# Bias Correction of Mixed Distributions of Temperature and Precipitation with Strong Diurnal Signal

## Presentation Outline:

- Mixed distribution of monthly dataset of the Blue Nile River Basin (BNB)

- Diurnal stratification and its impact on bias correction:
  - Temperature
  - Precipitation

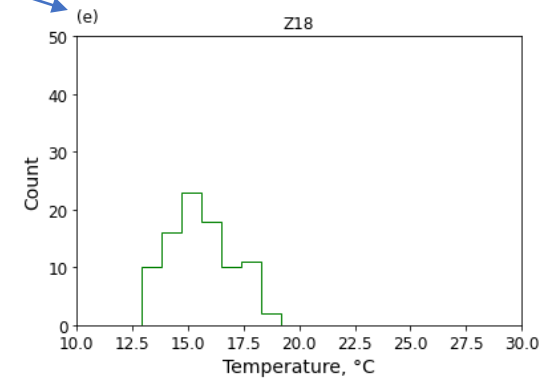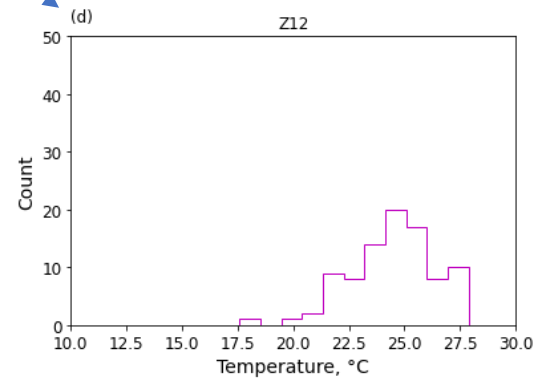Muhammad Rezaul Haider
Advisor: M. Peña
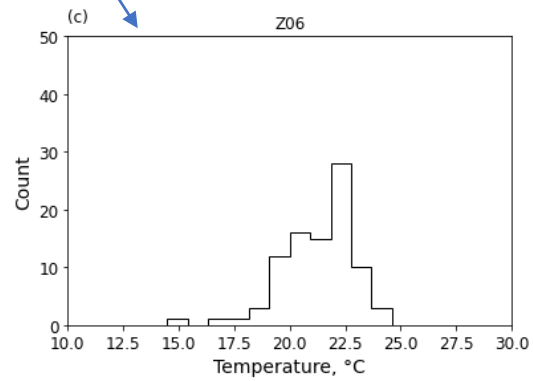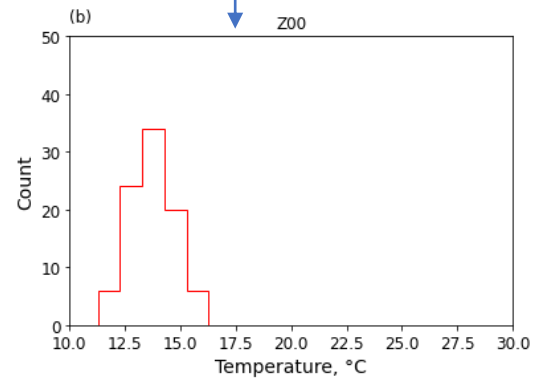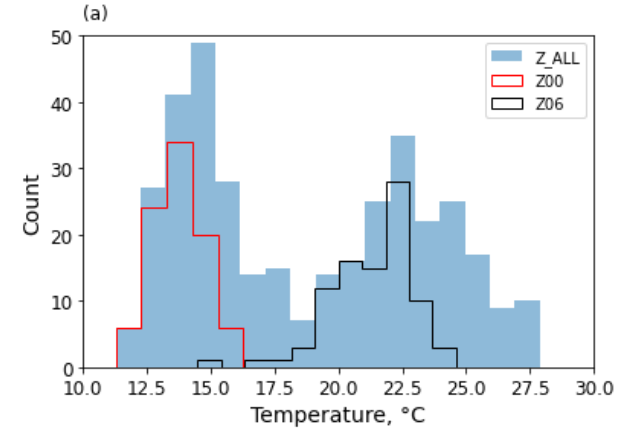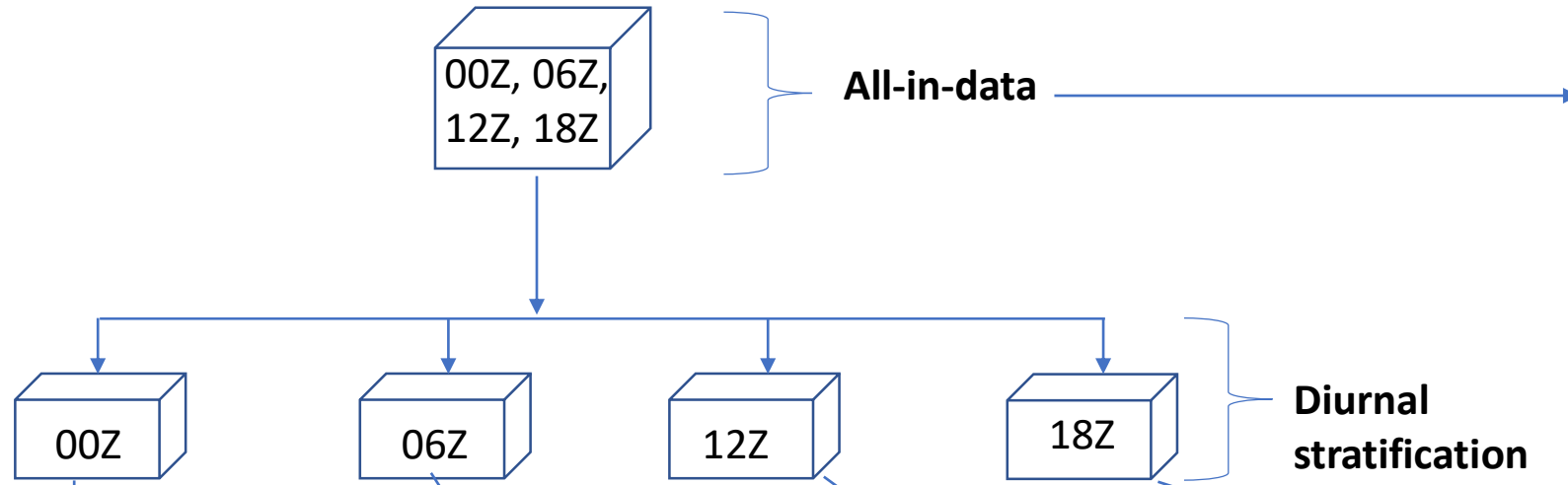
Contact:
muhammad.haider@uconn.edu

