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Statistical downscaling of extreme indices of precipitation in Sweden and China

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Statistical methods

- Analogue methods
  - Principal Component Analysis (PCA)
  - Teweles-Wobus Scores (TWS)
- Weather patterns
  - Multi-objective fuzzy-rule-based classification method (MOFRBC)
- Regression
  - Statistical Downscaling Model (SDSM)

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Validation variables from STARDEX

(Statistical and Regional dynamical Downscaling of Extremes for European regions)

Key indices

- Amount precipitation on a wet day
- 90%-percentile of precipitation amounts on wet days
- Maximum 5 day precipitation
- Maximum length of dry period

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Data

Predictors: Large-scale atmospheric variables, such as MSLP, GPH, geostrophic winds and humidity at different levels

The predictor data was from NCEP/NCAR reanalysed gridded time series

Predictands: Daily precipitation series from weather stations in Sweden and China

Calibration: 1961–1978, 1994–2000

Validation: 1979–1993

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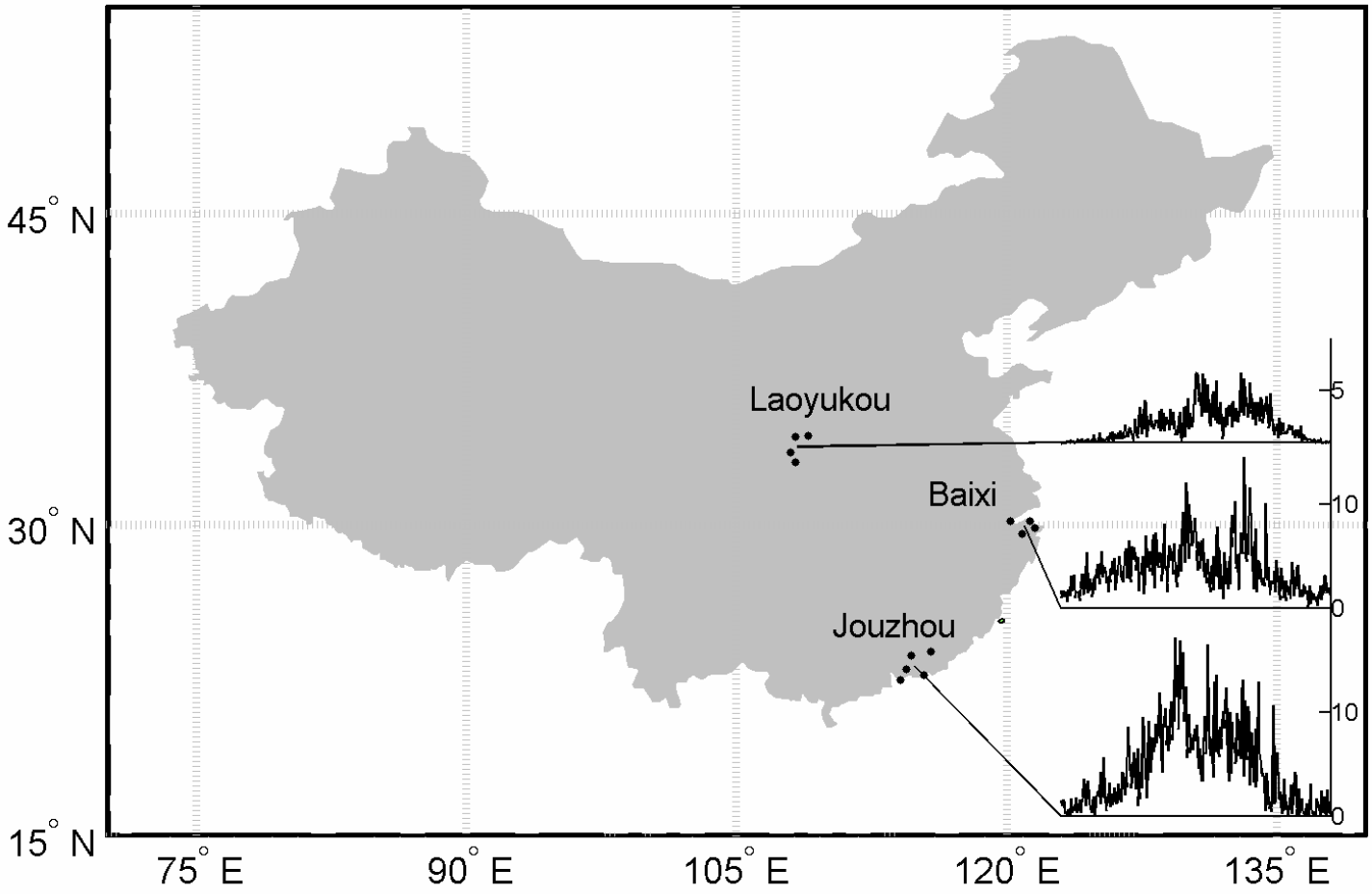
Study area 1



