Verification of medium-range ensemble flow forecasts for drought prediction applications in the Potomac River Basin

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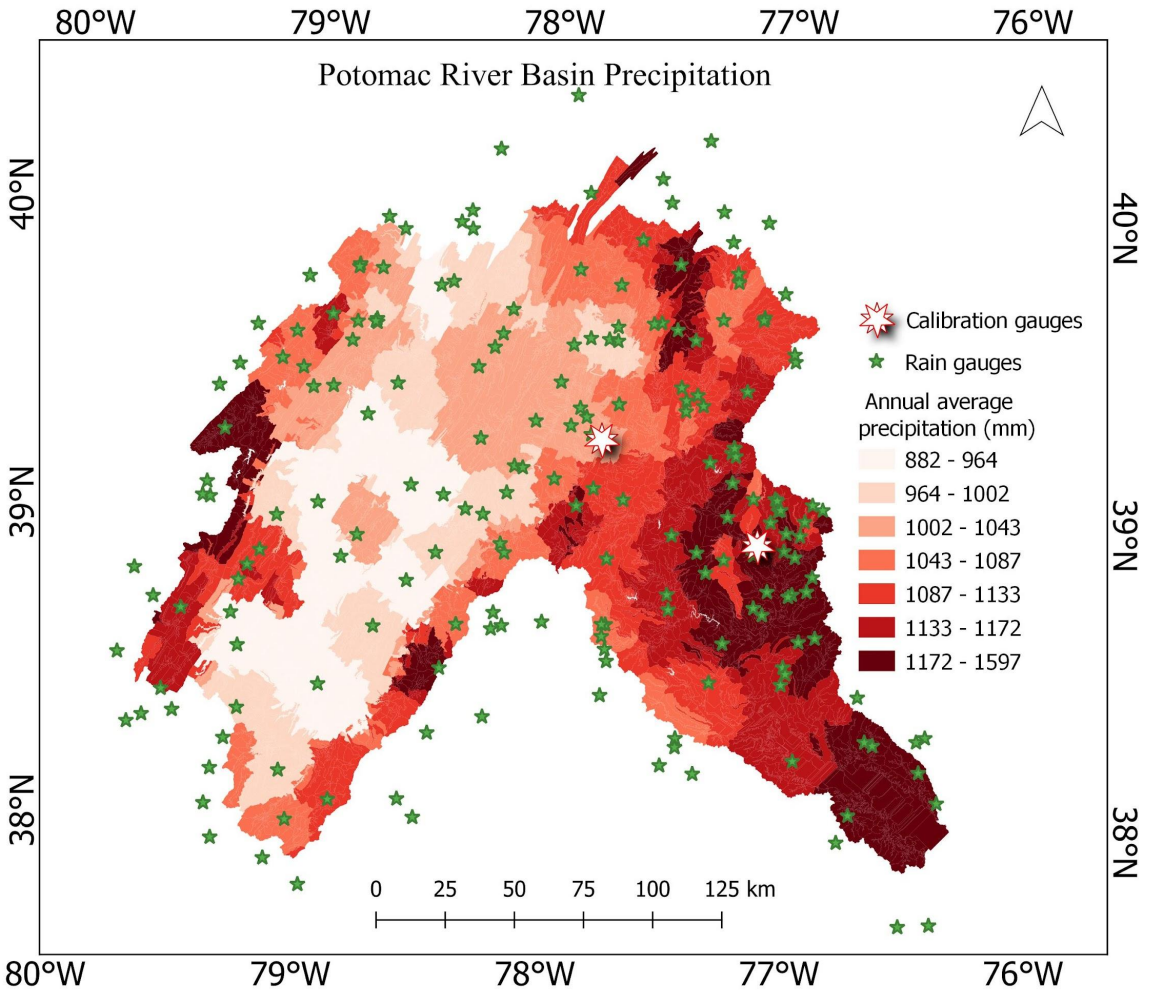
Objectives

- Development of SWAT+gwflow model for Potomac River Basin
- Verification of rainfall reforecast of GEFSv12 for Potomac River Basin
- Verification of streamflow forecast using GEFSv12 reforecast data

