



IMPORTANCE OF DIURNAL CYCLE BIAS CORRECTION FOR HYDROLOGICAL STUDIES

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INTRODUCTION

Climate change impact on precipitation:

Increasing frequency of convective storms and extreme precipitation, and especially so at the sub-daily temporal scales.

Climate change impact on discharge:

Increasing flooding risk, particularly over small catchments with sub-daily response time.

Adapt to climate change impact

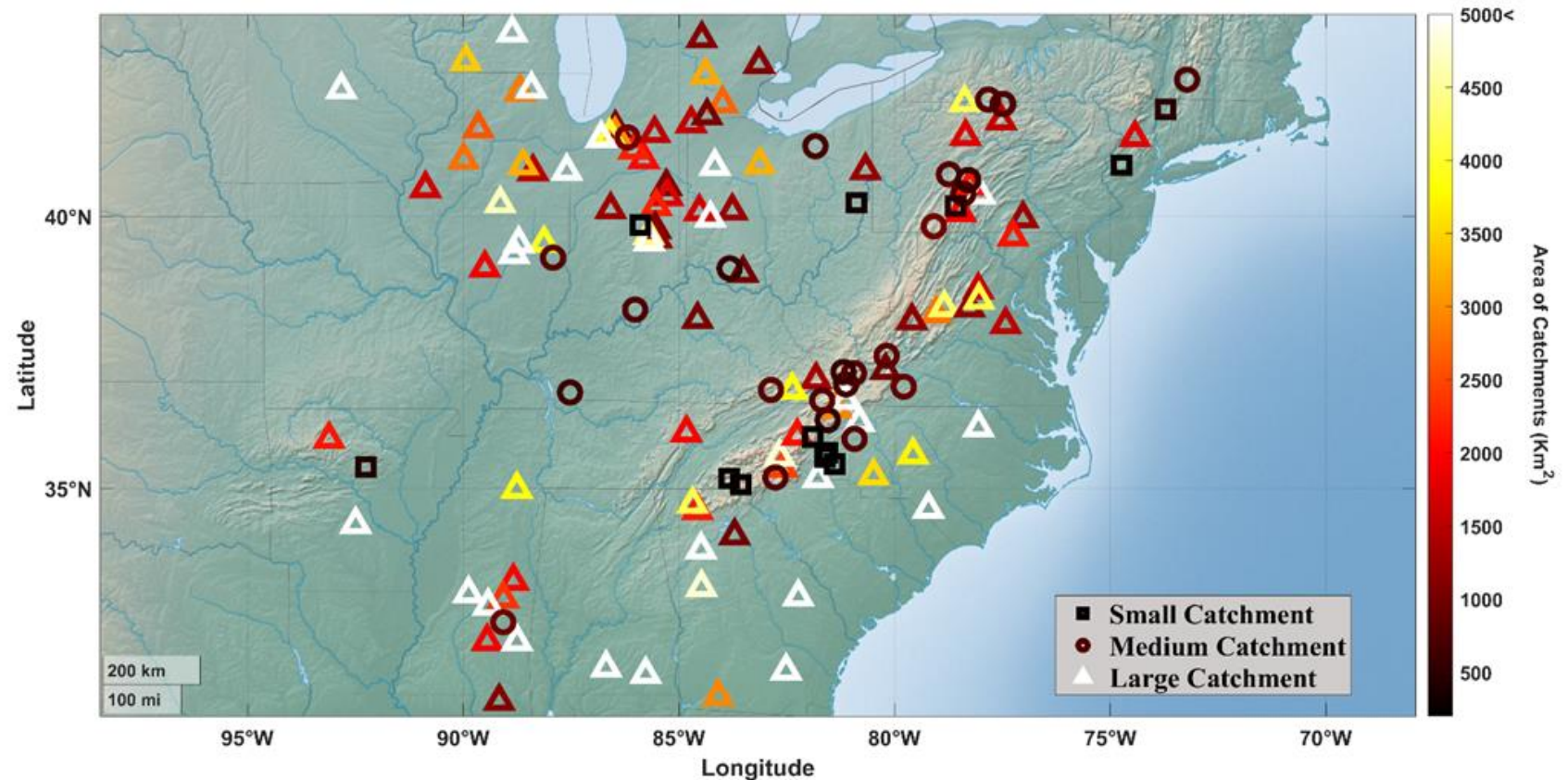
Sub-daily climate modeling time step is required.

