Developments and applications of CBaM for post-processing seasonal climate forecasts

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LAND AND WATER
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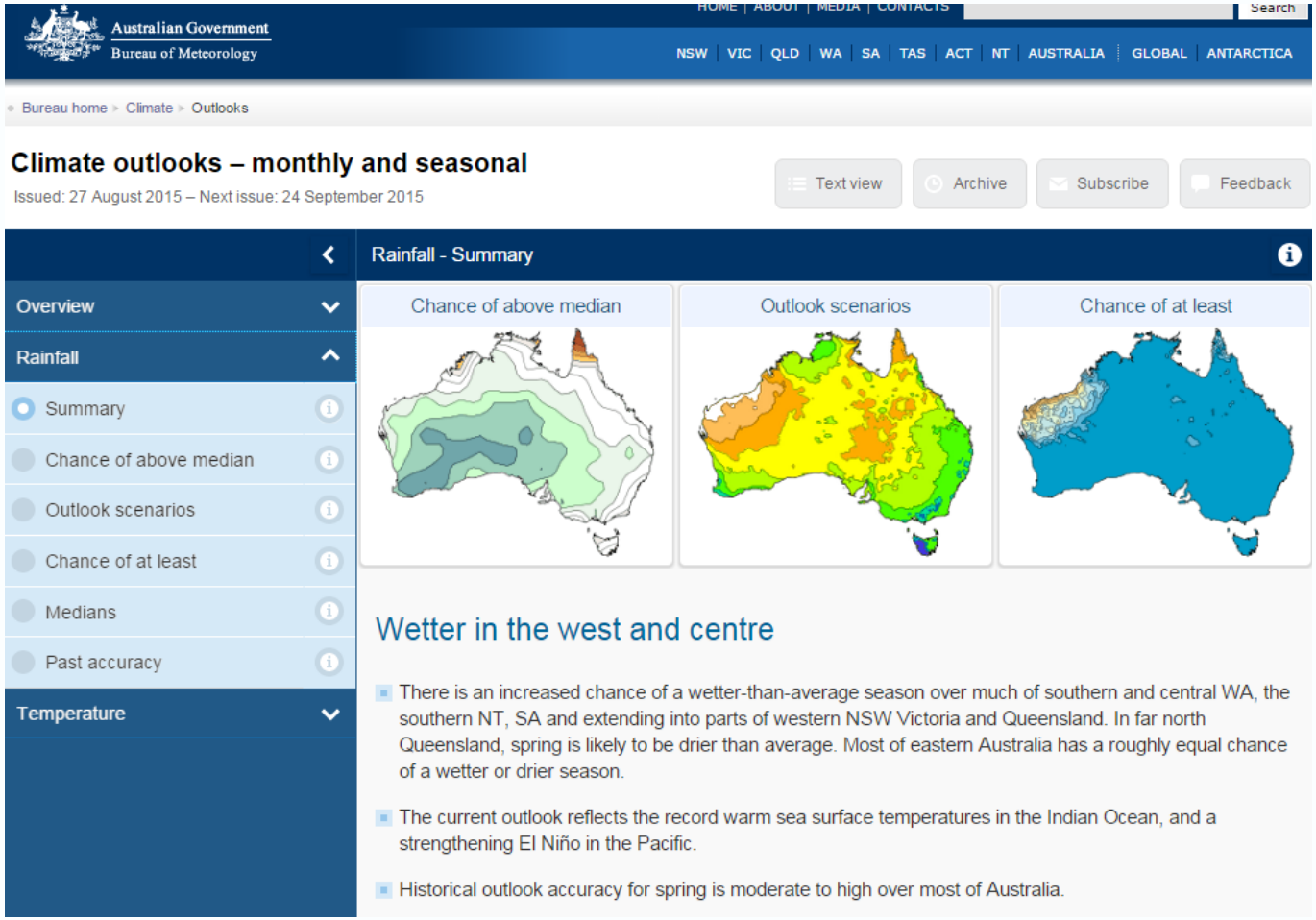
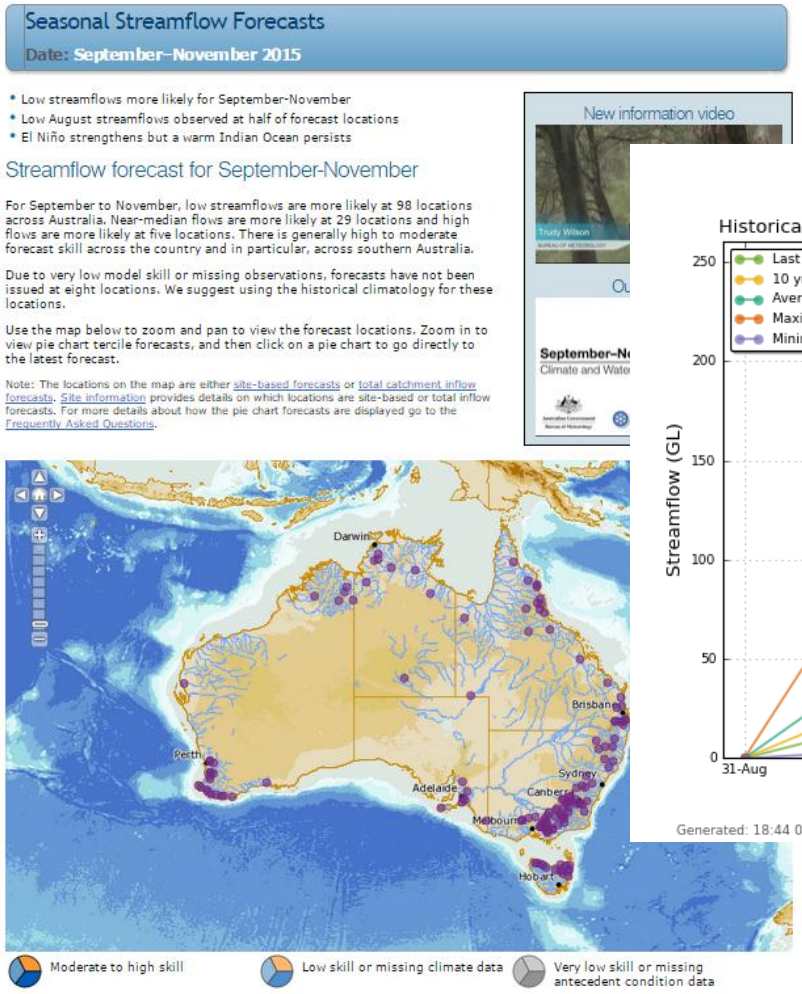
Talk outline