Study area: Potomac River Basin



Weather and streamflow

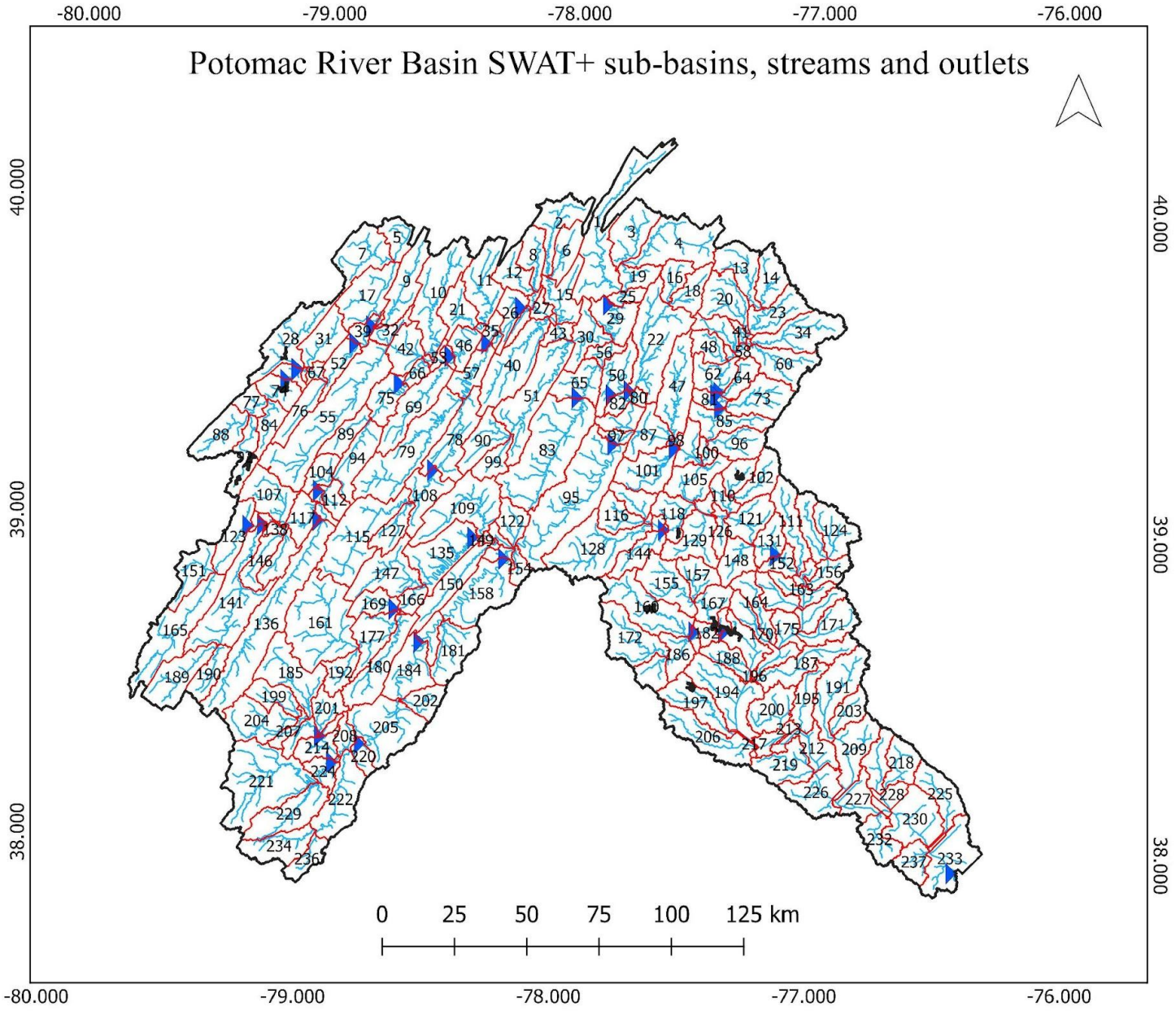
- NOAA weather data
  - https://www.ars.usda.gov/plains-area/temple-tx/grassland-soil-and-water-research-laboratory/docs/us-climatic-data/
- USGS gauge streamflow data
  - https://waterdata.usgs.gov/nwis/sw

GEFSv12 Reforecast data

- Weather prediction for the past dates using current methods (hindcast)
- Available from 2000-2019
- Spatial resolution: 0.25°* 0.25°
- Reporting time: 3 hours
- Lead time: 10 days (and 15 days)
- 5 member simulations