Diurnal bias correction

Should we bias-correct the diurnal cycle of climate model outputs?

OBJECTIVES AND STUDY AREA

- To examine the impact of bias-correcting the diurnal cycle on the hydrology of 133 North American catchments
- To examine how catchment size influences the dynamic response to extreme precipitation



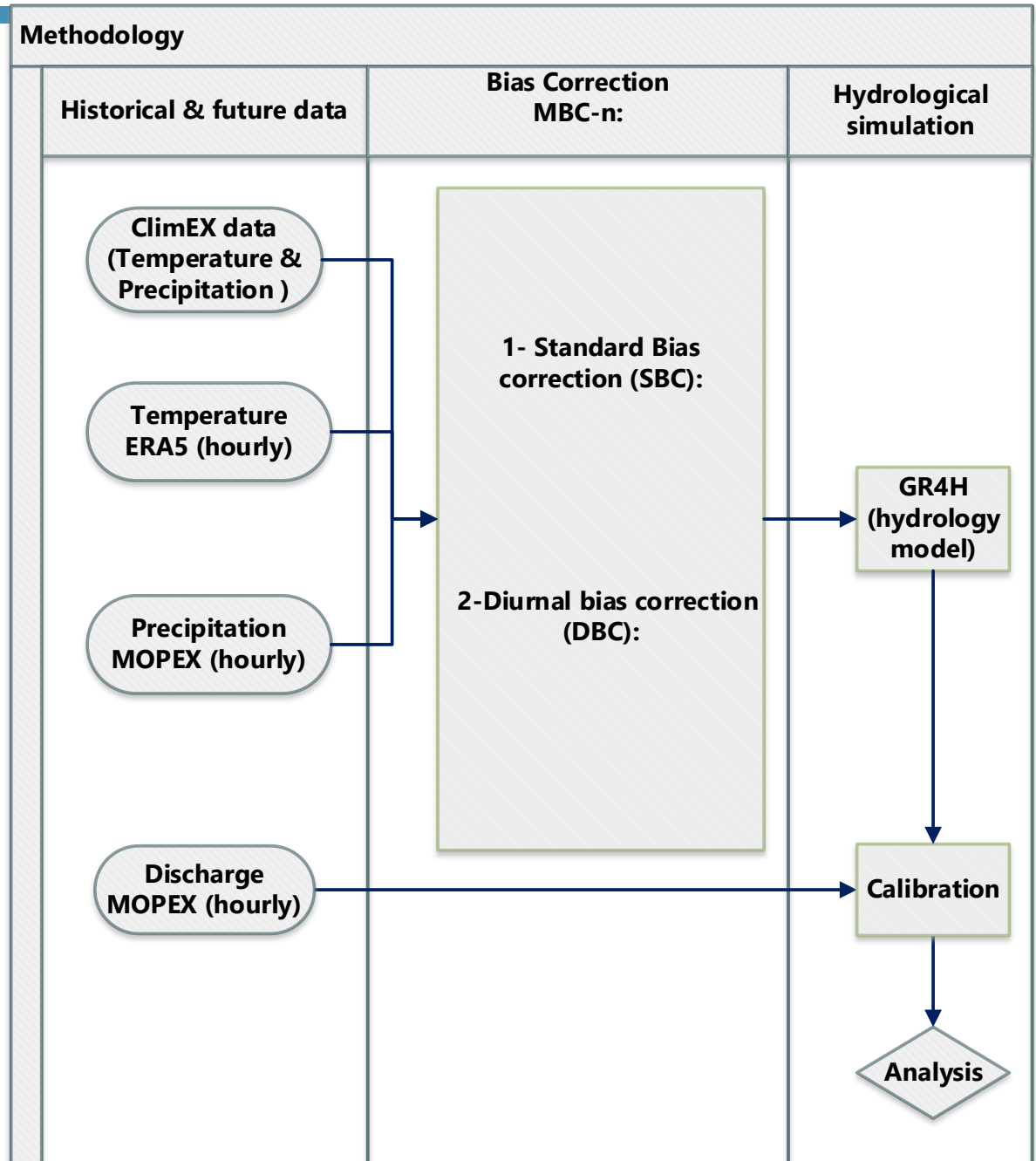