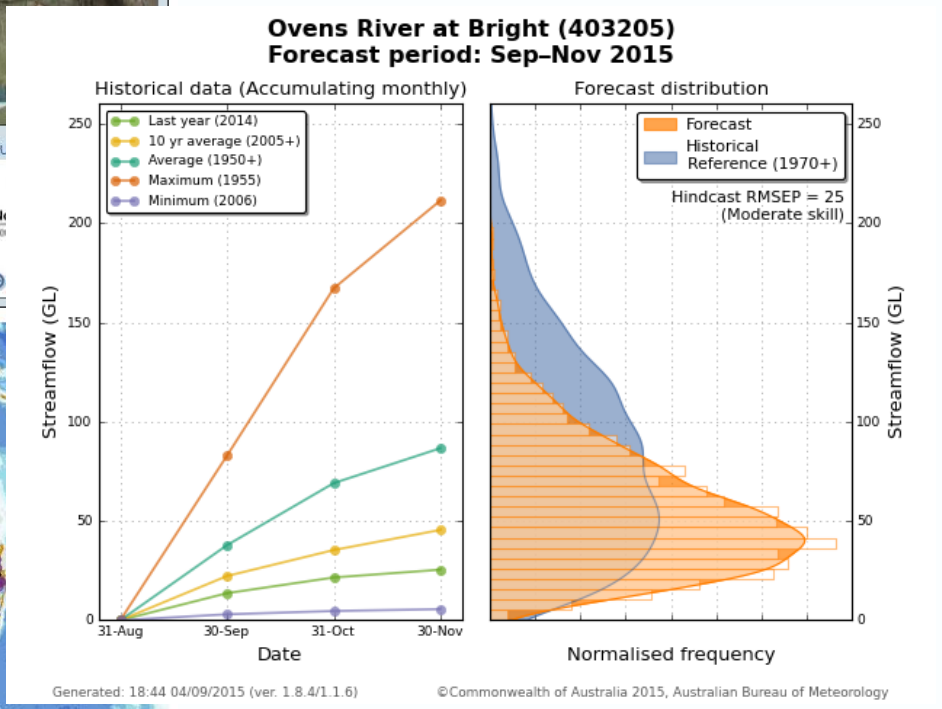
- Seasonal climate forecasting in Australia
- Introducing CBaM
- Applications and results
- Future development

Official seasonal climate forecasting in Australia is now GCM based



Water management and agriculture continue to use statistical forecasts





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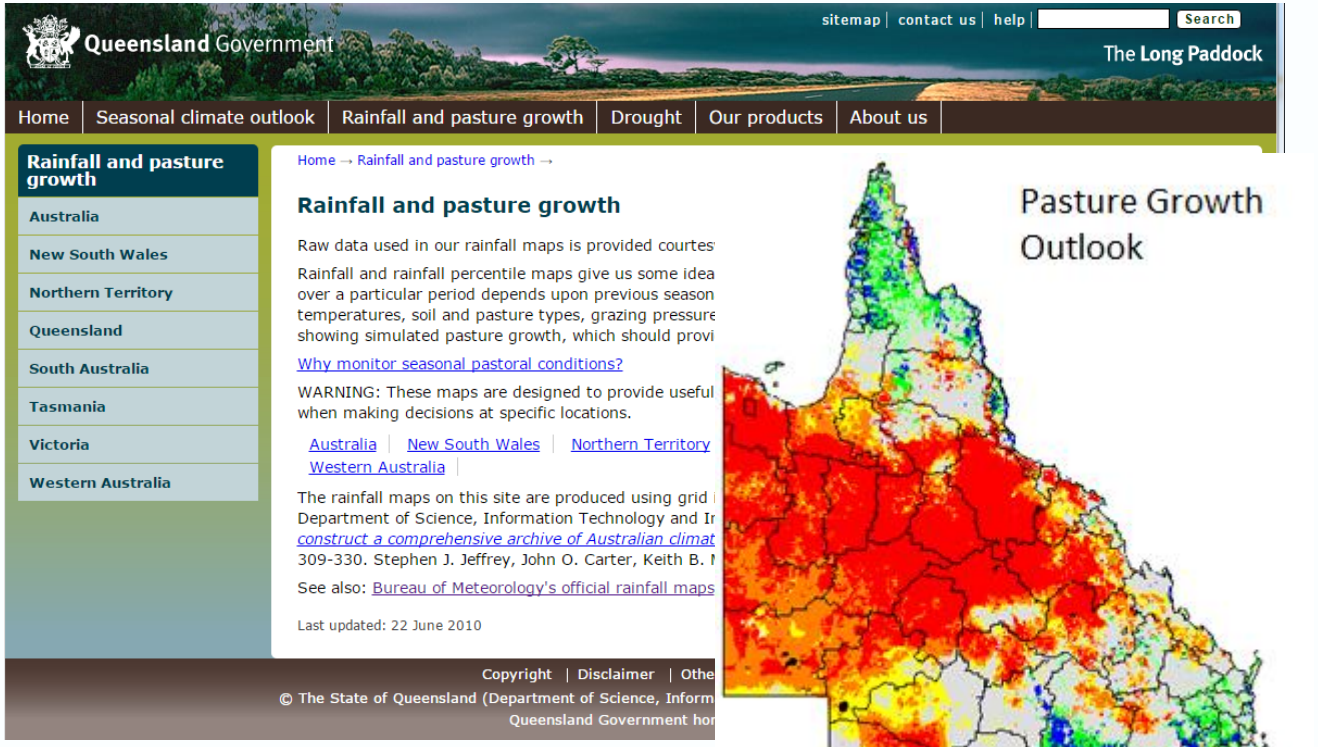

Overcoming the disconnect - Introducing CBaM

- CBaM is a statistical post-processing method
  - Corrects biased and/or unreliable GCM forecasts and upskills
- Produces ensemble time series forecasts
- Adoption can benefit water management, agriculture, energy, mining

How does CBaM work?

- **Calibration**
  - Eliminates bias and improves reliability
- **Bridging**
  - Recovers skill through teleconnections
  - Extends forecast lead times
- **Merging**
  - Maximises skill for each location and time period
  - Links ensemble members into time series
- Matches spatial scales
  - Downscaling

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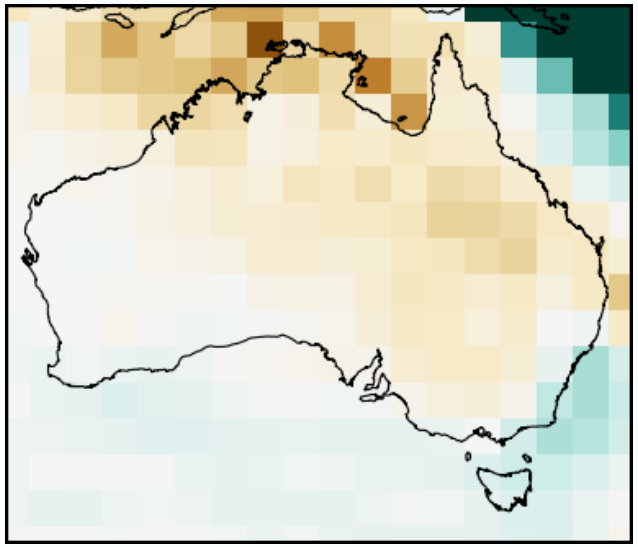
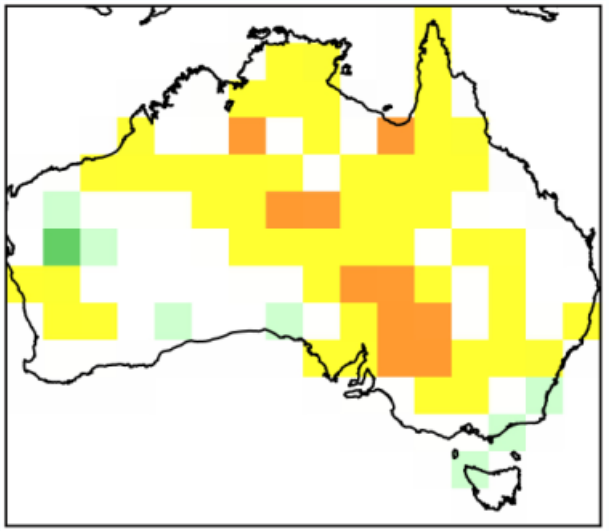
Calibration