SWAT+ setup

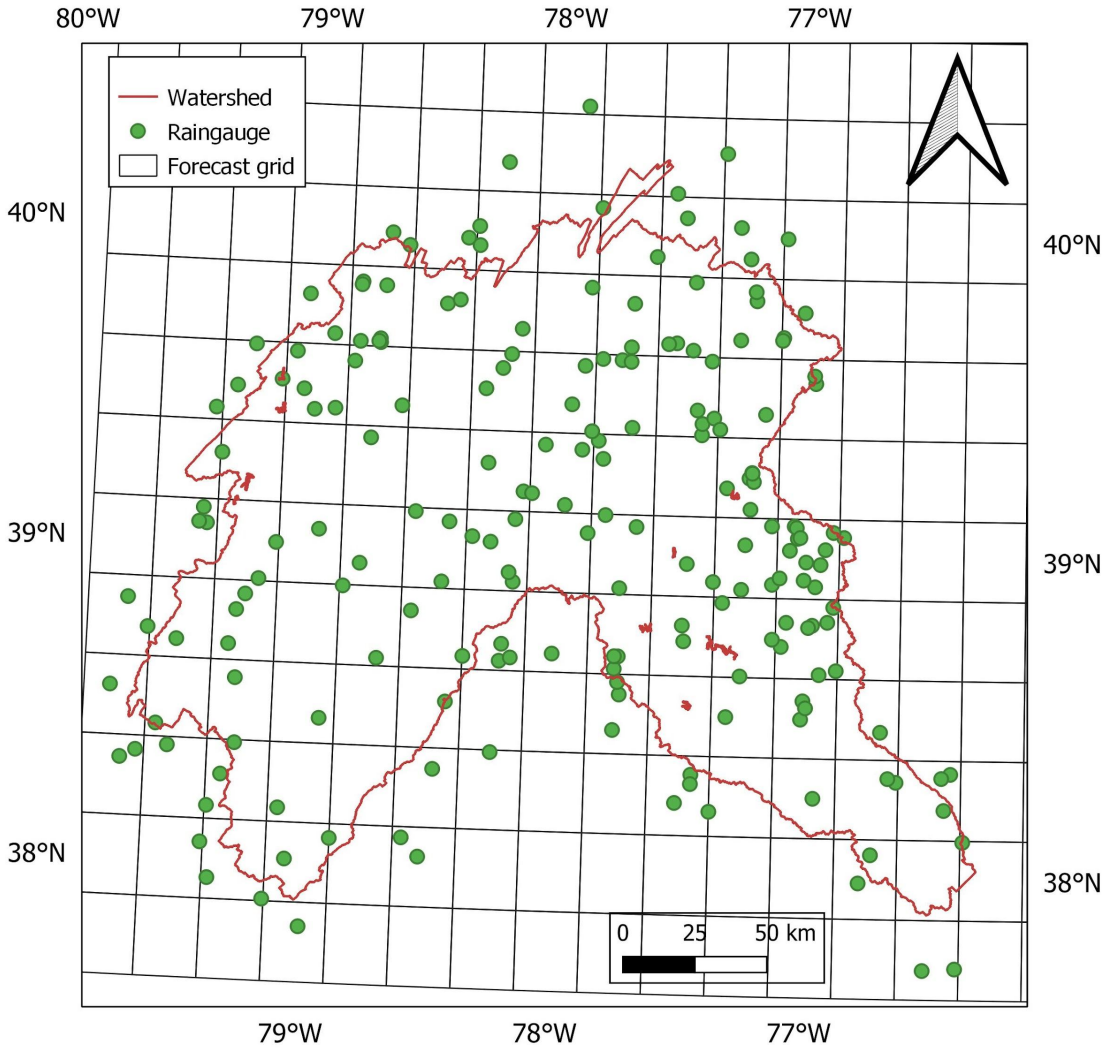
- Subbasin-Landscape-HRU
- Reservoirs
  - **Savage**
  - **Occoquan**
  - **Little Seneca**
  - **Jennings Randolph**
- Subbasins: 231
- LSUs: 4197
- HRUs: 28422
- Channels: 2081



