Statistical representation of temperature mean and variability in Europe

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Understanding the relationship between mean temperature and its variance is essential for the prediction of temperature variability in the European region. Results on regional temperatures have been obtained for the climate of the 21st century but they mainly focused on monthly-to-seasonal variability. Since environmental variables such as plant phenology, net primary production or atmospheric pollution react on shorter timescales, it is necessary to investigate how daily variability is related to interannual temperature changes. Here, we assess the mean-variance seasonal dependence of observed daily temperatures over Europe. We find that extreme mean temperatures in the summer and winter tend to be associated with more variance. This assessment allows us to test whether 11 climate model simulations used in the IPCC AR4 can reproduce this relationship in cold and warm seasons. Most models yield a fair performance in the winter, but apart from four models, the mean-variance relationship is underestimated in the summer.