- **Standard Bias correction (SBC):**

For each calendar month, a single set of quantile correction factors was applied to all hourly data

- **Diurnal bias correction (DBC):**

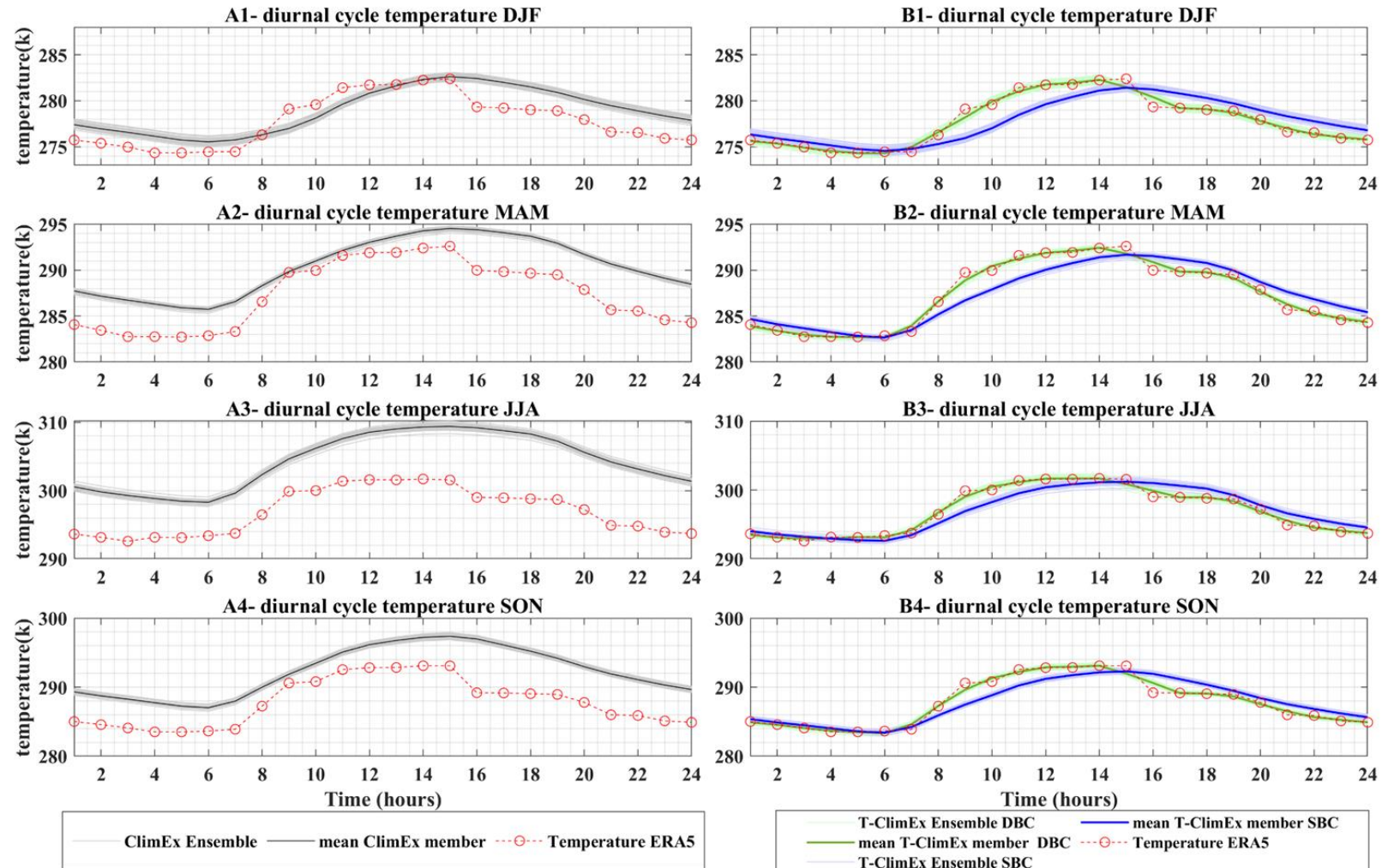
For each month, there are 24 sets of quantile correction factors (one for each hour). using a 3 h moving window to pool all hourly values within a given month