Raw GCM output



Calibration forecast



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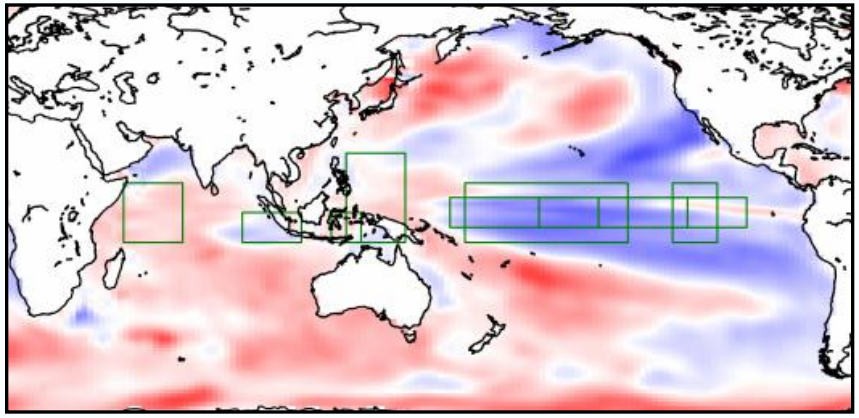
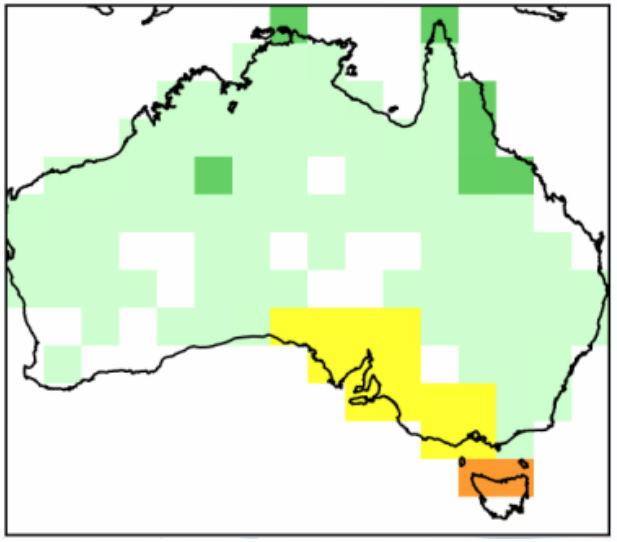
Bridging

GCM SSTs



Bridging forecast



Predictors: **Ensemble means of GCM climate indices**

(e.g. NINO3, NINO3.4, NINO4, EMI, DMI, II)

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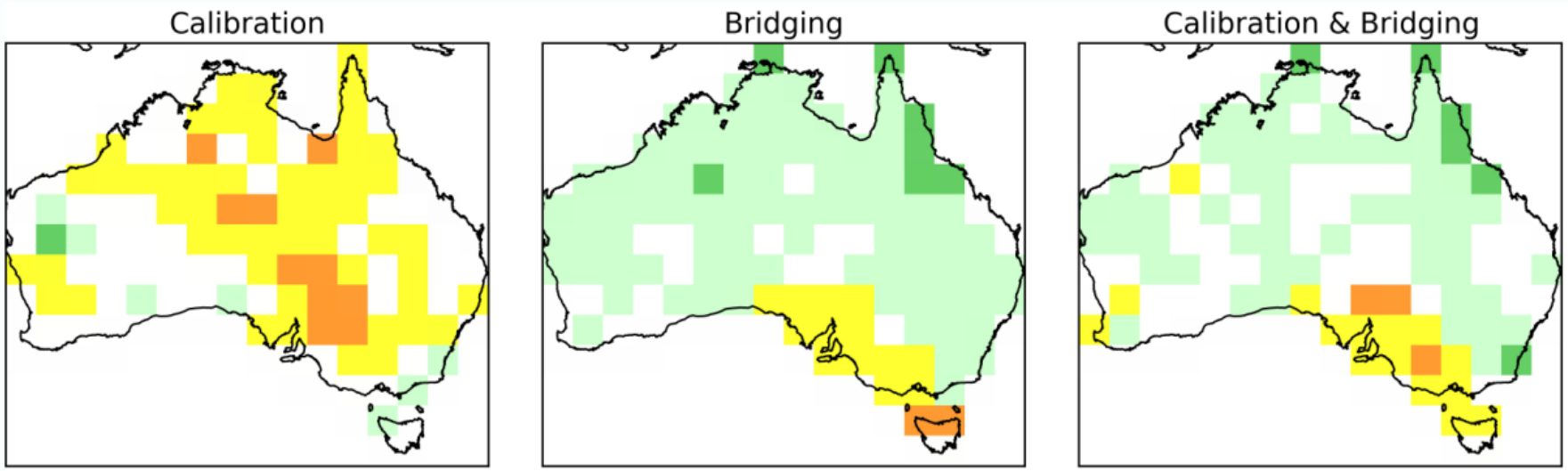
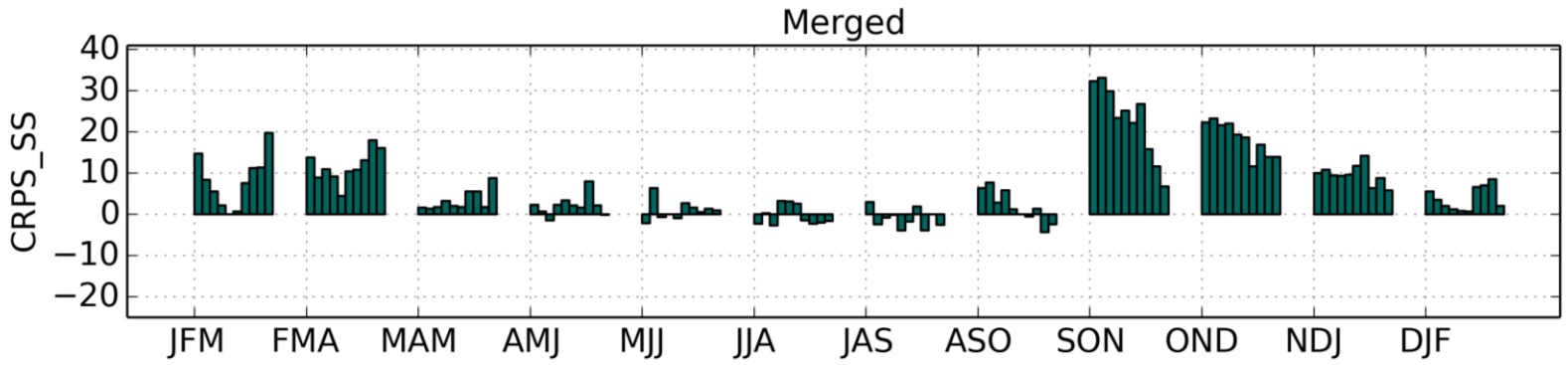
Merging


