Understanding the current gaps between global and catchment scale seasonal streamflow forecasts

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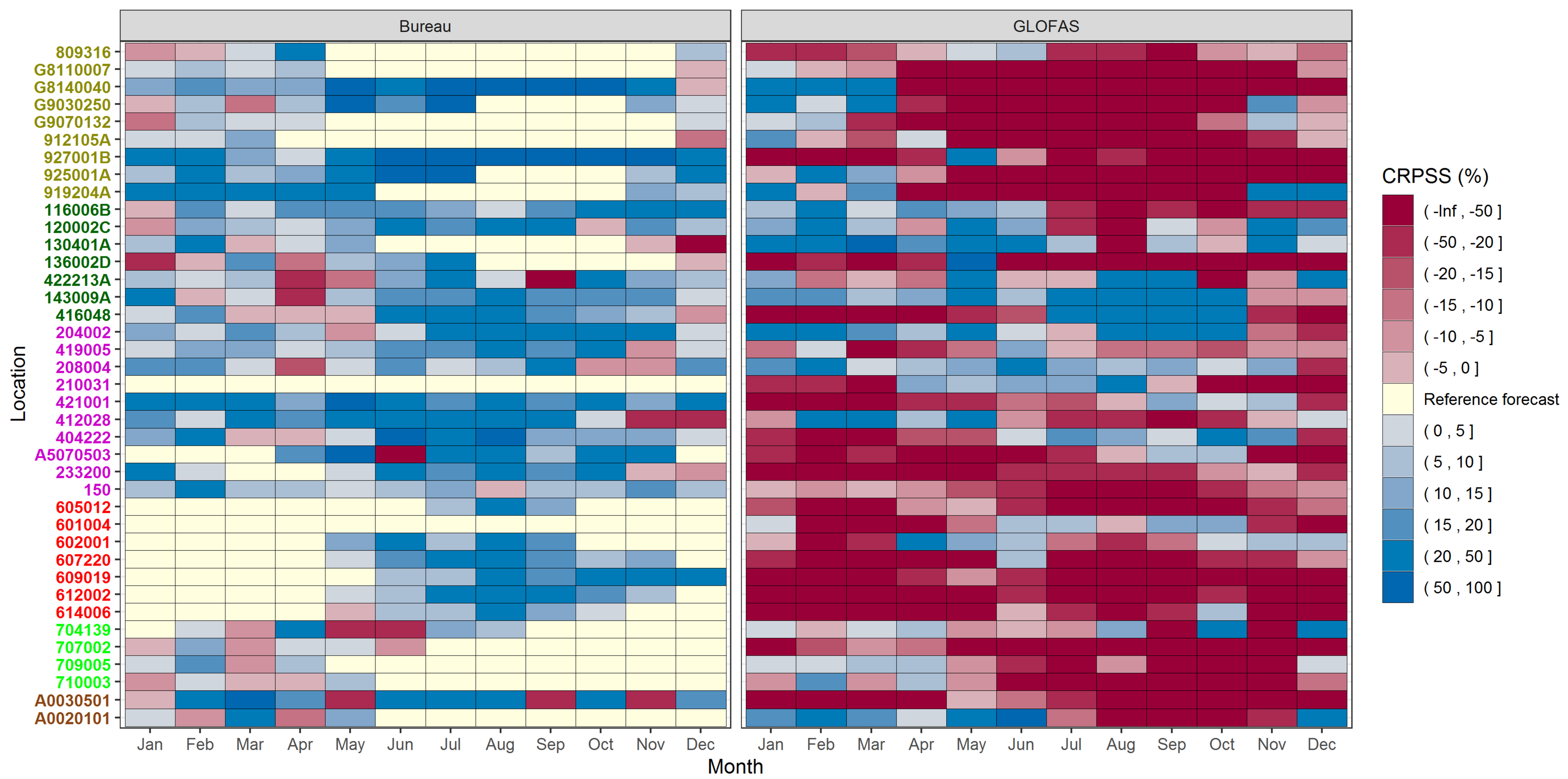

Figure 2: Continuous Ranked Probability Skill Scores for forecasts of 1-month streamflow volumes issued at the start of each month. Skill is computed with respect to a cross-validation climatology derived from observations.

