agencies (rural and urban) and moving water around the Victorian (in south-east Australia) Water Grid
- Improving management of environmental flows
- ... Need to understand how users make decisions and influence changes in decisions
Operational Seasonal Streamflow Forecasts

- Started December 2010
- Initial target catchments in south east Murray-Darling Basin
  - 21 locations (8 storages)
- Public release via Bureau website
- Using CSIRO Bayesian Joint Probability Model
- Zero lead time 3 month forecasts
- Use statistical/dynamic modelling to extend nationally

Oct to Dec 2011
It started with stakeholder engagement

- Planning started in January 2009
  - Users, researchers, service providers
- Three workshops
  - Planning and requirements
  - Experimental products
  - Final product design
- Stakeholder meetings with over 20 agencies across Australia
- Experimental website starting December 2009
Stakeholder influence
- two stage release of new sites and models
Stakeholder influence
- product design
Stakeholder influence – product design

Historical analogues give context

Visually compare forecast and historical probability distributions and exceedance probability curves

Include skill score

Plot latest streamflow for verification
Stakeholder influence
- present and explain skill

- Skill varies between months and sites
- Use historical probabilities for very low skill
- Skill and reliability are important

- Moderate to high skill
- Low skill
- Very low skill (using historical probabilities)
Stakeholder influence
- data behind the products

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All ensemble members for input to other models

Trends in streamflow

Basic statistics

Basic Statistics

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<th>Basic Statistics</th>
<th>Streamflow Forecast (3 month total flow in GL)</th>
<th>Historical Reference (3 month total flow in GL)</th>
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<th>Adjungbilly Creek at Dubbo</th>
<th>Last twelve months of streamflow</th>
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Stakeholder influence
- increase understanding with support information

Service backed by peer reviewed research

Break down the complexity
Built on quality research and science

• Through WI RADA (Water Information Research and Development Alliance, with CSIRO):
  - CSIRO’s Statistical Bayesian Joint Probability (BJP) approach
  - Downscaling climate inputs from global climate model to hydrological model
  - Dynamic hydrological modelling approach
  - Statistical-dynamical approaches
  - Improved climate predictions from the POAMA (Predictive Ocean Atmosphere Model for Australia) seasonal climate forecasts

• BATEA Uncertainty analysis (with University of Newcastle)
Next steps and future developments

• Service extension and development
  - Releasing 15 new sites on public website in November
  - Extend to more sites using hybrid dynamic/statistical in 2012
    • BJP/POAMA/WAPABA – monthly timestep water balance model
  - September 2012: Pilot monthly and 3-monthly forecasts from daily time step dynamic modelling
  - June 2013: Operational seasonal forecasts from blended statistical/dynamic
  - Aim to have seamless integration at user/products interface
Thank you

Neil Plummer
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Stakeholder influence  
- site selection and extension

- Leveraging the stakeholder engagement for the High Quality Streamflow Reference Stations project

- Finding new test sites have less skill than existing operational sites
  - Less catchment memory
  - Need better forecast rainfall

- Targeting high quality sites upstream of storages

- Careful release based on skill and need

HQSRS Sites overlaid on climate zones