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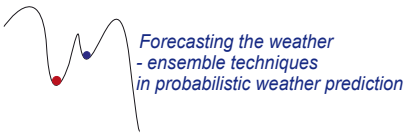

Biases in the diurnal temperature range in Central Europe in an ensemble of regional climate models and their possible causes

E. Plavcová (1,2), J. Kyselý (1), R. Beranová (1), and P. Štěpánek (3)

(1) Institute of Atmospheric Physics AV CR, Prague, Czech Republic (plavcova@ufa.cas.cz), (2) Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic, (3) Czech Hydrometeorological Institute, Brno, Czech Republic

The study examines how regional climate models (RCMs) reproduce the diurnal temperature range (DTR) in their control simulations over Central Europe. We evaluate 30-yr runs driven by perfect boundary conditions (the ERA40 reanalysis, 1961–1990) and a global climate model (ECHAM5) of an ensemble of RCMs with 25-km resolution from the ENSEMBLES project. The RCMs' performance is compared against the dataset gridded from a high-density stations network. We find that all RCMs underestimate DTR in all seasons, notwithstanding whether driven by ERA40 or ECHAM5. Underestimation is largest in summer and smallest in winter in all RCMs. The relationship of the models' errors to indices of atmospheric circulation and cloud cover is discussed to reveal possible causes of the biases. In all seasons and all simulations driven by ERA40 and ECHAM5, underestimation of DTR is larger under anticyclonic circulation and becomes smaller or negligible for cyclonic circulation. In summer and transition seasons, underestimation tends to be largest for the southeast to south flow associated with warm advection, while in winter it does not depend on flow direction. We show that the biases in DTR, which seem common to all examined RCMs, are also related to cloud cover simulation. However, there is no general tendency to overestimate total cloud amount under anticyclonic conditions in the RCMs, which suggests the large negative bias in DTR for anticyclonic circulation cannot be explained by a bias in cloudiness. Errors in simulating heat and moisture fluxes between land surface and atmosphere probably contribute to the biases in DTR as well.