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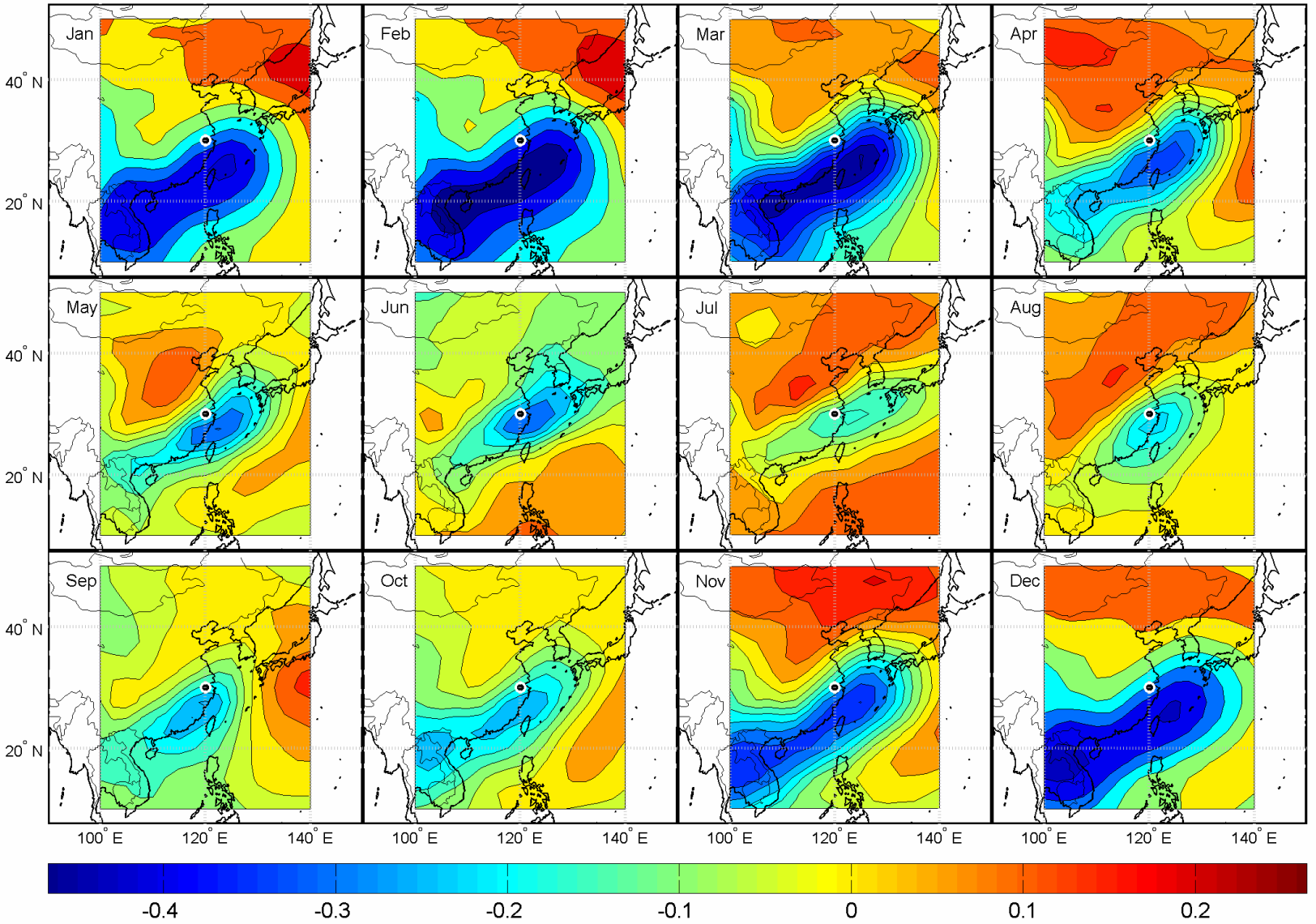
Correlation MSLP-precipitation for Baixi



