



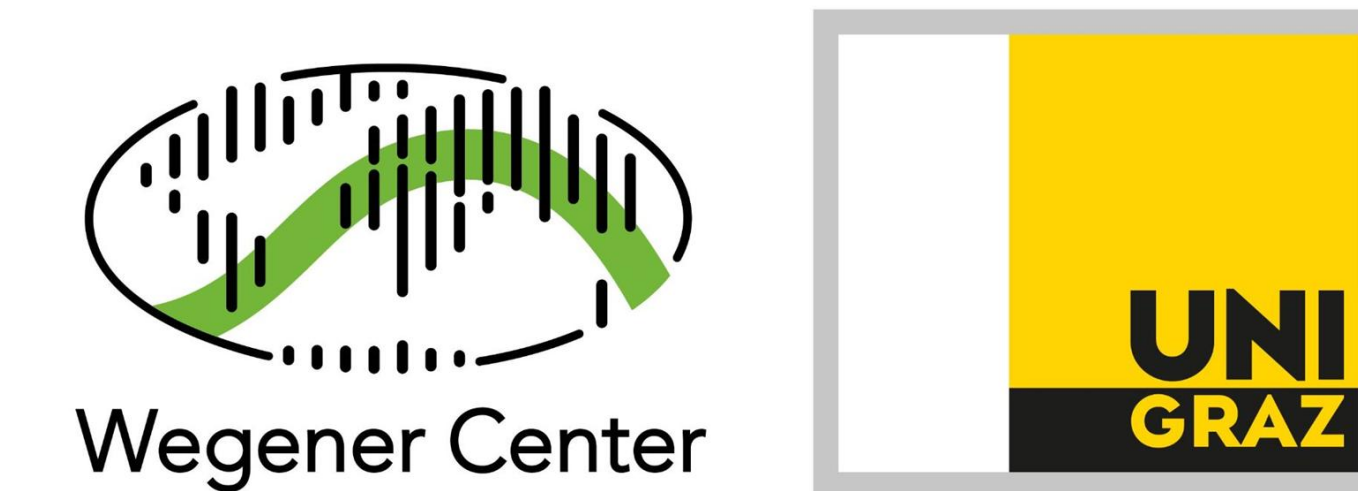
Evaluation of minimum and maximum temperatures in convection-resolving climate models

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The km-scale CORDEX-FPS Convection ensemble shows
an elevation-dependent temperature bias over Austria.
Why?

HighResMountains

Mountain Weather in high-resolution climate data

SEASON AND ELEVATION-DEPENDENT DIFFERENCES

Figure 1

- Convection-resolving models realistically reproduce daily minimum and maximum temperatures over Austria. Nevertheless, seasonal differences are evident.

- The diurnal temperature range, defined as the difference between maximum and minimum temperatures, is systematically underestimated by the models, especially COSMO-CLM.

Figure 2

- The seasonal deviations are elevation-dependent. In comparison with SPARTACUS, the CORDEX-FPS models show an increasingly negative bias with higher elevation. These biases likely result from a lack of observations at high elevations and shortcomings in the physical parameterizations of the models.

DATA

Evaluation Period: 2000 - 2009

Dataset	Resolution	Variables
CORDEX-FPS ensemble (21 models)	3 km	clt, huss, rsds, tasmin, tasmax, snowc
SPARTACUS	1 km	tasmin, tasmax
STRAHLGRID	1 km	rsds
ERA5	0.25°	clt, rsds, tasmin, tasmax
E-OBS	0.25°	clt, rsds, tasmin, tasmax
EMO-5	5 km	rsds, tasmin, tasmax
EUMETSAT	0.05°	rsds