The MBCn algorithm (Cannon, 2018) was applied in both cases.



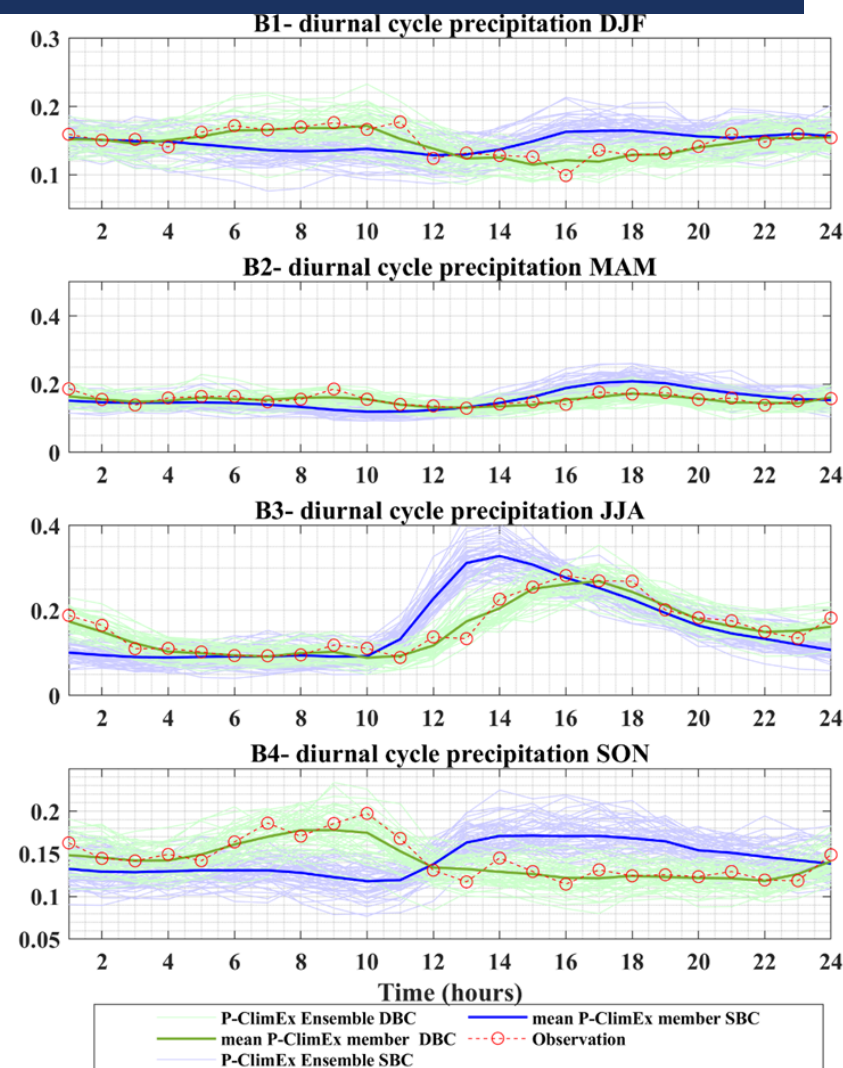
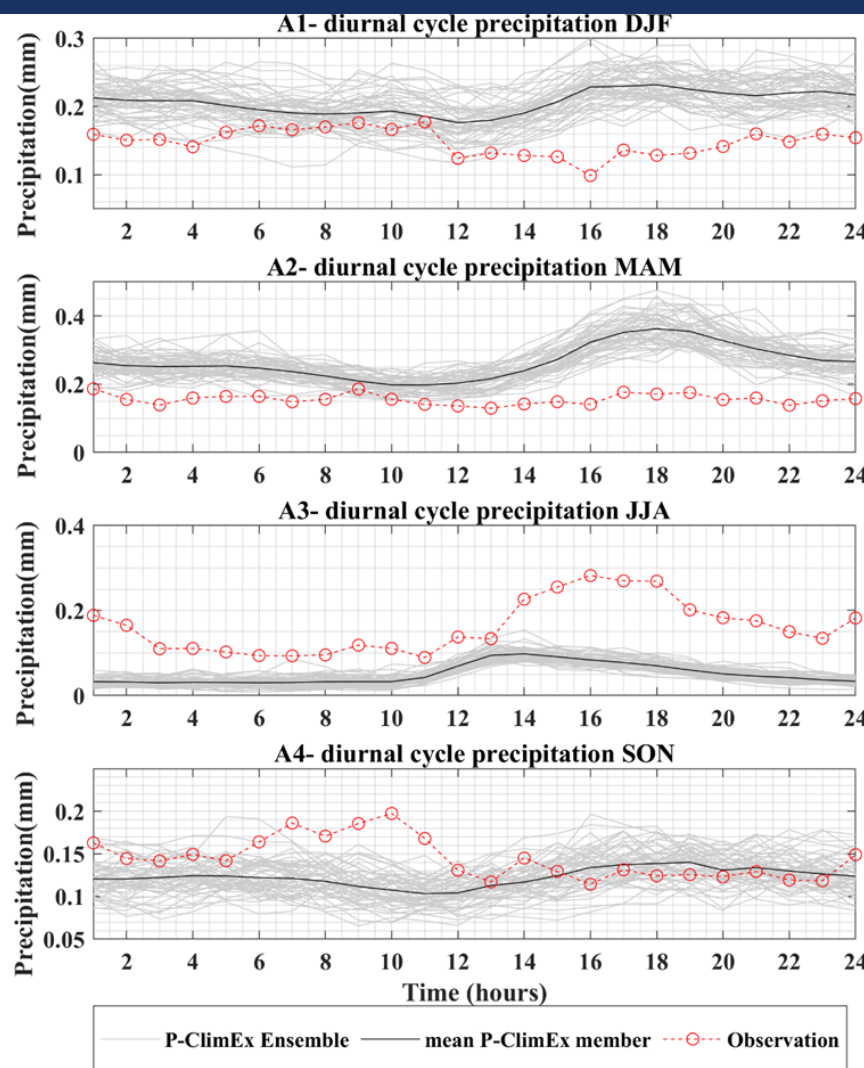
TEMPERATURE BIAS CORRECTION

- Left: Observed (ERA5 in red) and modelled (Climex - all members in gray, ensemble mean in black) diurnal cycle.
- Right: Observed (ERA5 in red) and bias corrected data using both approaches (SBC in blue, DBC in green).
- SBC correct the mean daily biases, with no impact on the shape of the diurnal cycle.
- DBC (green) corrects the shape of the diurnal cycle.



