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European temperature distribution changes in observations and climate change scenarios

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Changes in the frequency of climatological events are in general described by changes of the probability distribution function. For Central Europe, observed seasonal mean temperatures show large increases in the last few decades. Climate projections for the 21st century suggest even stronger mean changes and several models indicate additional changes in interannual variability. In this study, changes in the distribution of seasonal surface temperature are investigated for central Europe using observations and A2 and B2 scenario climate change simulations from the third assessment report of the Intergovernmental Panel on Climate Change. A piecewise detrending methodology is used to distinguish between intrinsic and trend-induced variability changes. Mean and interannual variability changes are standardized with the intrinsic variability of the respective dataset.

Within this framework, the strongest temperature changes in mean since 1990 are found for the summer season, both in observations and climate models. The largest disagreement between modelled and observed trends is found for the autumn season. No statistically significant variability changes are found in the recent observations, but there is a weak increase (decrease) in summer (winter). For the 21st century all climate scenario runs suggest large relative increases in mean for all seasons with maximum amplitude in summer. Although changes in relative variability vary substantially between models, there is a tendency for increasing (decreasing) variability in future summers (winters).