Abbreviations

tasmax: daily maximum temperature

tasmin: daily minimum temperature

dtr: diurnal temperature range (tasmax - tasmin)

rsds: daily mean global radiation

clt: daily mean total cloud cover

huss: daily mean specific humidity

snowc: daily mean snow cover

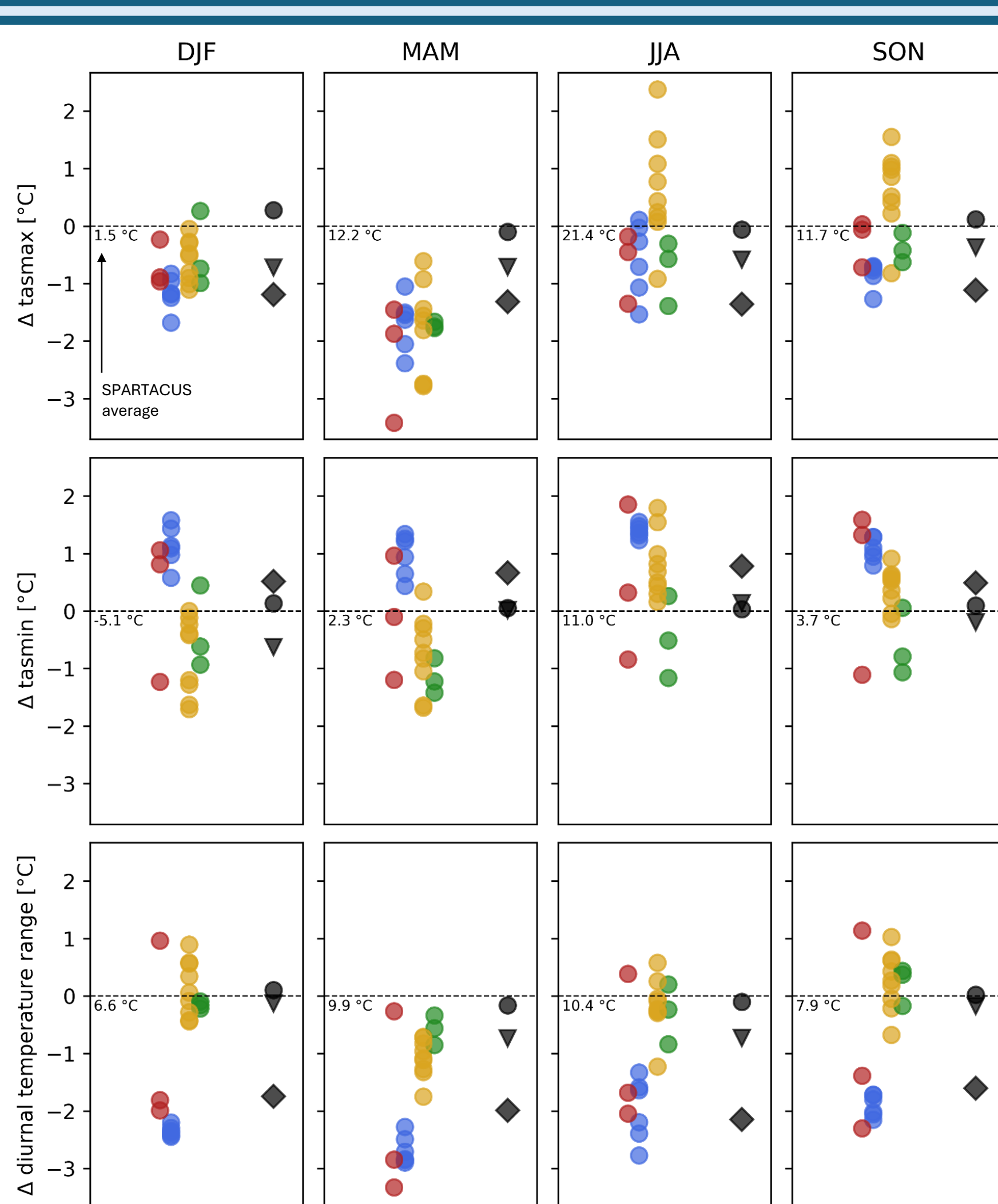
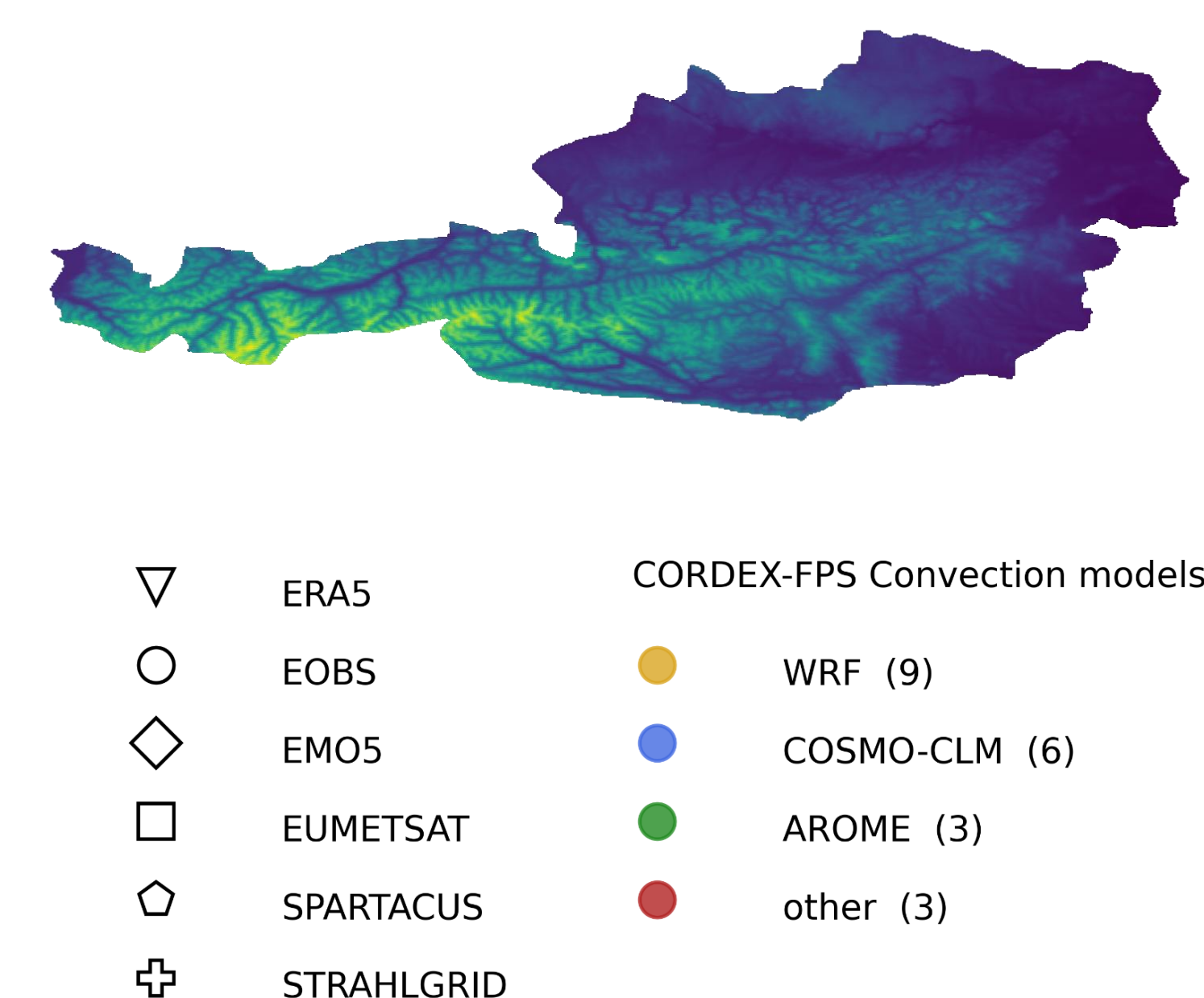