Calibration
Bridging
Calibration & Bridging


Merged
CRPS_SS
40
30
20
10
0
−10
−20
JFM
FMA
MAM
AMJ
MJJ
JJA
JAS
ASO
SON
OND
NDJ
DJF

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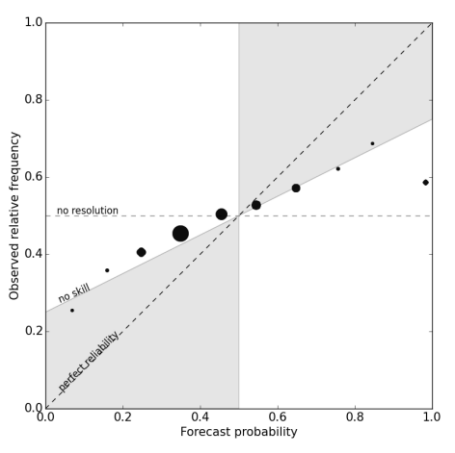
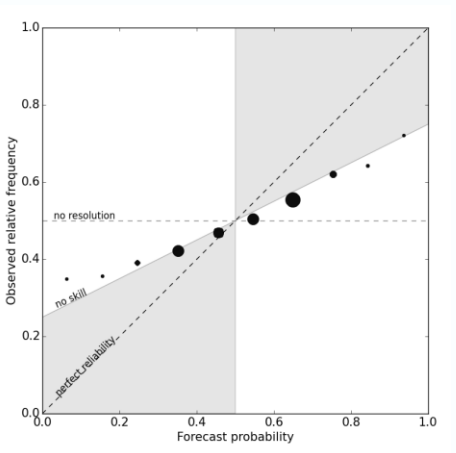
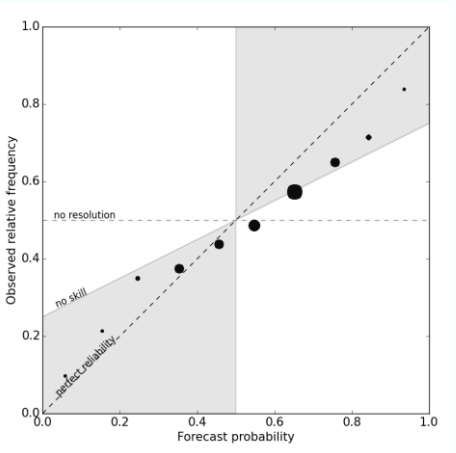
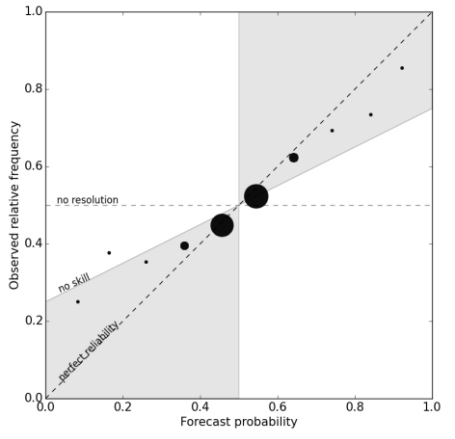
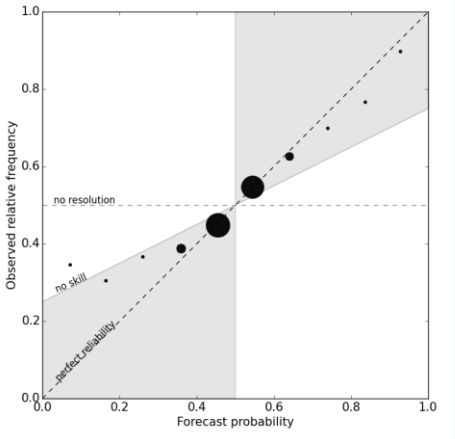
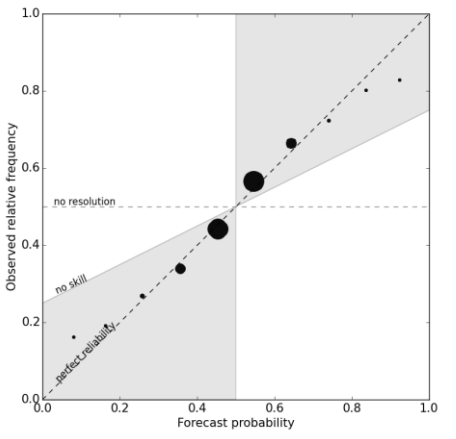
CBaM = BJP + BMA + Schaake Shuffle

Recent applications

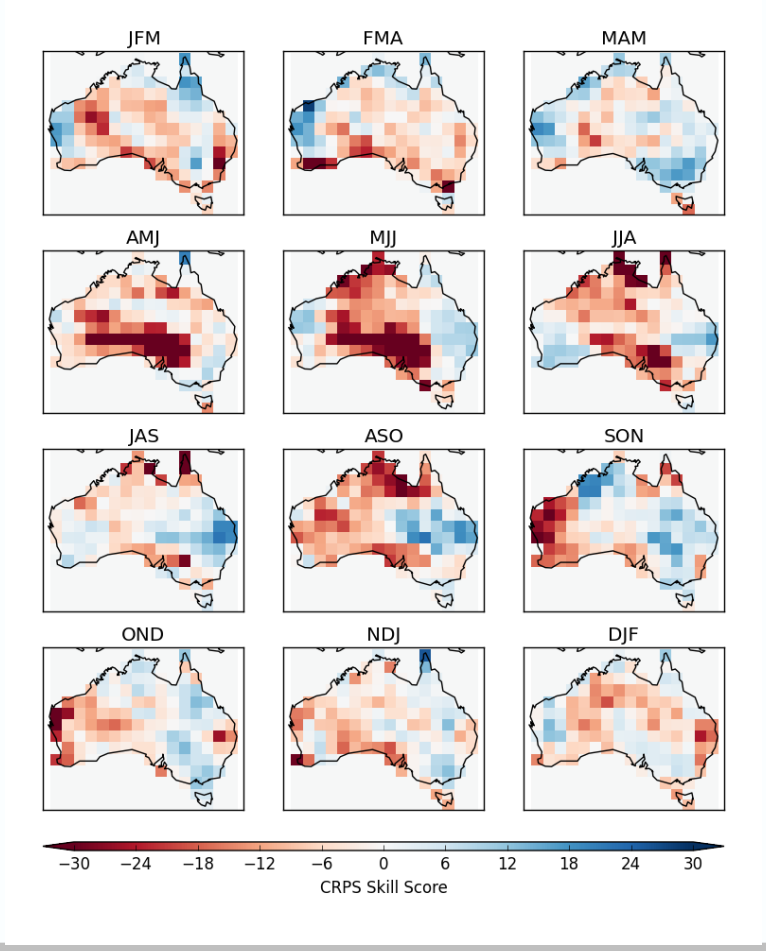
- POAMA, CFS2, System4
- Seasonal Rainfall, Tmin, Tmax
- 1983 – 2010 Cross-validation
- 2.5 degree grid across Australia