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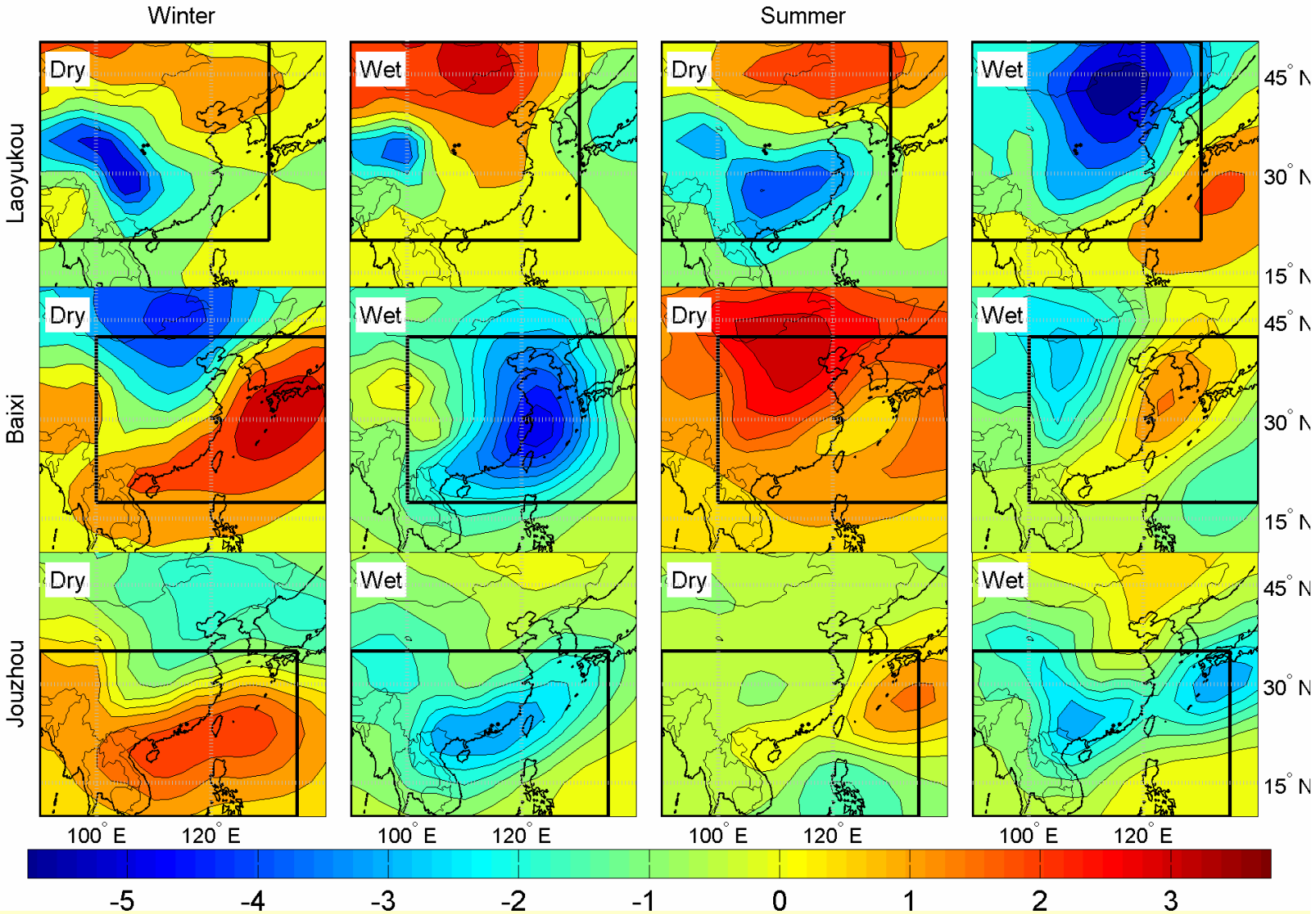

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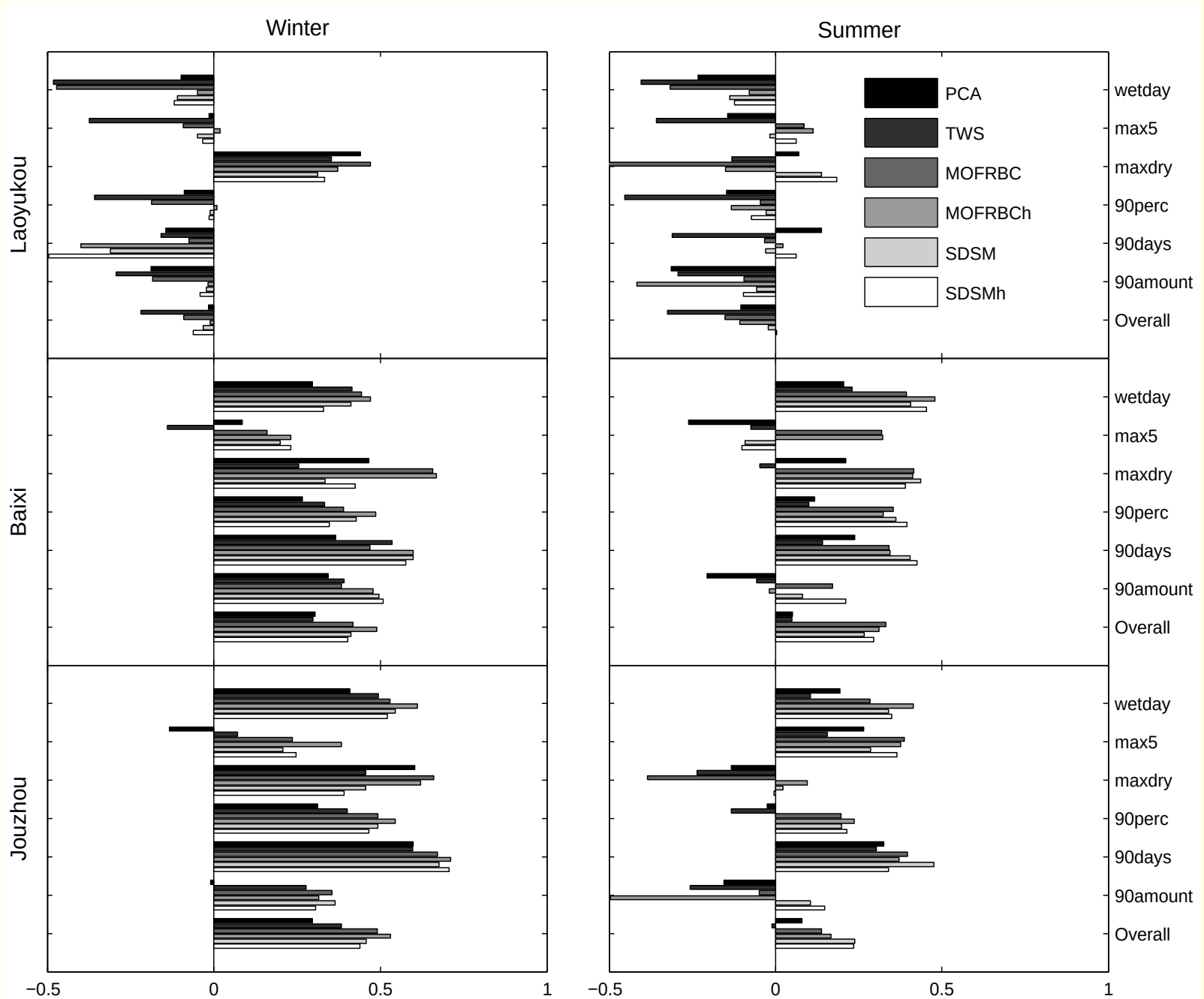
CRPS for the Chinese areas