Fig. 1 Seasonal differences between SPARTACUS (dashed line; reference dataset), CORDEX-FPS models (in color) and other observations (black) for tasmax (1st row), tasmin (2nd row) and the dtr (3rd row).

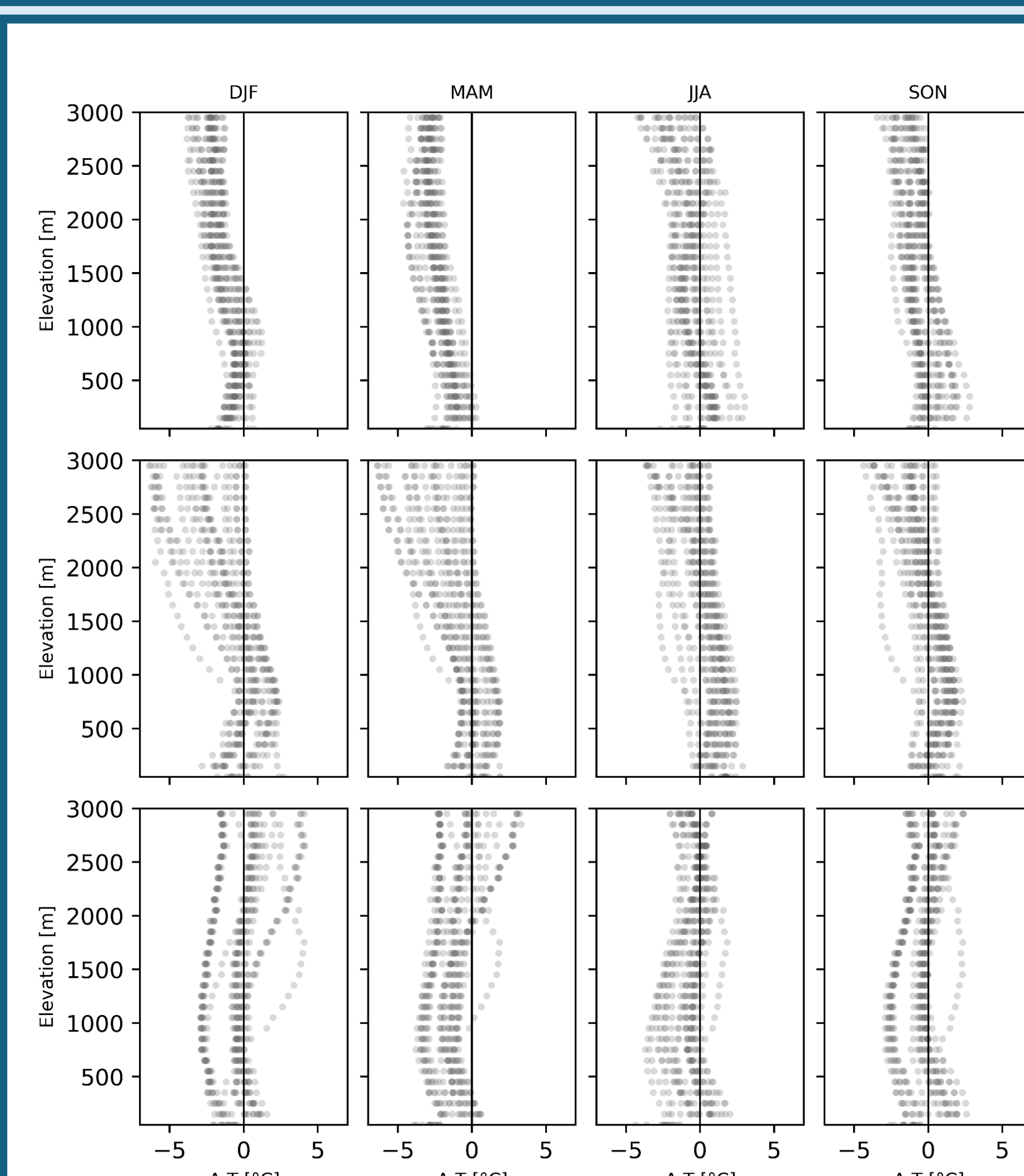


Fig. 2 Elevation-dependent bias in the CORDEX-FPS Convection models with respect to SPARTACUS for tasmax (1st row), tasmin (2nd row) and the dtr (3rd row).

PHYSICAL PROCESS UNDERSTANDING (WORK IN PROGRESS)

Figure 3

- We aim to identify processes contributing to the deficiencies in temperature representation in the CORDEX-FPS ensemble. For this purpose, we investigate the relationship of tasmin and tasmax with other potentially related climate variables.
- Simulations from the same RCMs tend to cluster together. Thus, large ensembles profit from models with various physical parameterizations, which play an important role even at high resolutions.