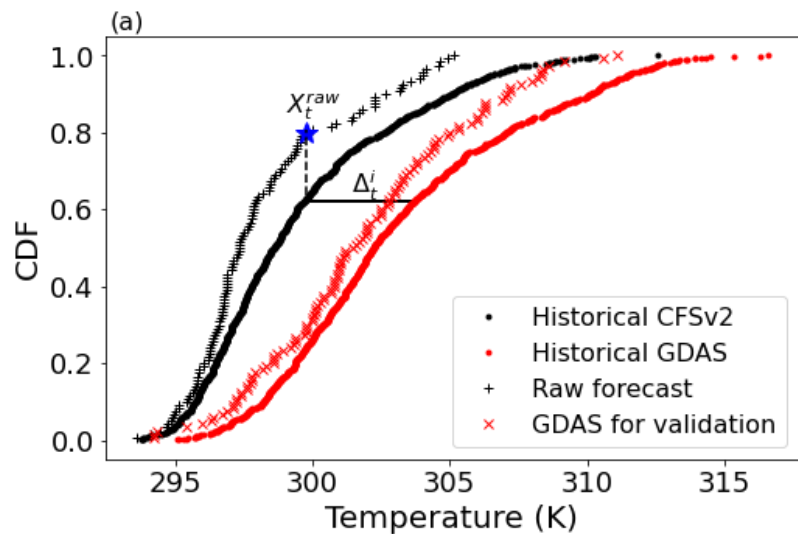# Unimodal and bimodal distributions of Temperature (T) and Precipitation (P) across the BNB
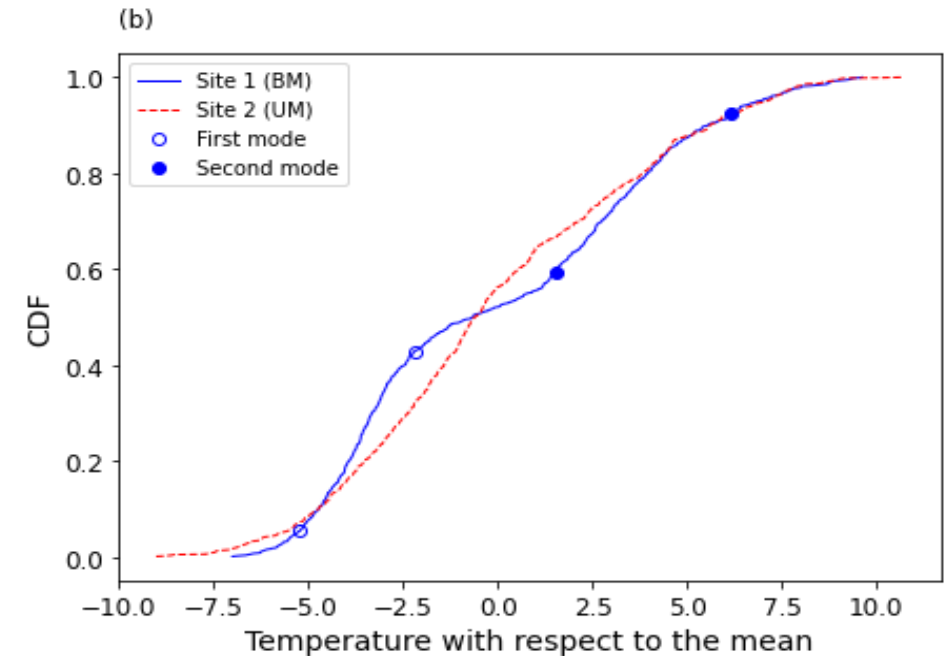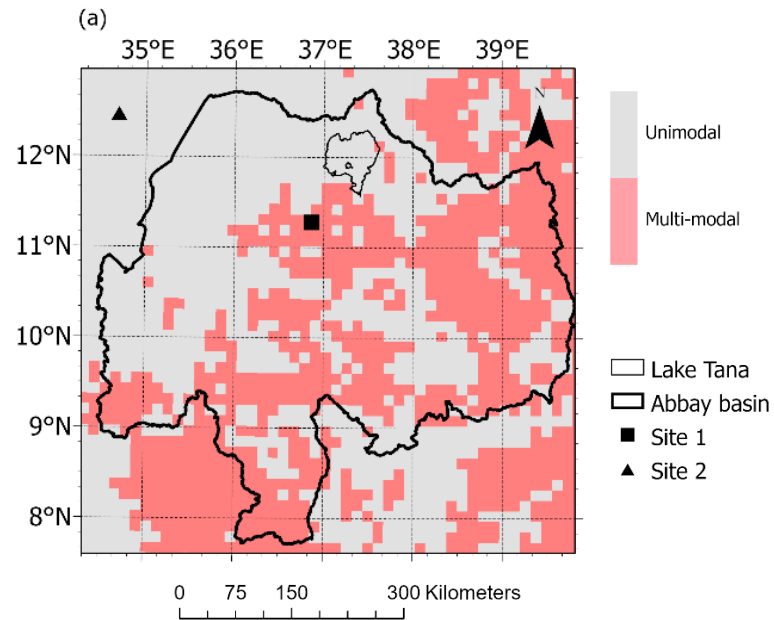