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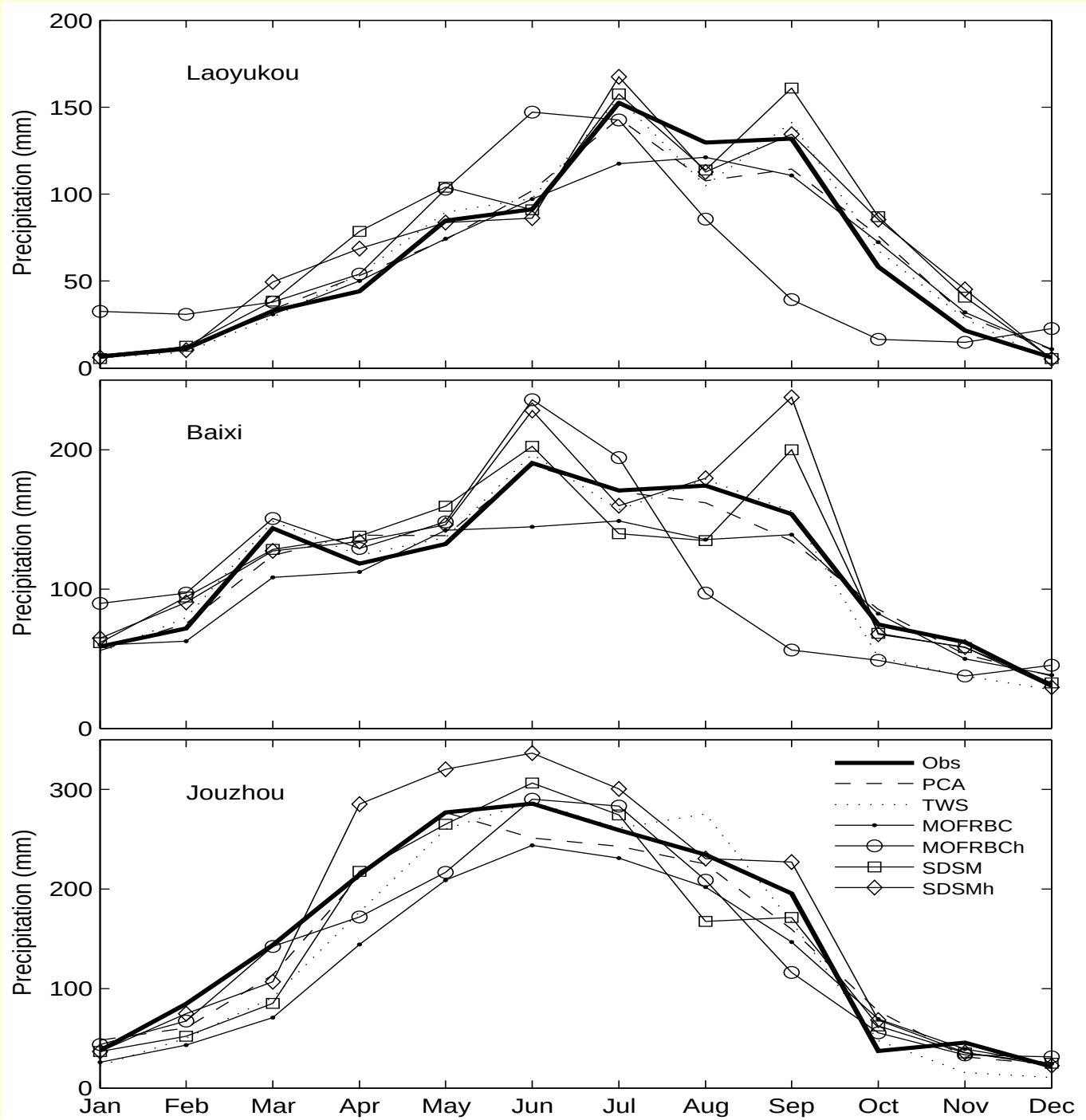
Intra-annual variation for China