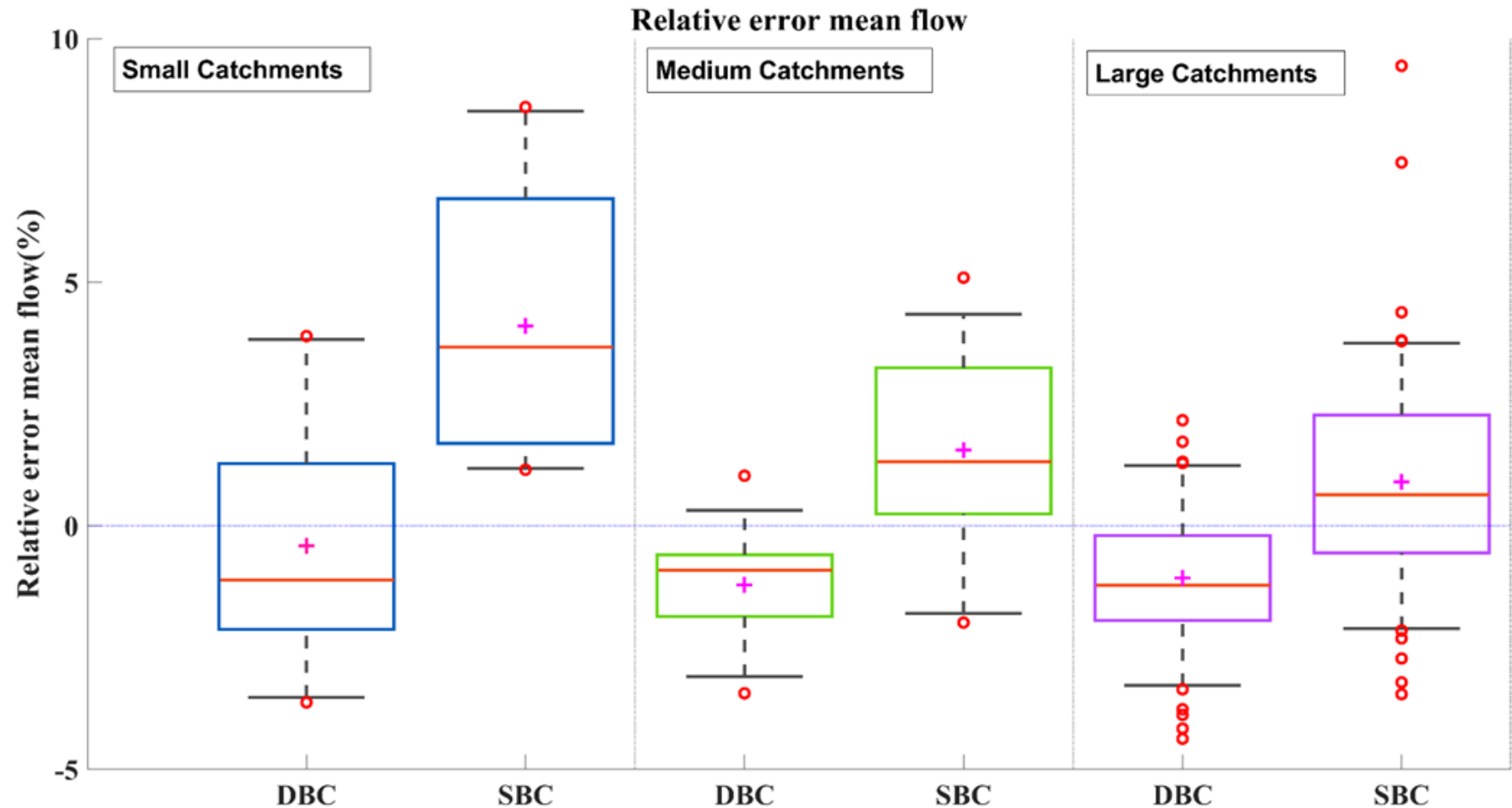
PRECIPITATION BIAS CORRECTION

- Same as before but for precipitation.
- Simulated internal variability of precipitation is much larger than for temperature.