Data:
- CFSv2 (6 hr, 1°x1°) forecast:  P and T
- GDAS (3 hr, 0.1°x0.1°): T
- MSWEP (3 hr, 0.1°x0.1°): P
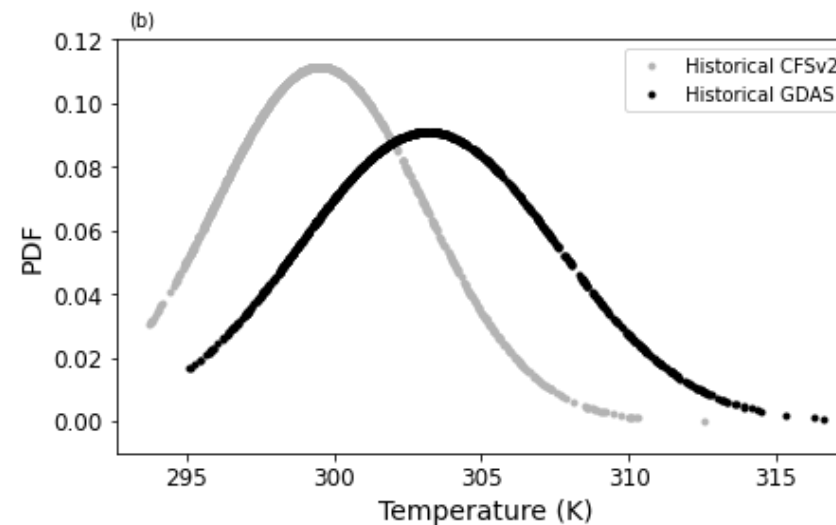
# Diurnal stratification of data