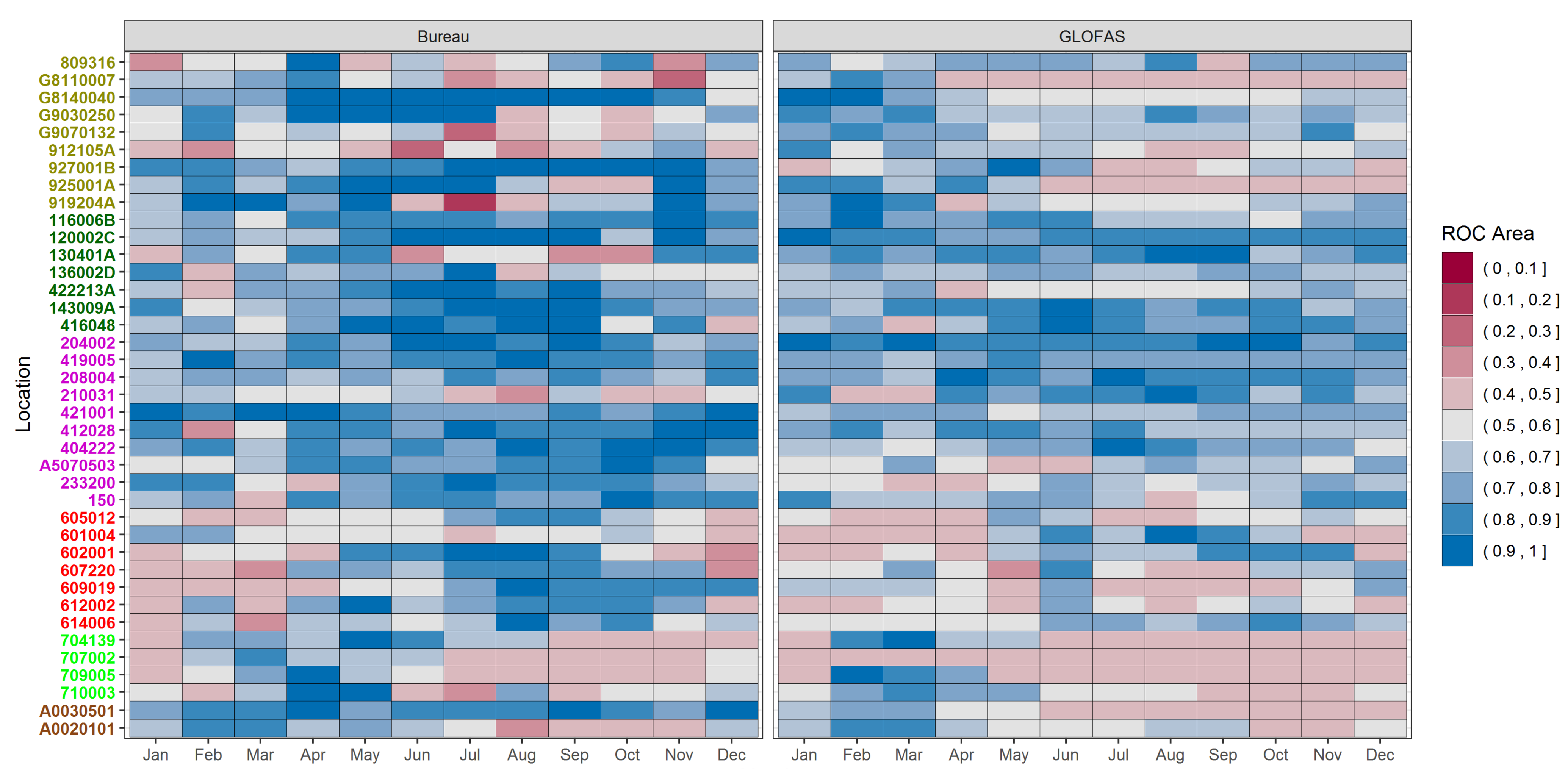

Figure 3: ROC Area for forecasts of the probability of 1 month streamflow exceeding the cross-validation climatology median issued at the start of each month. Climatology median use streamflow observations for Bureau forecasts and reanalysis for GloFAS forecasts

Aim:

To understand the relative performance of operational catchment-scale and global methods of streamflow forecasting.