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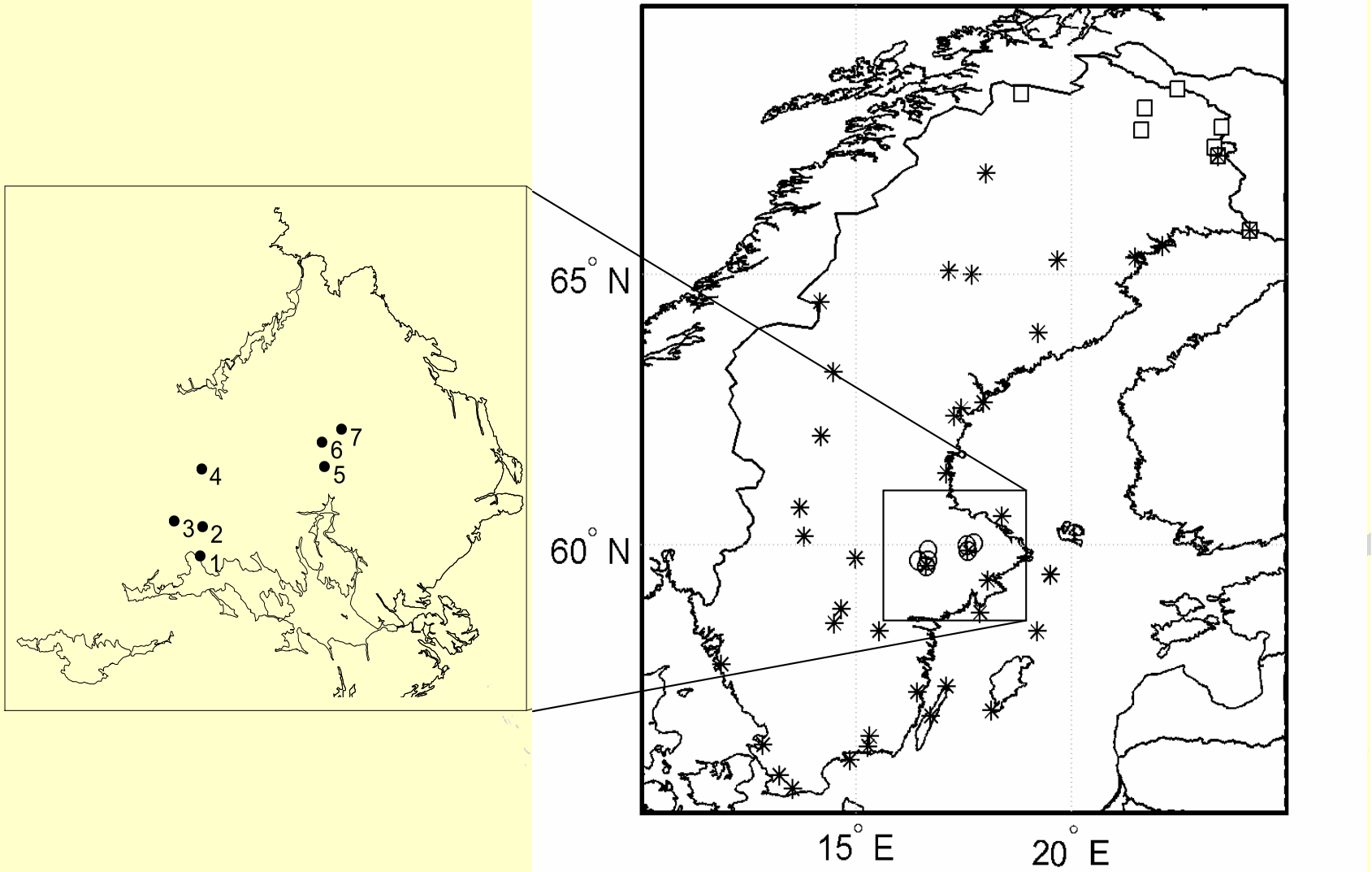
Study area 2