Improvement to reliability (e.g. POAMA2)

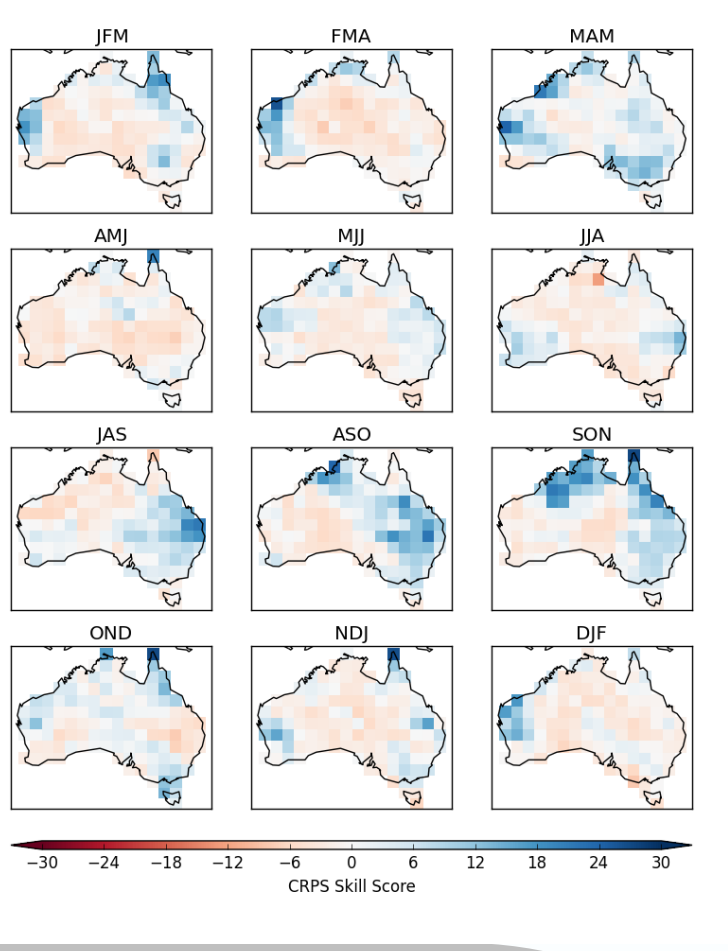
	Rainfall	Tmin	Tmax
Raw			
mean-corrected			
CBaM post-processed			

Skill of calibration (e.g. POAMA2 rainfall)

Mean-corrected (Raw)

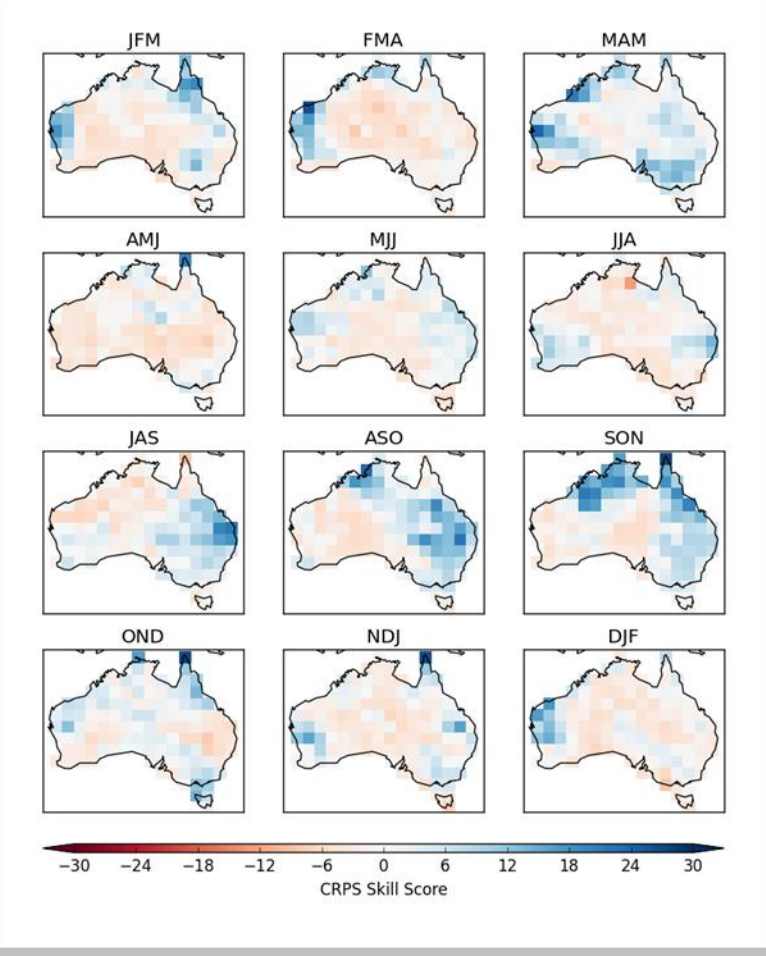


Calibration (CBaM)

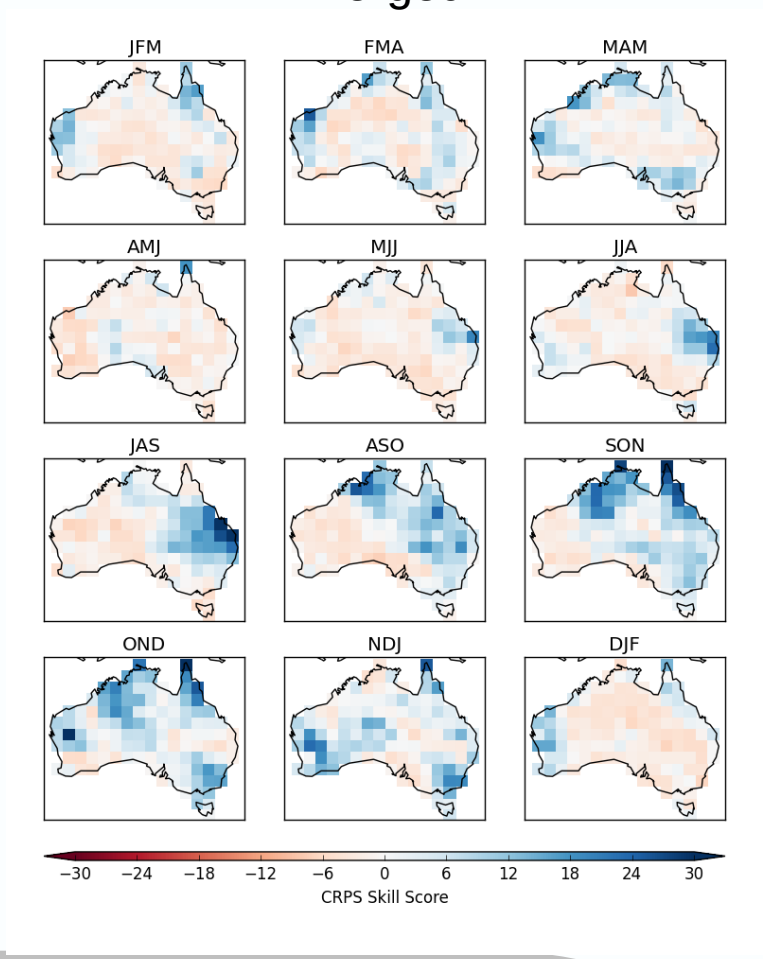


Skill improvement through bridging (e.g. POAMA2 rainfall)