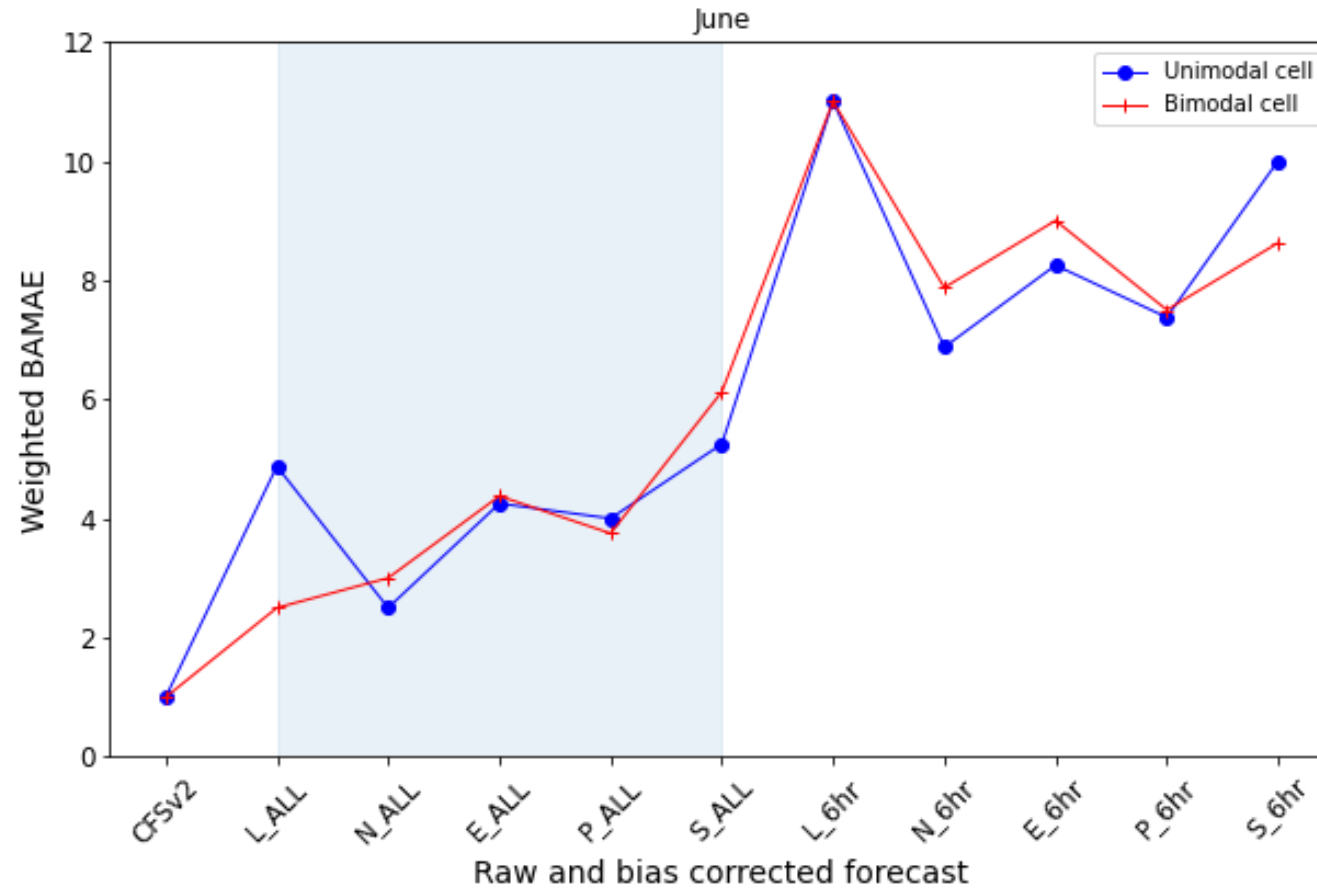# Bias correction methods