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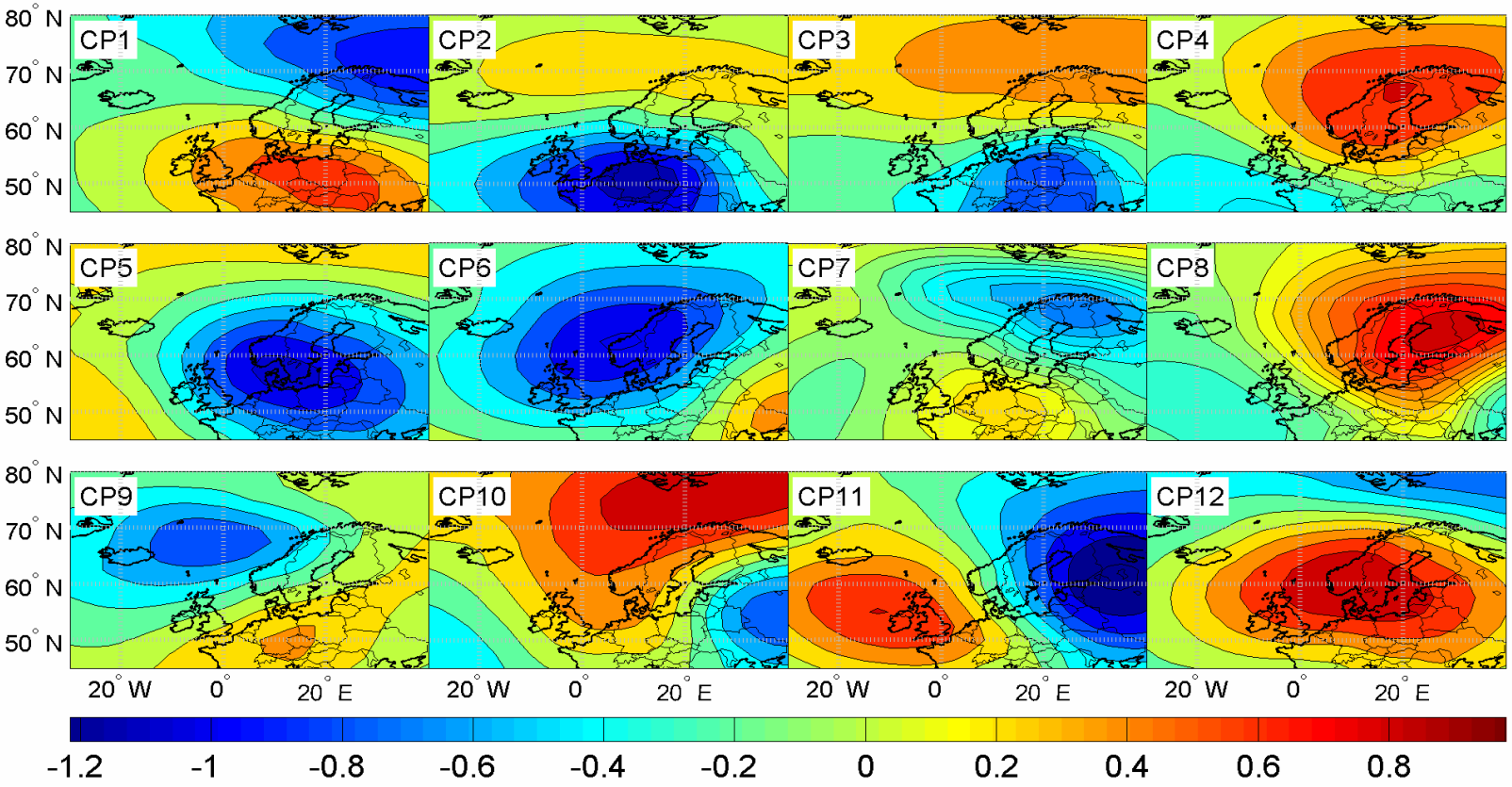
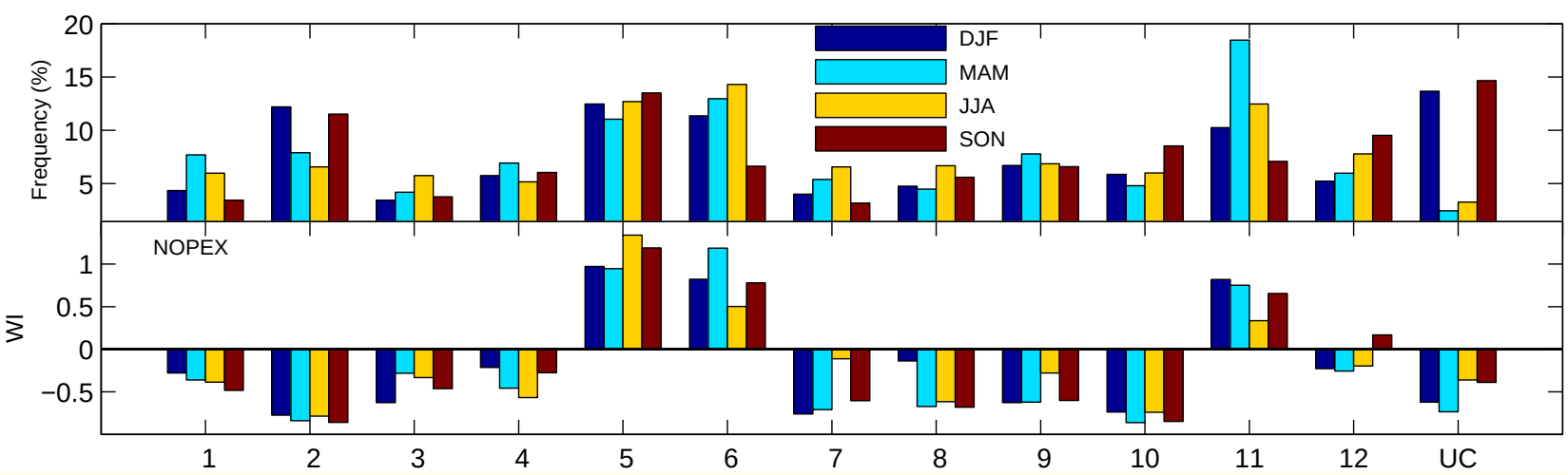
Weather patterns for Sweden