Performance Metrics and Scores

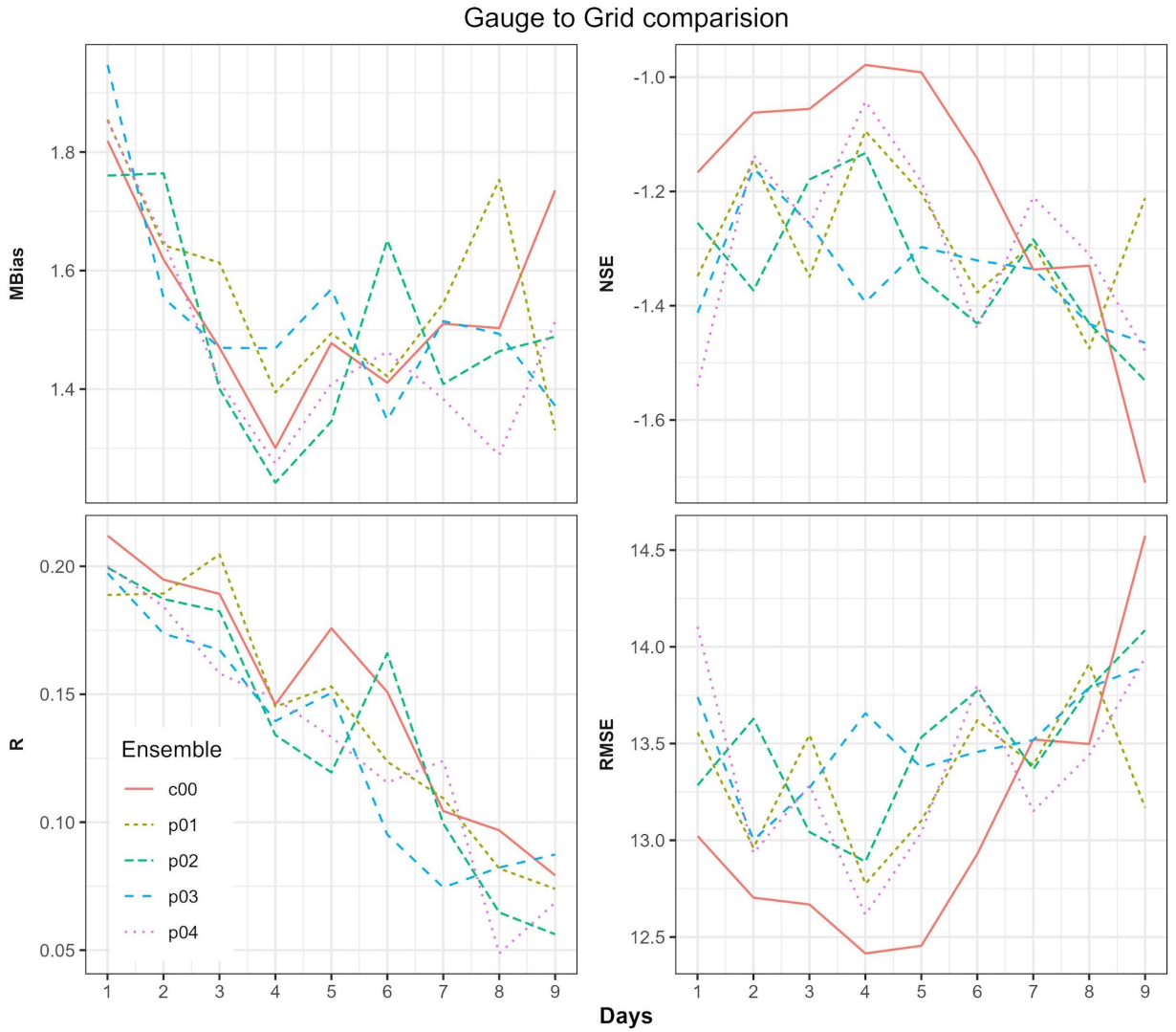
- Mean bias (Mbias)
- RMSE
- NSE
- R
- Brier Score
- Hit Rate (HR)
- Threat Score (TS)
- Accuracy
- False Alarm Rate (FAR)
- Miss Rate (MR)
- Correct Rejection Rate (CRR)

