3rd International Conference on Earth System Modelling
Vol. , 3ICESM-220, 2012
3rd International Conference on Earth System Modelling

Future changes of circulation types and their temperatures as simulated by climate models

E. Plavcova (1,2) and J. Kysely (1)

(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

Regional climate models (RCMs, driven by outputs from global climate models - GCMs) are the most widely used tool for simulating regional scenarios of climate change. Since projected surface air temperature changes may depend on changes of large-scale atmospheric circulation, we evaluate projected temperature changes with respect to the circulation types and changes in the frequencies of the types. The main focus is to examine changes over Central Europe as simulated in an ensemble of RCMs with high resolution (∼25 km) from the EU-FP6 ENSEMBLES project. Circulation types are classified using simple circulation indices (flow strength, direction and vorticity) derived from gridded mean sea level pressure. Temperature series (averaged over RCMs' grid points) represent a homogeneous lowland region in the Czech Republic.

The circulation types and the means of daily maximum and minimum temperatures within circulation types are compared in the control period (1961-1990) and two time slices of transient runs under the SRES A1B scenario in the first and second half of the 21st century (2021-2050 and 2071-2100). To study the influence of driving data, simulations of the driving GCMs are examined, too. The aims of the study are (i) to identify changes in the frequencies of the circulation types in the future climate scenarios in comparison to the control period, (ii) to evaluate the temperature changes for each circulation type with respect to the overall simulated temperature change in a given season, (iii) to compare the performance of the individual RCMs, and (iv) to investigate the dependence of the results on the driving GCM. We find that all models project changes of atmospheric circulation which are statistically significant, and although all models simulate warming of daily minimum and maximum temperatures in all seasons for both studied future periods, the magnitude of the warming differs for individual circulation types and models. The overall warming cannot be explained by the changes of frequencies of circulation types only.