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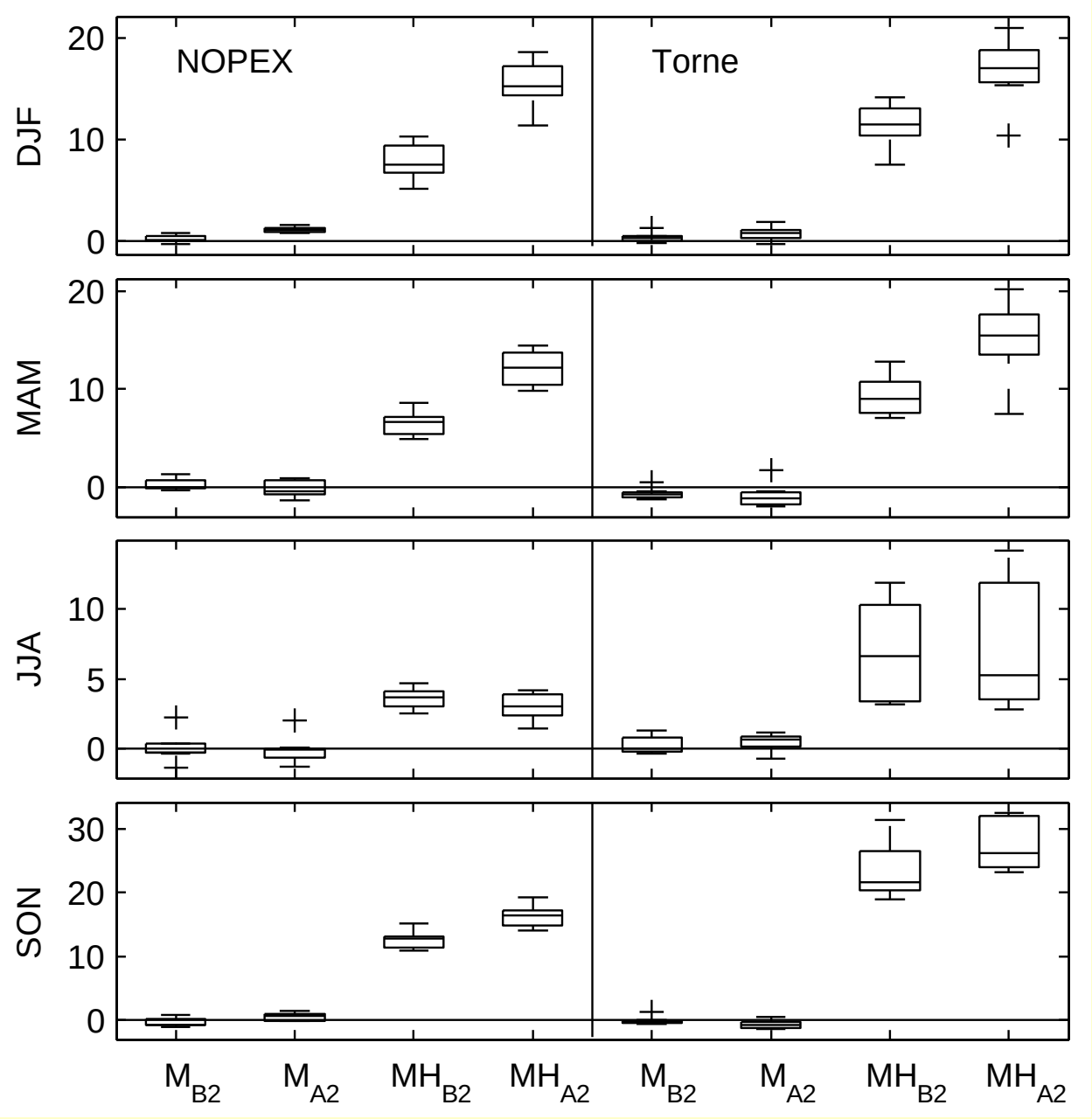
Precipitation on a wet day



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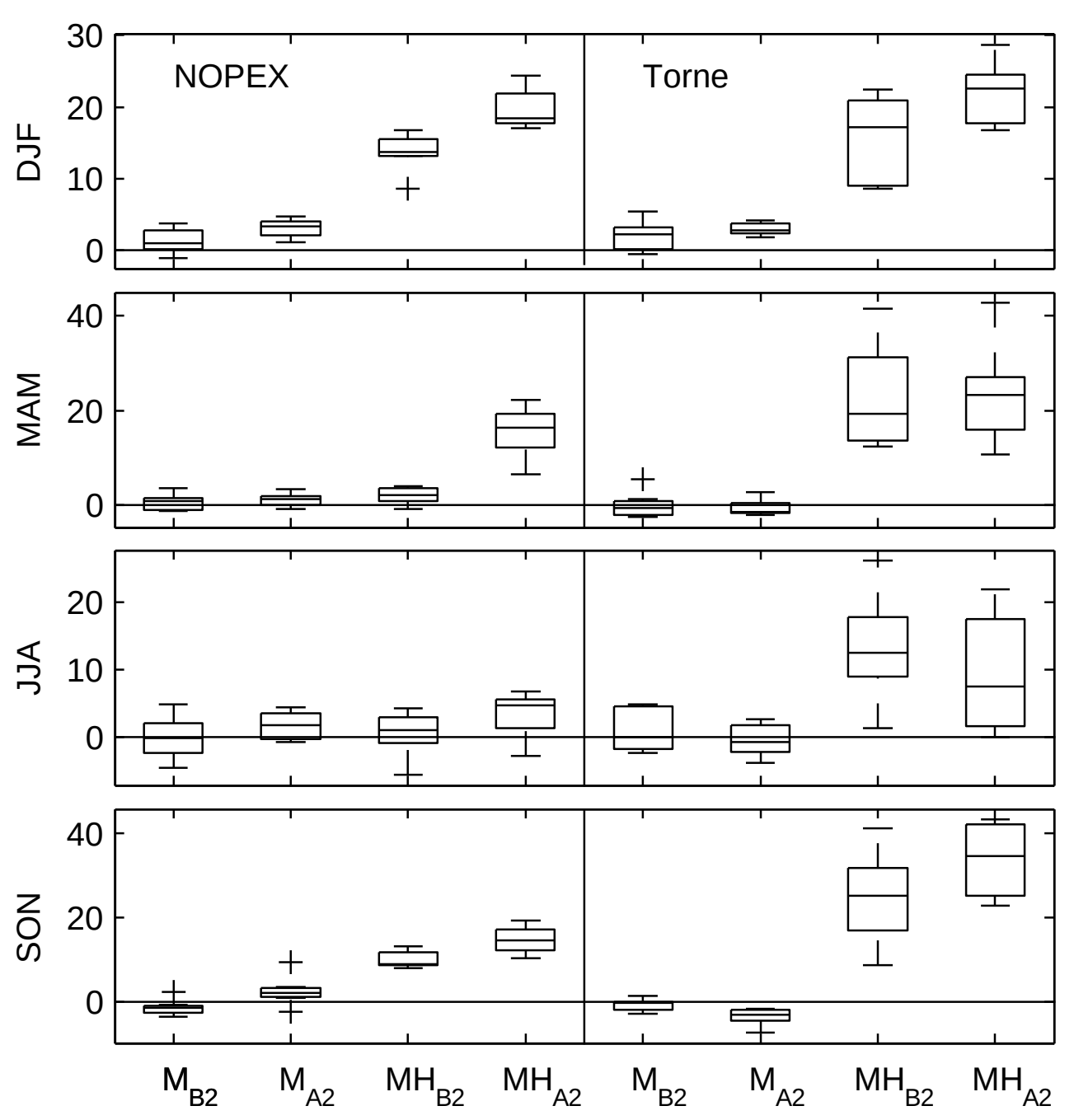
Maximum 5-day precipitation