Methods:

39 catchments across Australia (Figure 1)

Streamflow forecasting systems

- Bureau of Meteorology BJP statistical forecasts cross-validated (Wang and Robertson, 2011; Zhao et al 2016)
- GloFAS-Seasonal v2.1
  - Reanalysis (Harrigan, et al 2020)
  - GloFAS-Seasonal Forecasts (Emerton, et al 2018)

Verification

- Reanalysis – Bias and correlation
- Forecasts – Skill (CRPS skill score), Reliability (PIT-alpha), Relative sharpness (IQR ratio), Discrimination (ROC-Area)

Key findings:

Catchment-scale forecasts

- Tend to be more skilful (Figure 2) and highly reliable
- Display negative skill in catchments with extreme outlying events
- Option to deliver climatology when variability is very low

Global forecasts found to be skilful

- More skilful in conditions where hydrological processes are less important (e.g wet season in tropics)
- Very sharp and not statistically reliable
- Better able to discriminate high and low flow seasons (Figure 3) than predict flow volumes
- Underlying hydrology prediction appears to limit forecast skill (Figure 4)
- Could benefit from post-processing to address bias and reliability limitations.

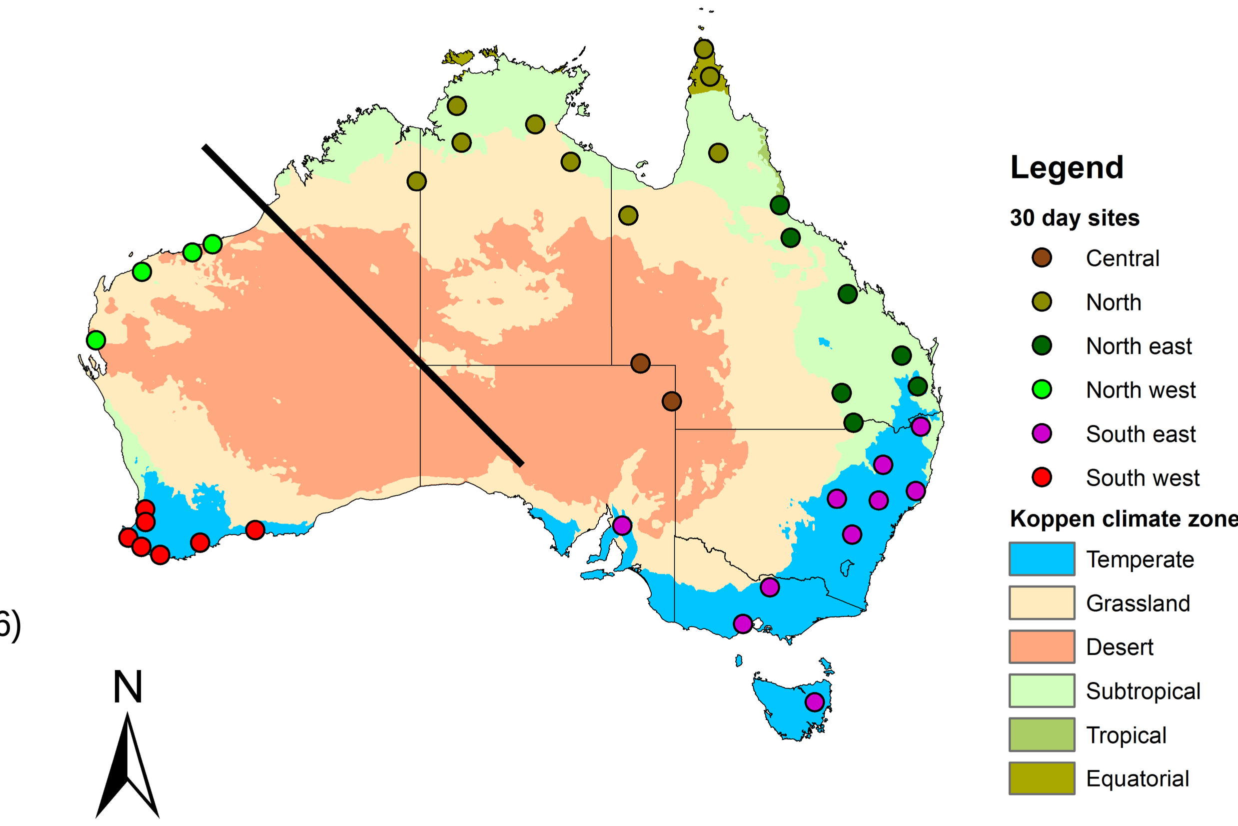

Figure 1: Catchments used in this study

(Verification score figures plot sites in clockwise order from the black line)