Calibration



Merged



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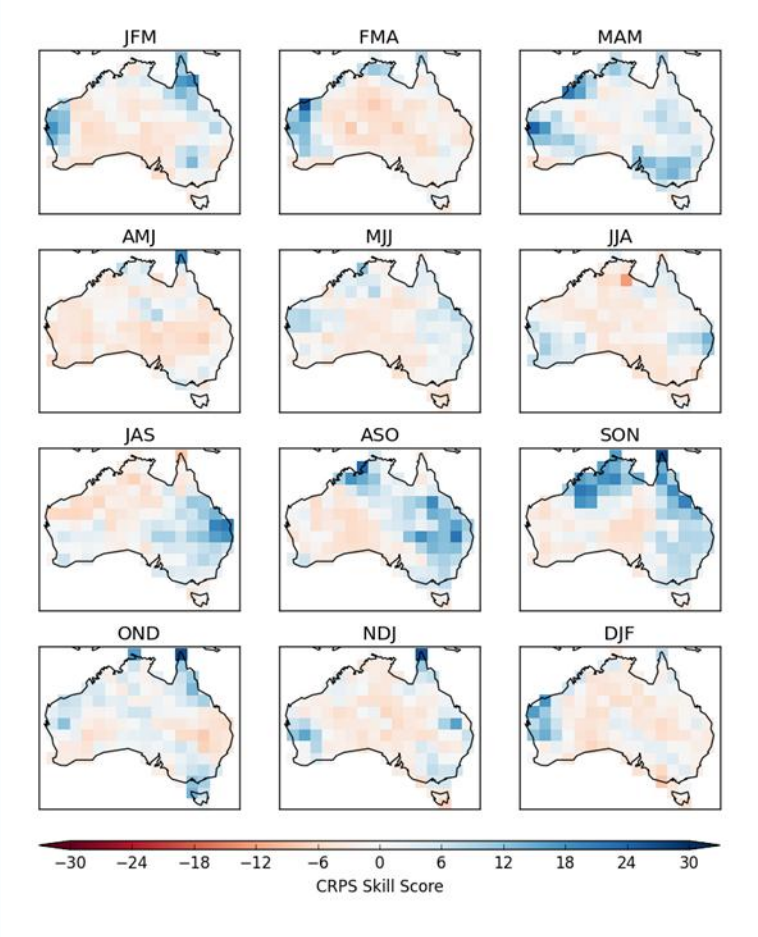
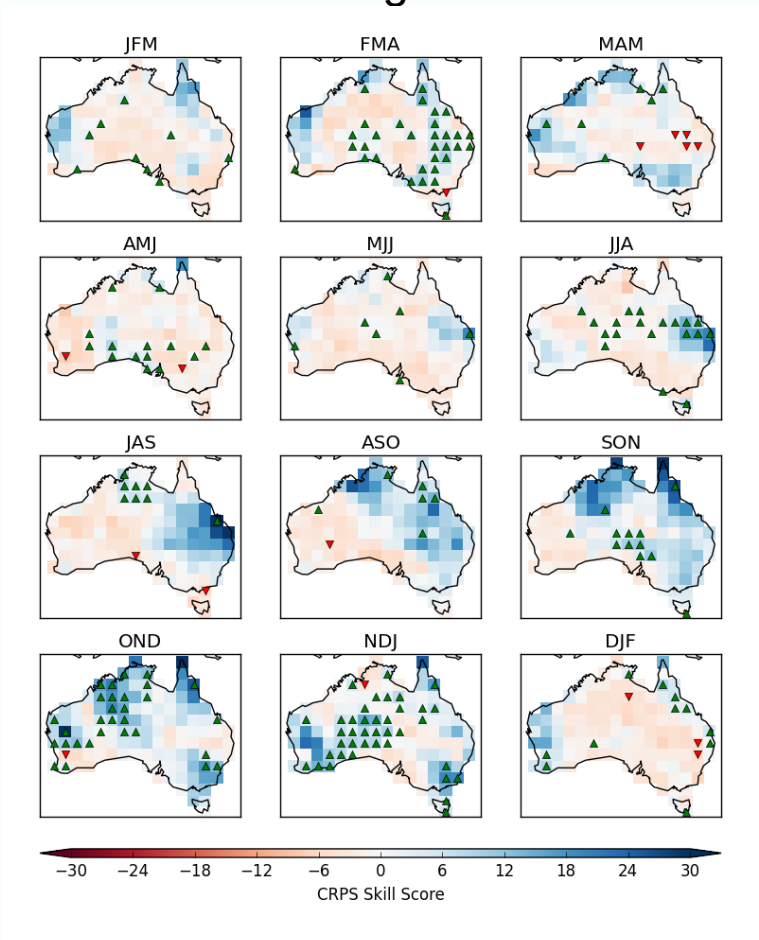
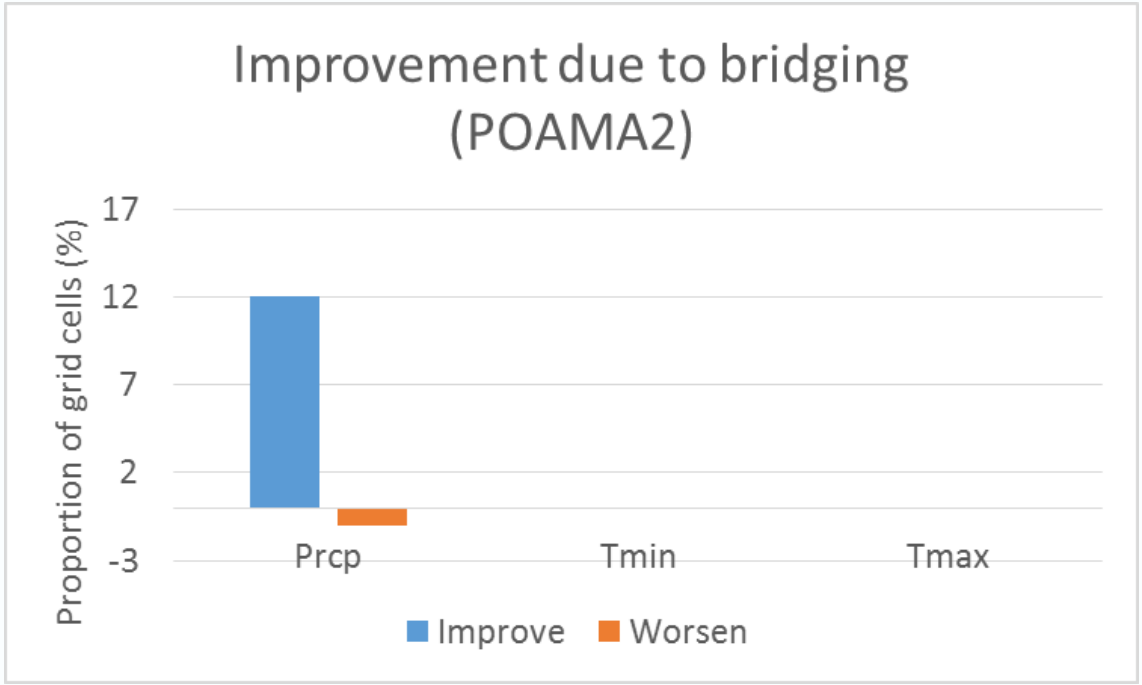