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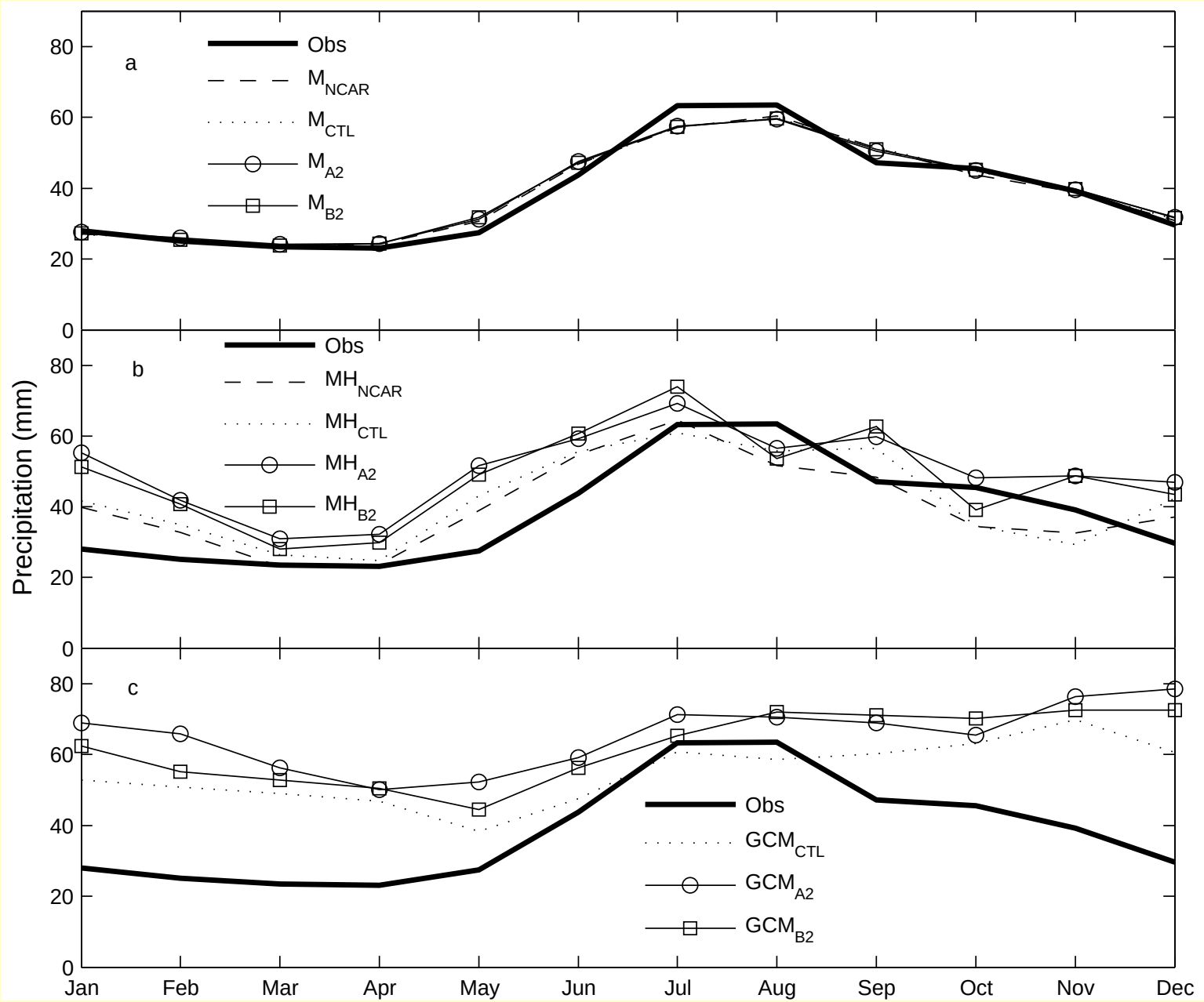
Intra-annual variation for NOPEX



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Conclusions

- Temporal and spatial analysis of the predictor-predictand relationship is crucial in downscaling
- Extreme events were well captured in different climates (Sweden and China)
- Winter indices better captured than summer indices in China
- Climate change signal carried in humidity in the HADAM3P model