Comparison of gauge and grid data

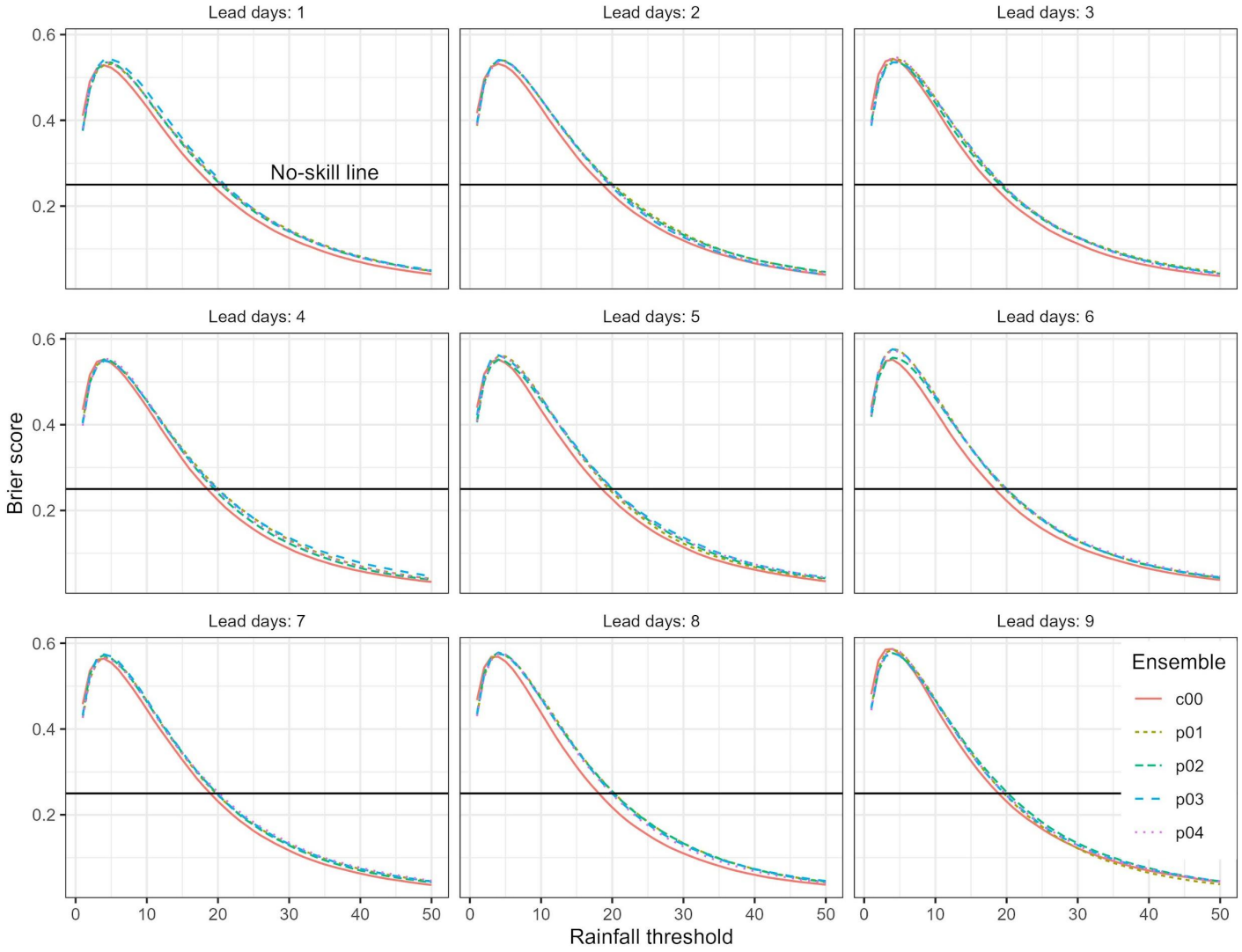


- Evaluation months: May to Oct
- Evaluation period: 2000-2012
- Non-rainy: <5mm rainfall