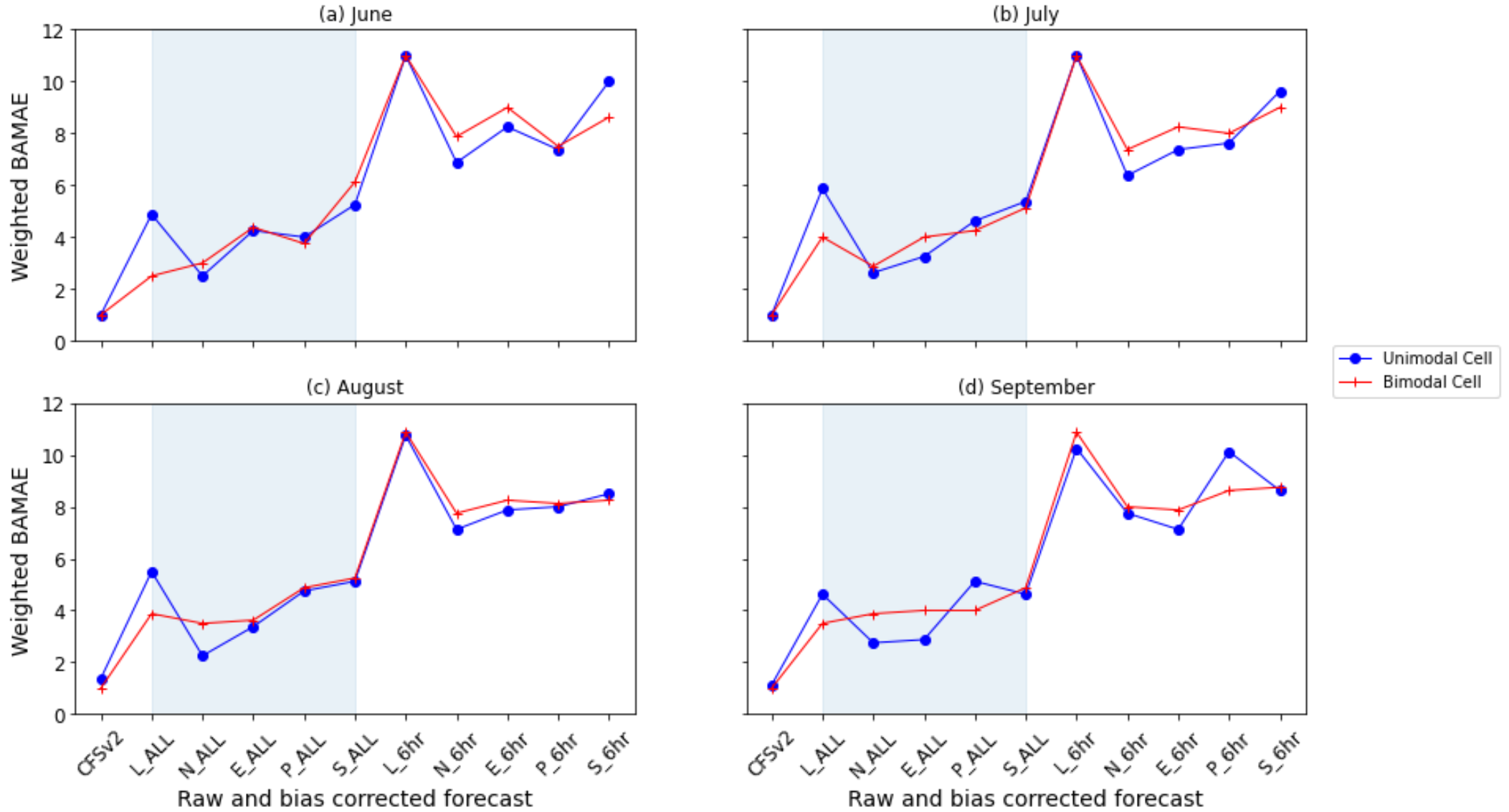
## Full-distribution correction