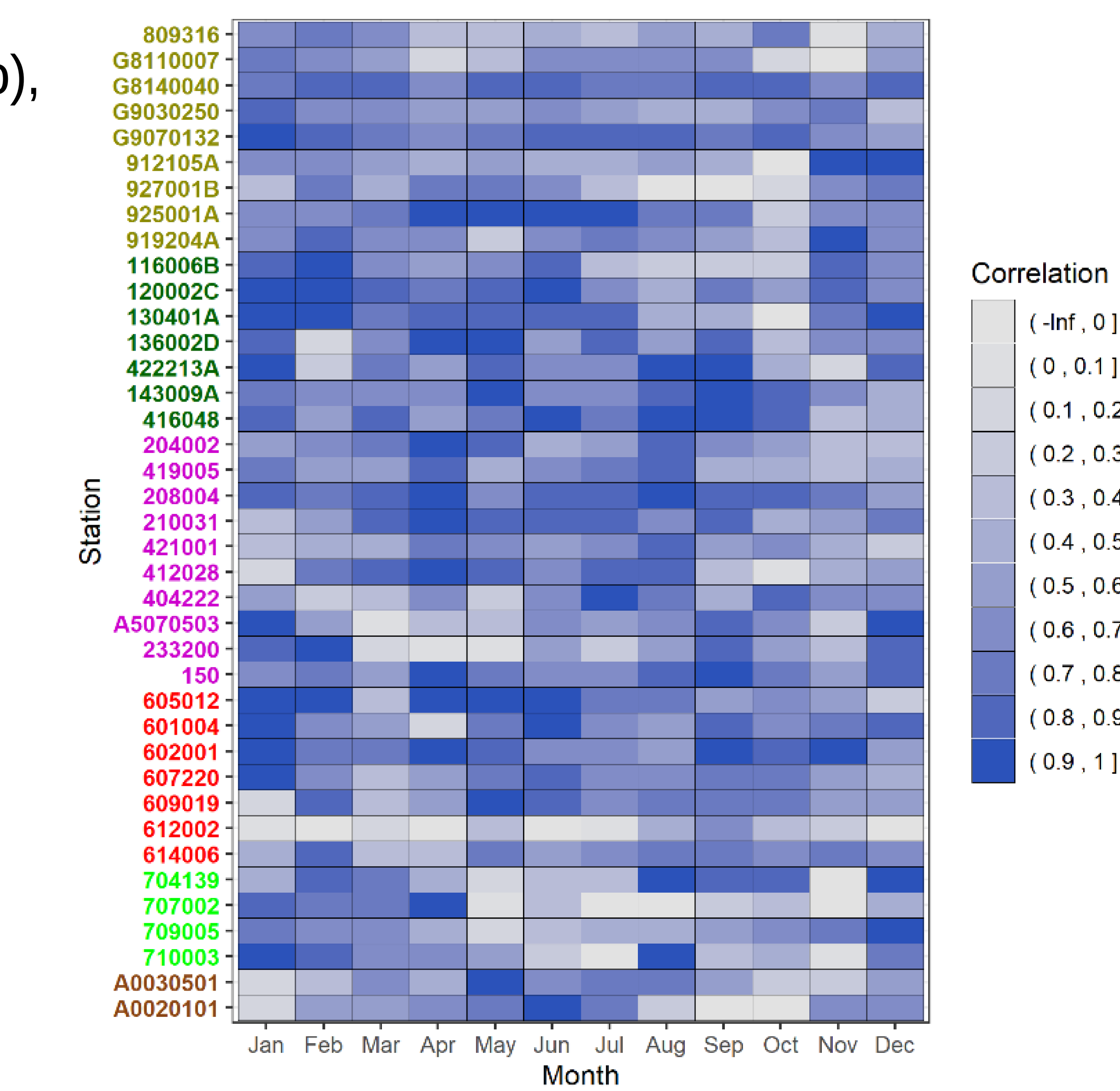

Figure 4: Monthly correlation between GloFAS reanalysis and observed streamflow

References

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