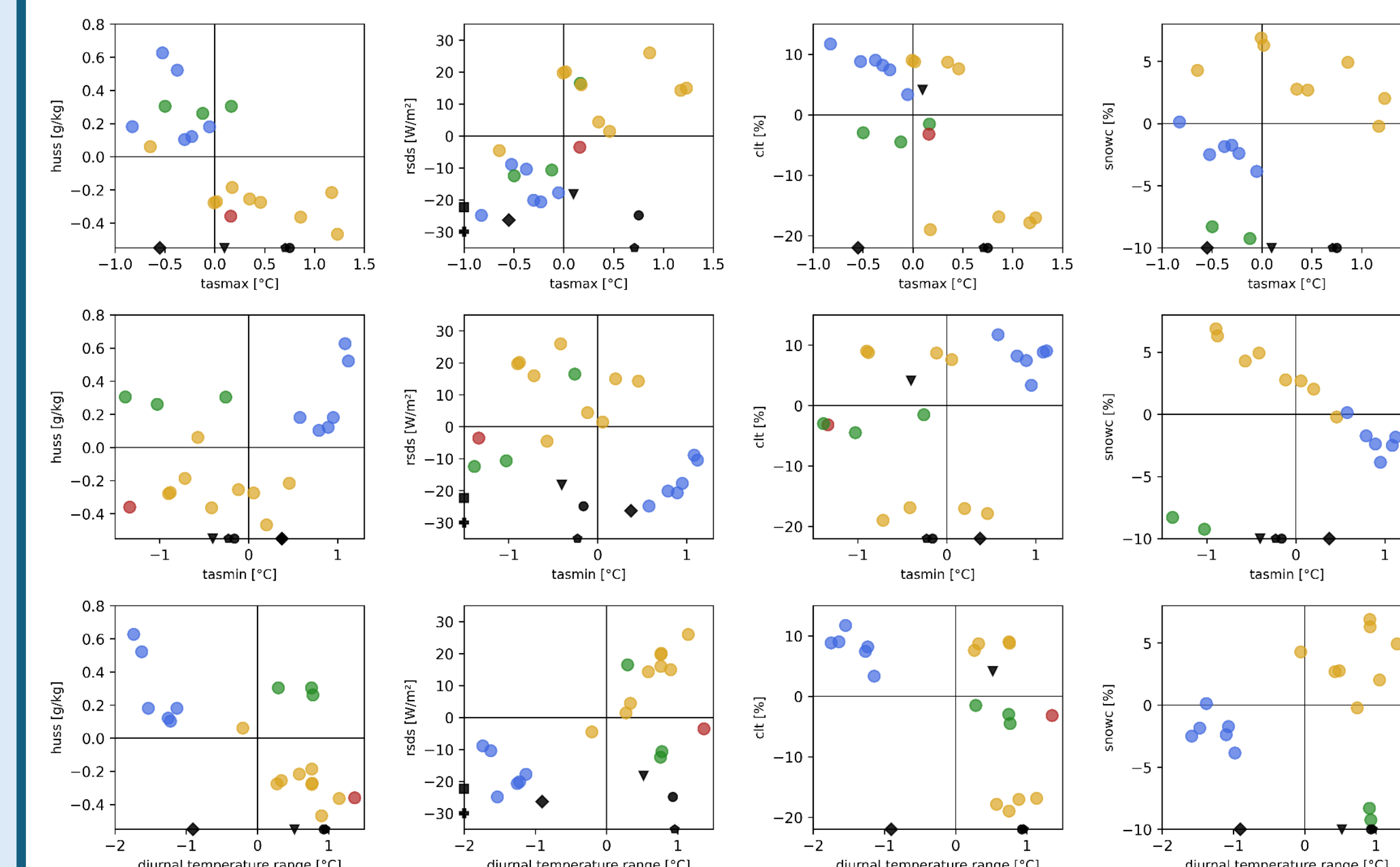


Fig. 3 Relationship between temperature (tasmax, tasmin and dtr) and a set of selected climate variables: huss, rsds, clt, snowc. All values are shown as differences from the multi-model mean. One outlying model has been omitted from this figure.

References

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Acknowledgements

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Your feedback and ideas are
very welcome!