Merged



Contribution of bridging to improving skill (e.g. POAMA2)



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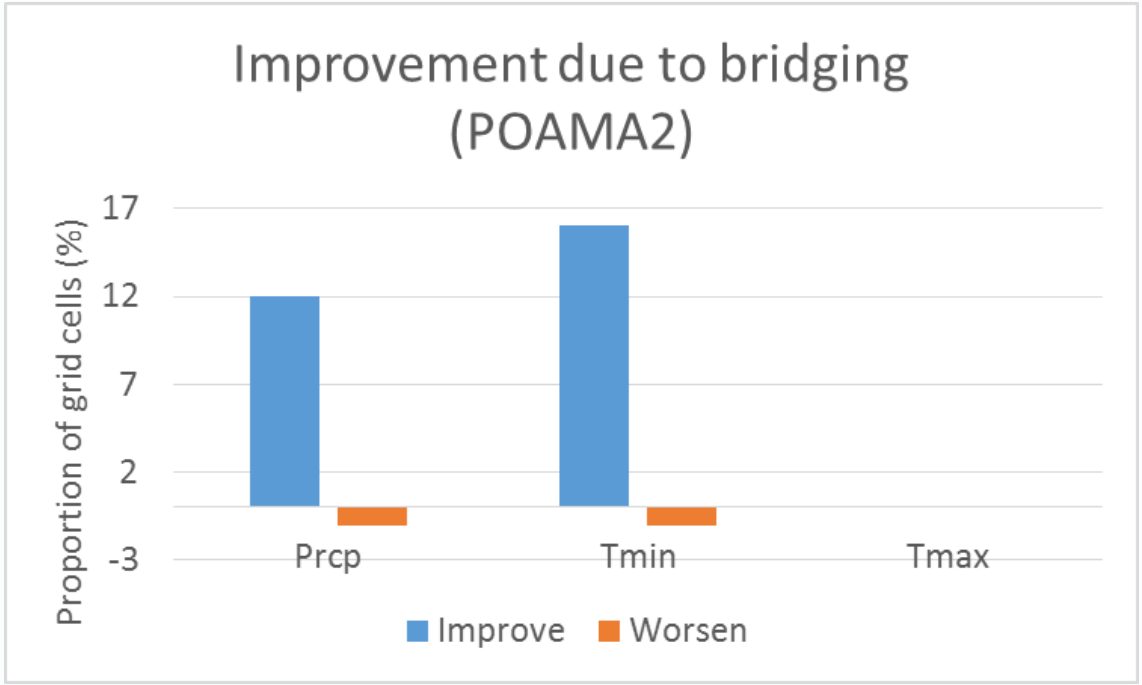

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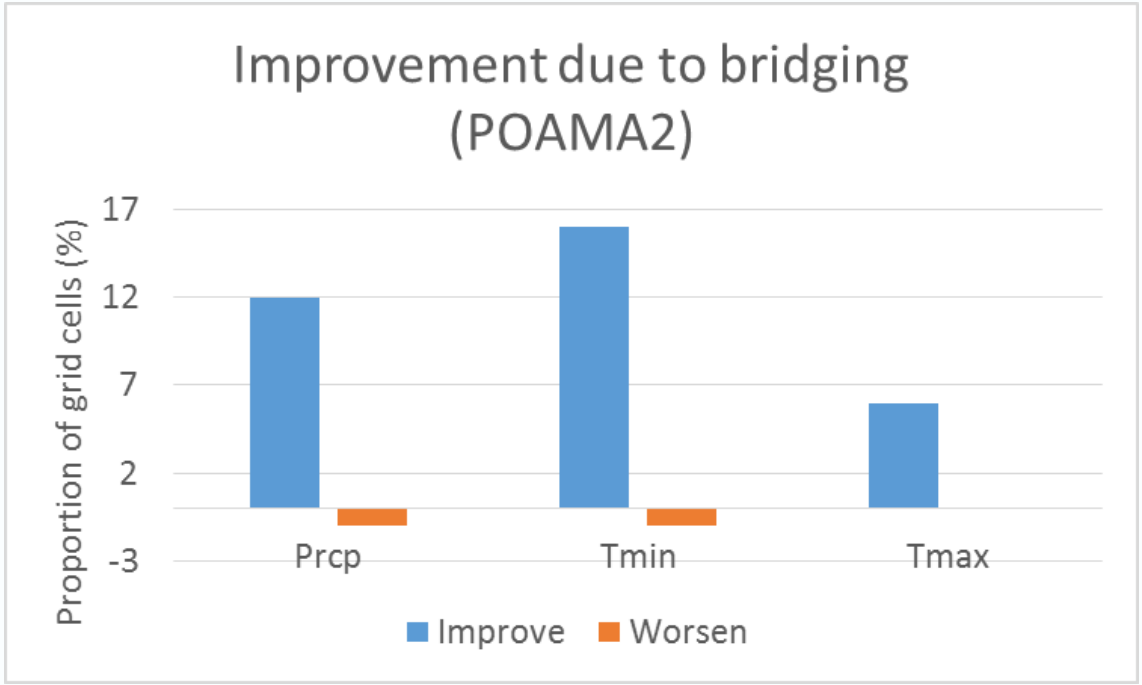