## Linear correction



PDFs for the dataset following a normal distribution

- Linear (L): L_ALL, L_6hr
- Non-parametric (N): N_ALL, N_6hr
- Equi-distant CDF matching (E): E_ALL, E_6hr
- Polynomial fitting based CDF matching (P): P_ALL, P_6hr
- Scaled Distribution method (S): S_ALL, S_6hr

# Result: Temperature bias correction



Haider, M.R., Pena, M., and Anagnostou, E. Bias Correction of Mixed Distributions of Temperature with Strong Diurnal Signal. [In Review], *Weather and Forecasting*, 2021. Manuscript Number- WAF-D-21-0108.

# Result: Temperature bias correction



(a) June   (b) July   (c) August   (d) September

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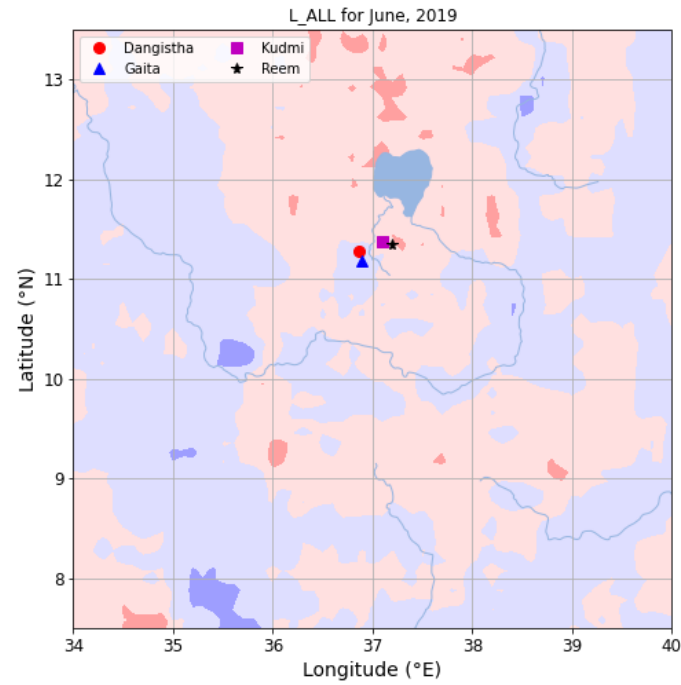
# Monthly Precipitation forecast error for **June, 2019**