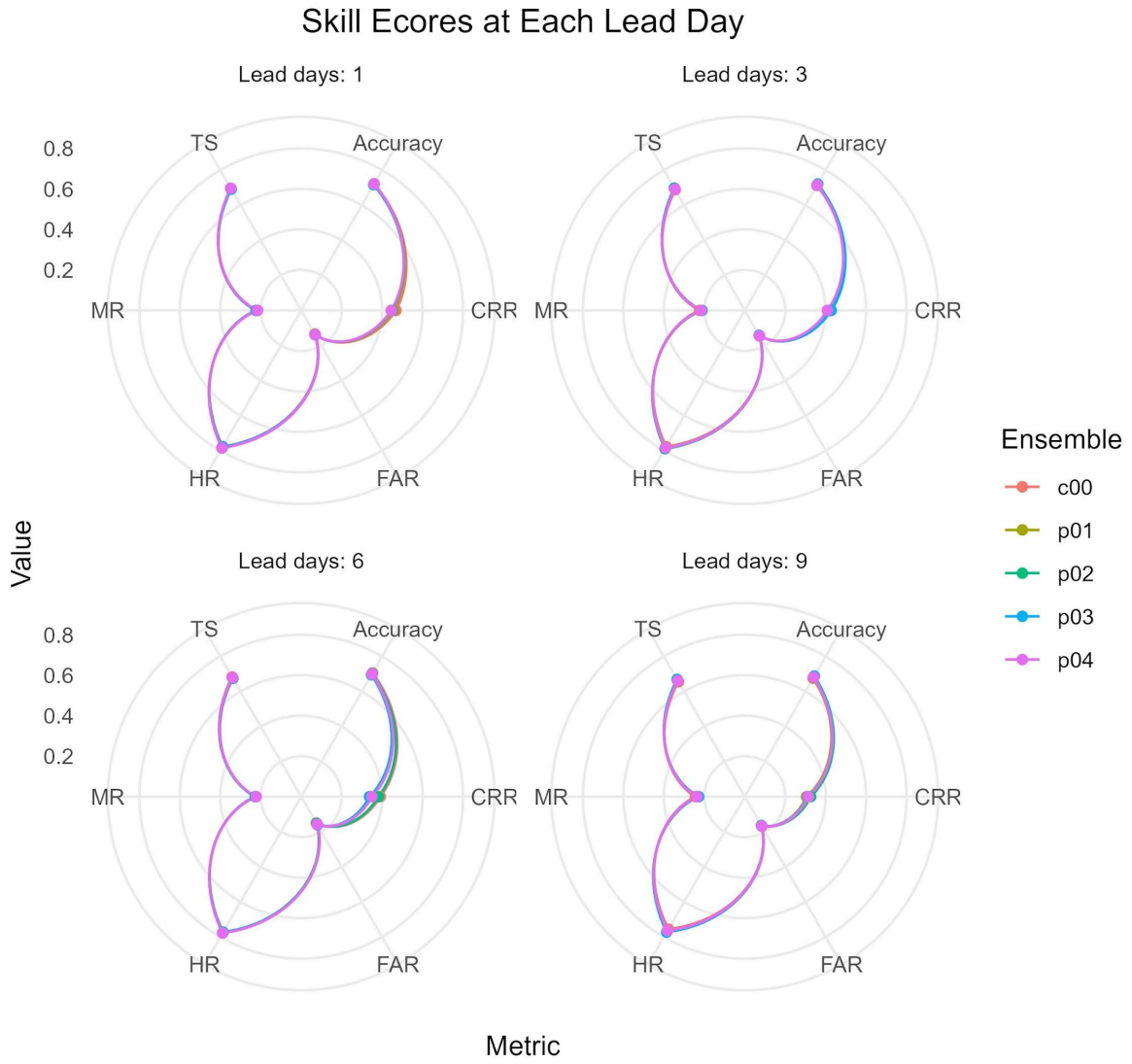
Rainfall forecast efficiency



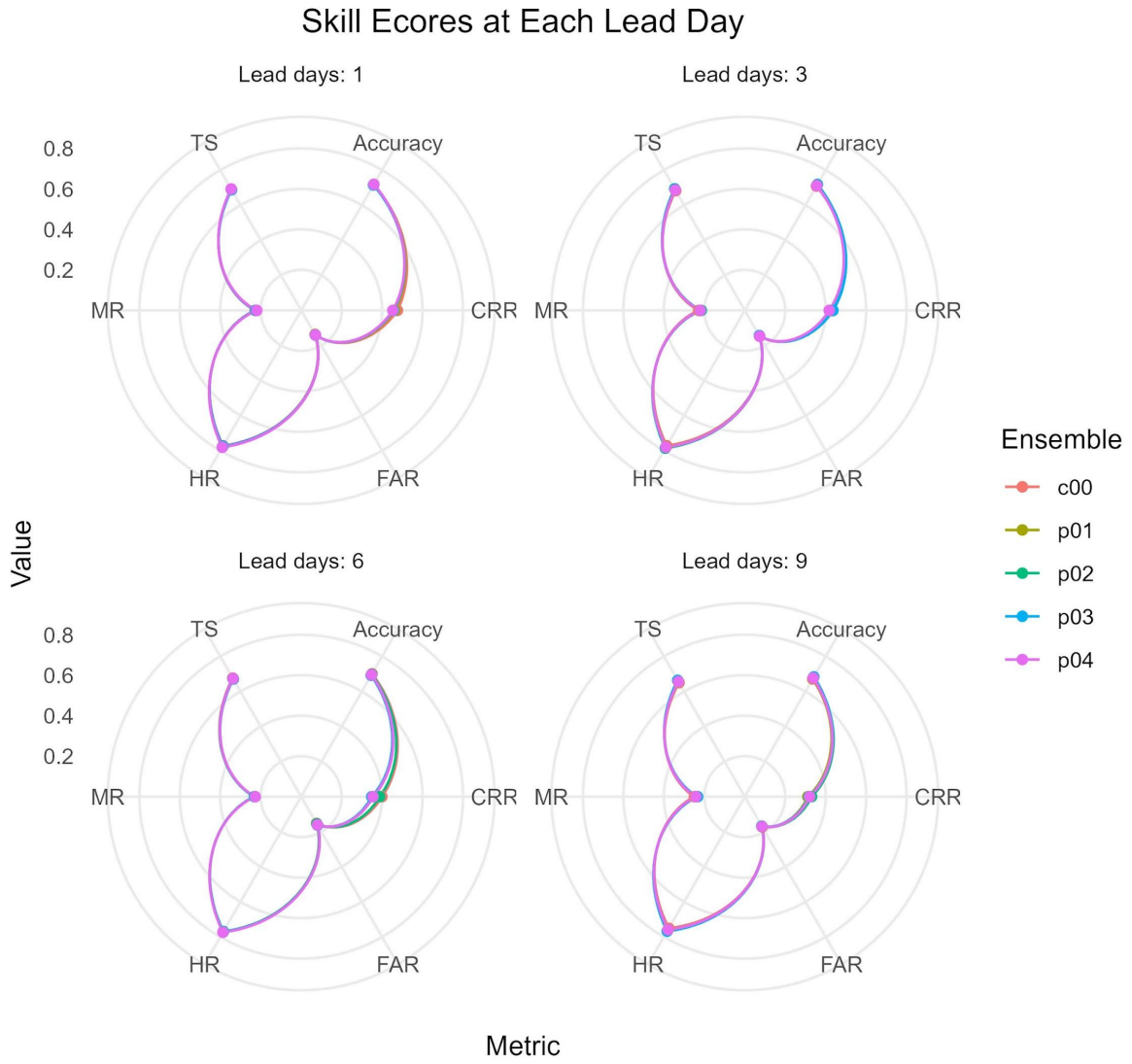
Rainfall forecast efficiency



Forecast skills gauge to grid



Forecast skills grid to grid