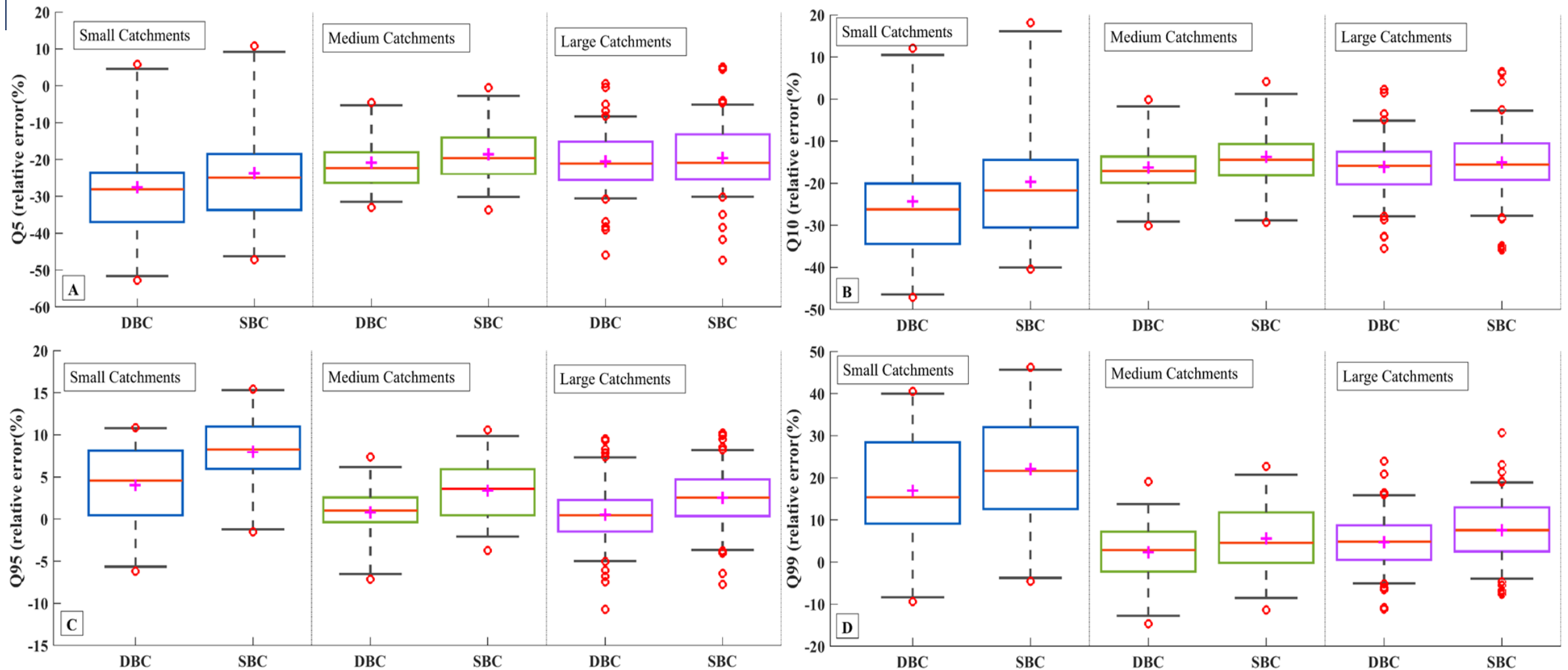


IMPACT OF SBC & DBC ON MEAN FLOW

- Bias correcting the diurnal cycle (DBC) reduces the mean bias and across catchment spread.

