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Evaluation of daily temperatures in an ensemble of control RCM simulations against different datasets

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The study compares results of the evaluation of daily temperatures in an ensemble of control runs (1961-1990) of regional climate models (RCMs) against different datasets representing observed data. The RCMs examined come from the RT3 dataset of project ENSEMBLES, and include i) a set of different RCMs driven by a single GCM (ECHAM5), and ii) a set of single RCM (RCA) simulations driven by different GCMs and the ERA-40 re-analysis. The observed data are represented by i) the E-Obs dataset (data gridded from a low-density station network), ii) the GriSt dataset (data gridded from a high-density station network in the Czech Republic), and iii) simple averages of station data in particular regions. We focus on daily maximum and minimum temperatures, and tails of their distributions (warm extremes in summer, cold extremes in winter).

The ability to capture the observed temperature characteristics varies substantially among the RCMs. The differences between models are generally larger in summer than winter in runs of different RCMs driven by a single GCM, while the opposite pattern is found for runs of a single RCM with different driving data (GCMs, re-analysis). This points to the fact that the formulation of an RCM plays more important role in summer while in winter, temperatures are more closely linked to atmospheric circulation, characteristics of which differ relatively little between the RCM runs and the corresponding driving GCM run. Results of the evaluation of a specific RCM considerably depend on the dataset of observations used for the comparison; while differences between the GriSt dataset and station data averages are relatively minor, mean monthly temperatures in the E-Obs dataset differ by more than 1°C from the two former datasets in some regions and some parts of year for daily temperature minima. Dependence of the evaluation of the models' performance on the observed dataset becomes particularly important for extremes of daily temperatures. Data gridded from a high-density station network should be preferred to E-Obs if the analysis focuses on specific regions and if such data are available.