(Forecast Error = Raw or corrected Forecast – MSWEP)
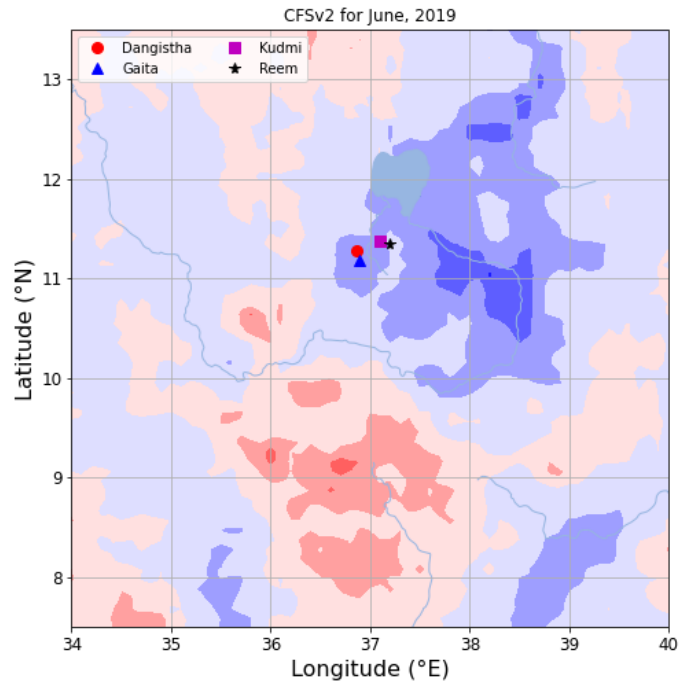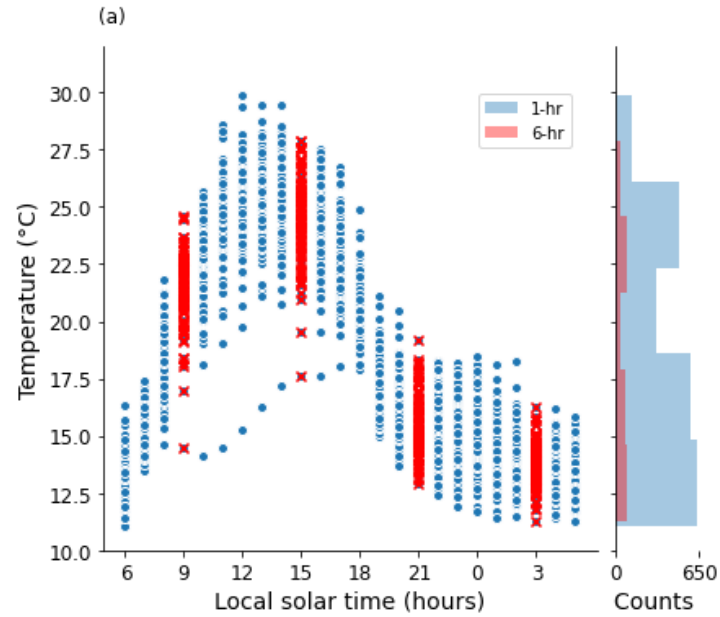
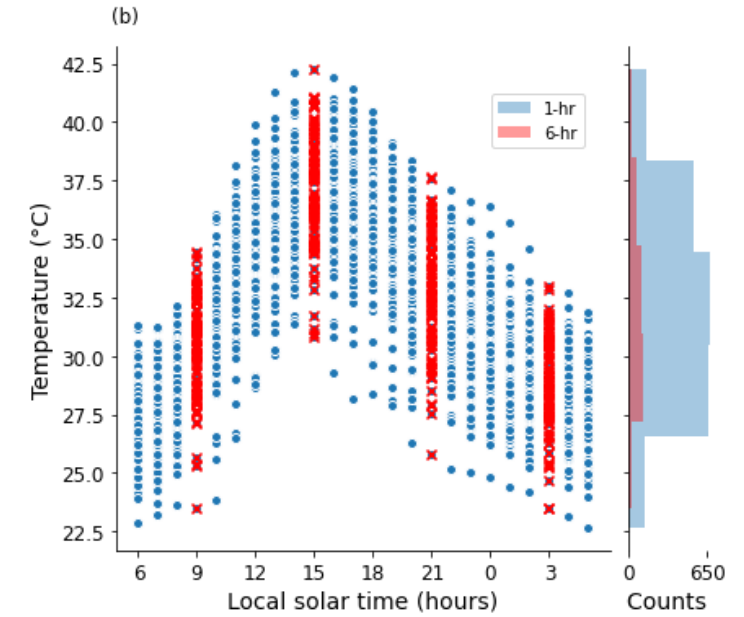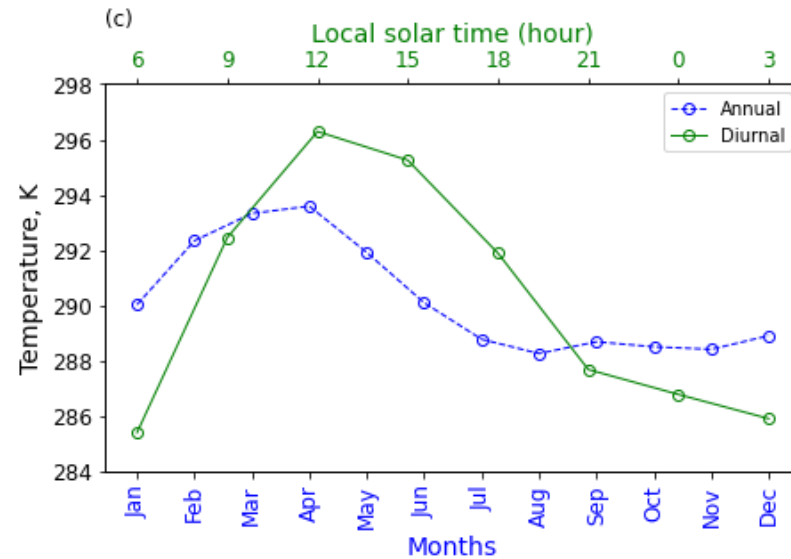**CFSv2**  **L_ALL**  **L_6hr**
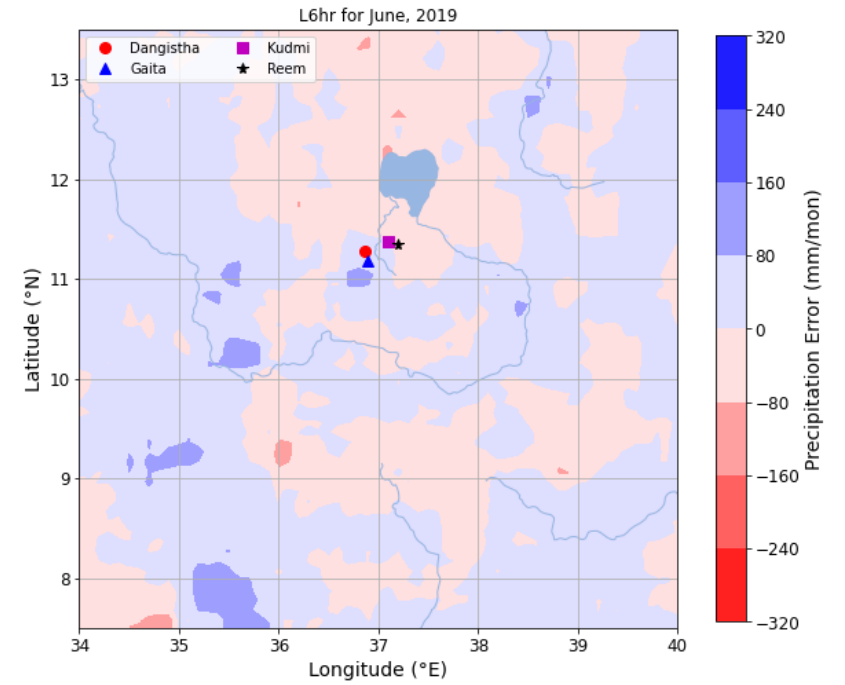
# Necessary condition for diurnal stratification



(a)

Bimodal site

(b)

Unimodal site

(c)

# Conclusion and remarks

- Diurnal stratification marginally increases the temperature forecast skill for the regions where the data distribution is multi-modal.

- The mixed distribution is decomposed into a set of unimodal distributions.

- Maximum benefit of stratification is obtained with the Linear model with a short data sample.

- A necessary condition for the stratification is that the amplitude of the diurnal cycle be larger than the interannual variability in the sample.