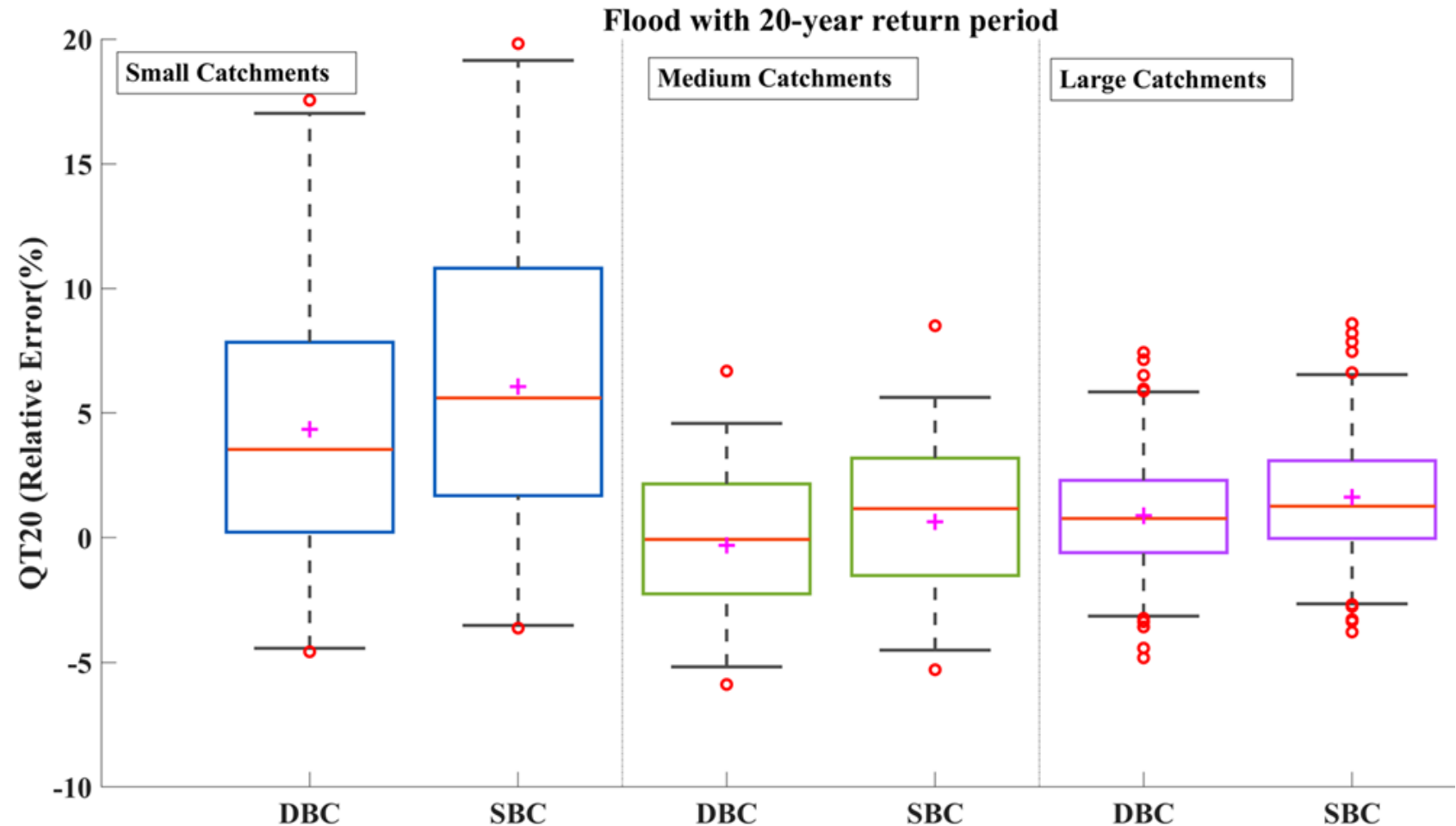


IMPACT OF SBC & DBC ON LOW AND HIGH FLOW



IMPACT OF SBC & DBC ON FLOOD WITH 20-YEAR RETURN PERIOD

- Small relative biases for the medium and large size catchments, and slightly positive and a bit larger over the small catchments.



THANK YOU



Hydrol. Earth Syst. Sci., 26, 1545–1563, 2022
<https://doi.org/10.5194/hess-26-1545-2022>
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Hydrology and
Earth System
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Impact of correcting sub-daily climate model biases for hydrological studies

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Received: 3 May 2021 – Discussion started: 7 June 2021

Revised: 15 December 2021 – Accepted: 13 February 2022 – Published: 23 March 2022

Ministère
du Développement durable,
de l'Environnement
et de la Lutte contre les
changements climatiques
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