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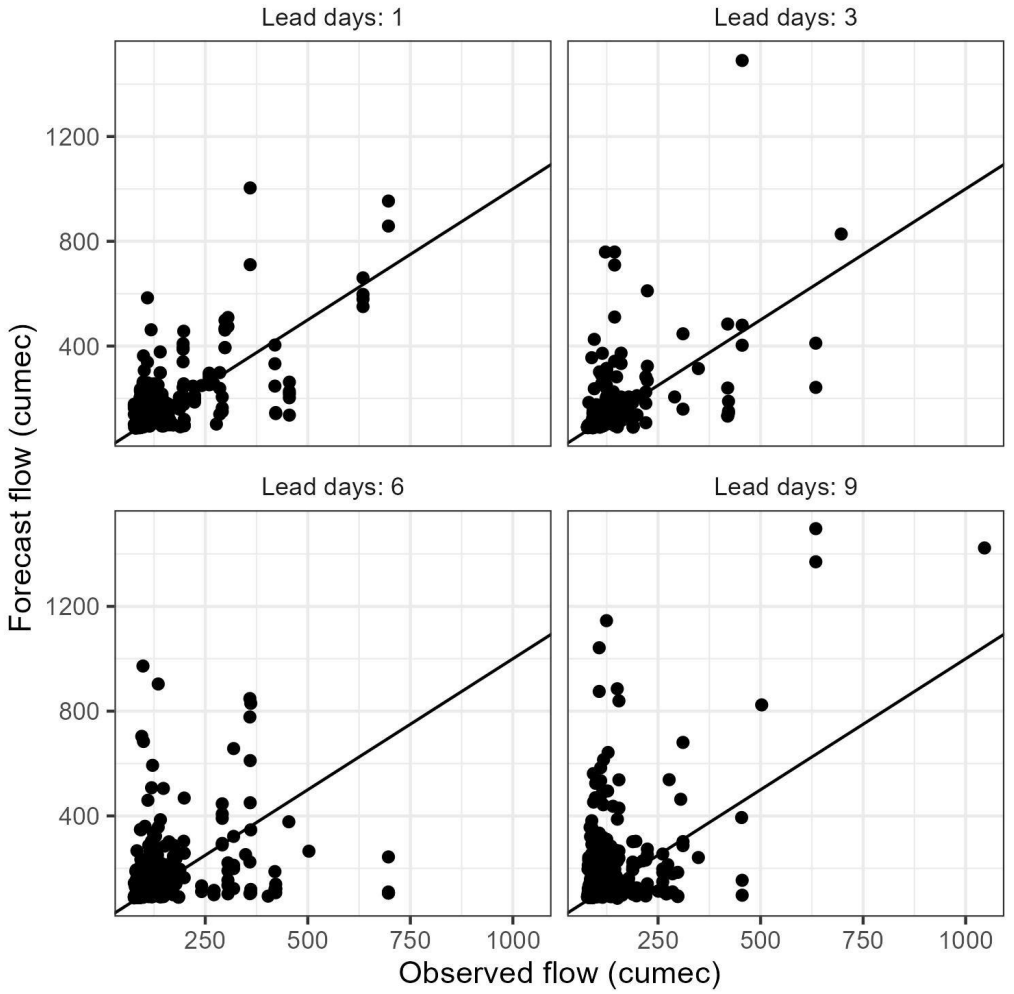
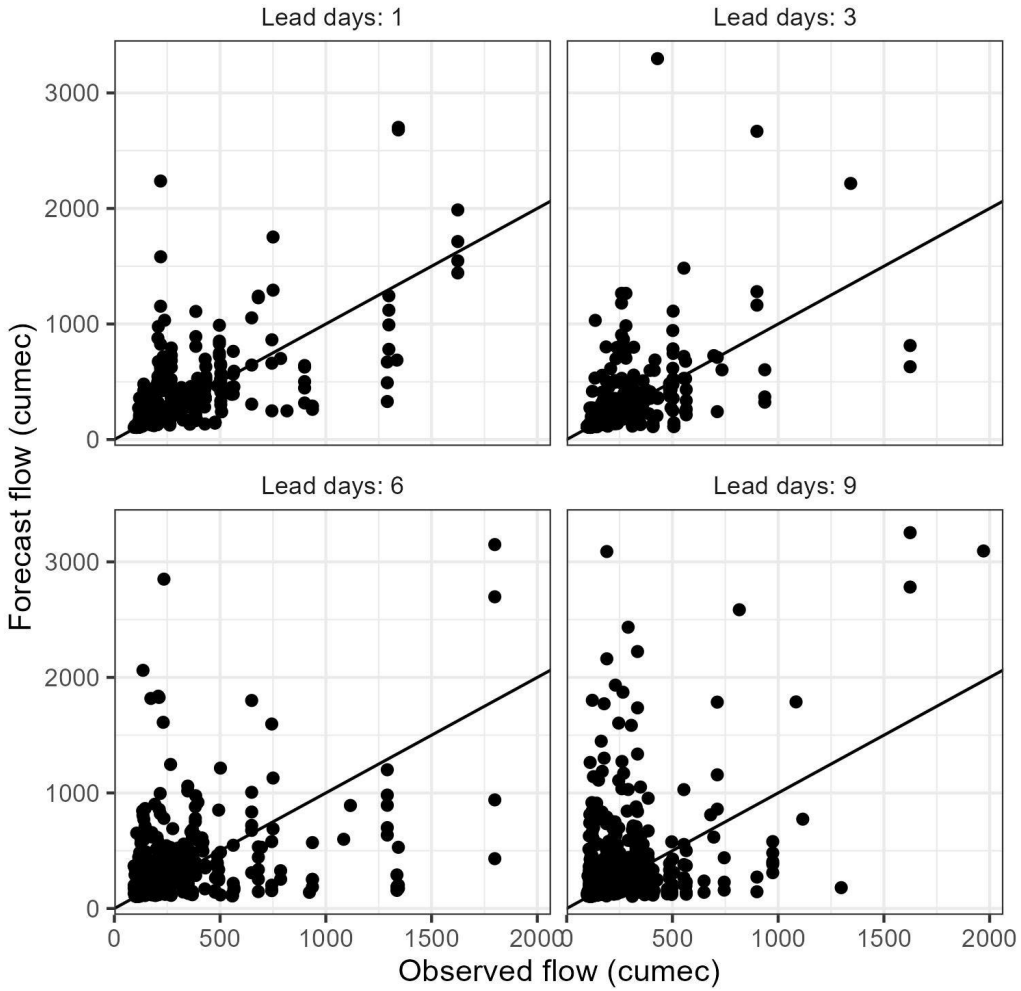
Flow verification [01636500] (RMSE:40-70 cumec)



Flow verification [01646500] (RMSE:120-210 cumec)



Concluding thoughts

- More research and analysis is required towards verification of low to no rainfall forecast efficiency.
- Detailed verification of forecast informed low flow simulation is required for efficient drought management.