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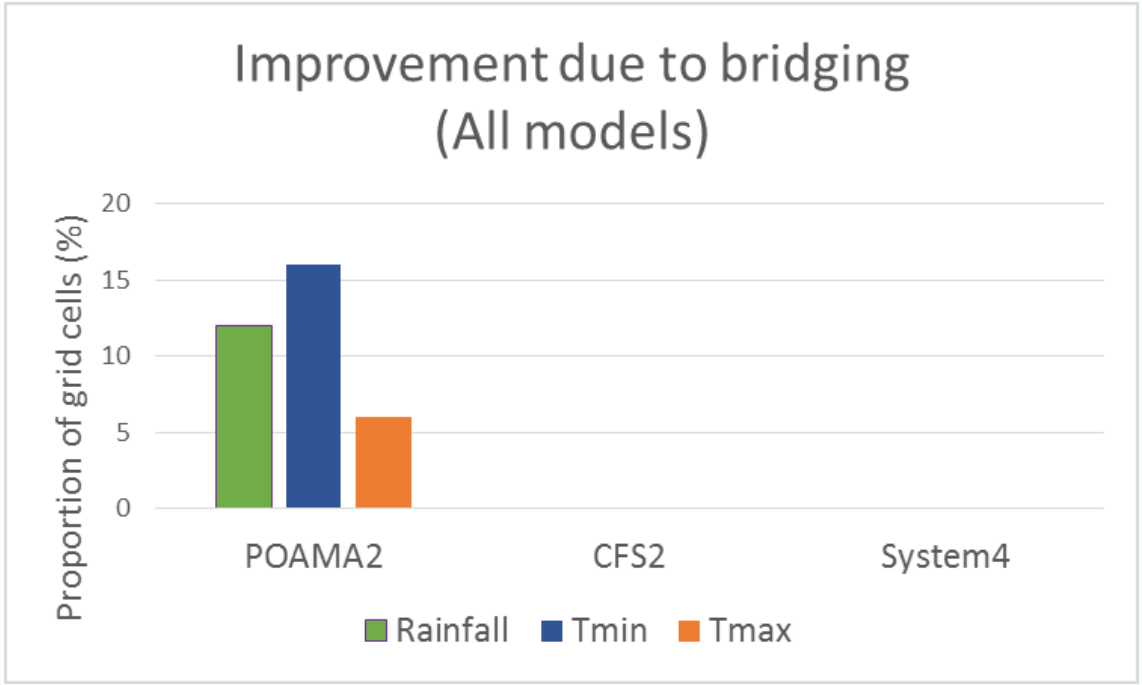

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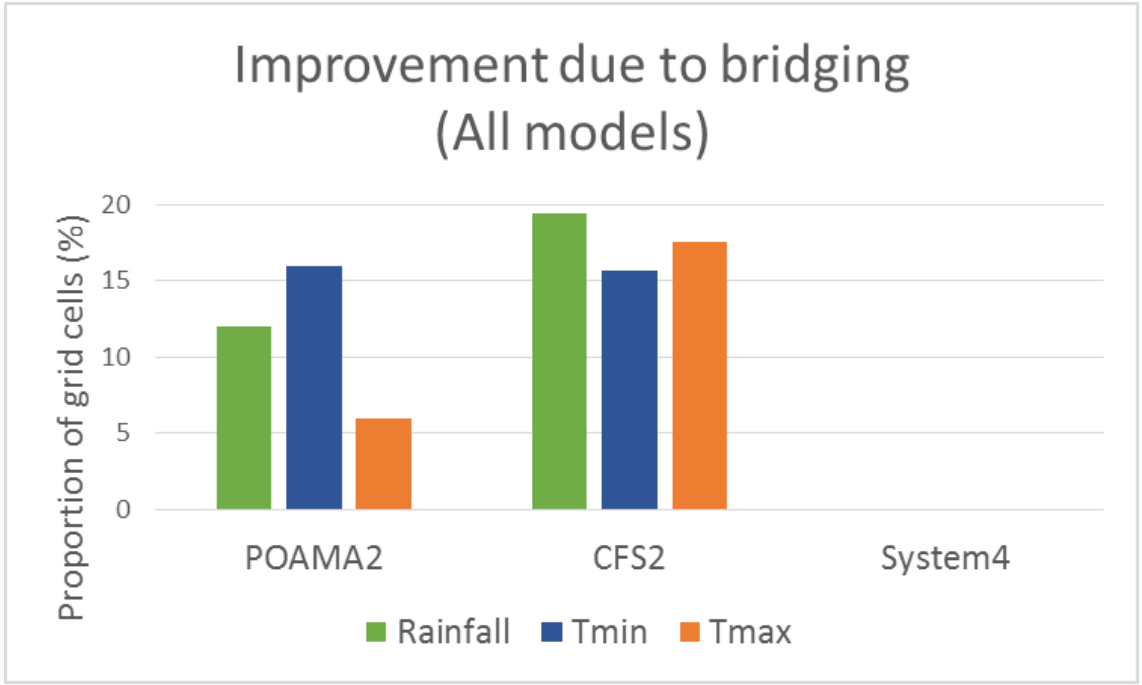

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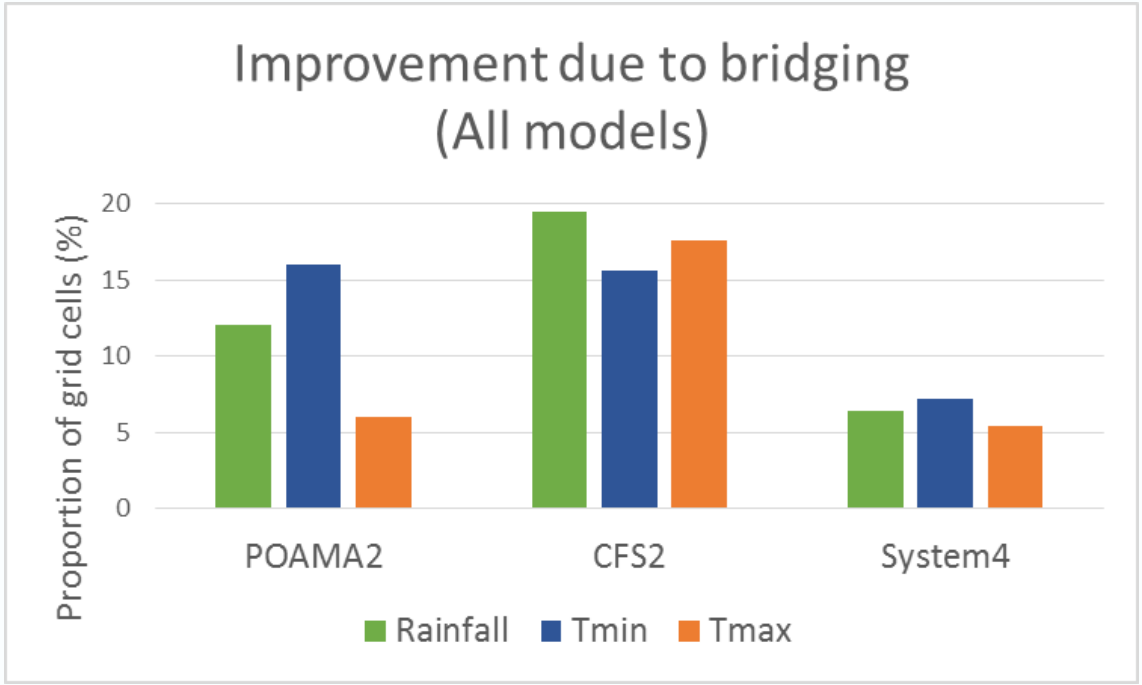

Summary of results

- CBaM produces reliable ensemble forecasts
- Bridging produces additional skilful forecasts in many locations and time periods
- CBaM is effective for maximising skill across multiple GCMs

Much work to be done

- Transition to ACCESS-S
- Catering for different ensemble generation methods
- Linking to user models (e.g. crop)
- Quantifying the benefit of using GCM forecasts

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Questions?

Thank you.

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Research Scientist

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e Andrew.Schepen@csiro.au