EMS Annual Meeting Abstracts
Vol. 10, EMS2013-587, 2013
13th EMS / 11th ECAM

Estimated changes in seasonal return periods of the daily precipitation for Central/Eastern Europe using a multi-model approach

R. Pongracz, J. Bartholy, and A. Kis
Dept. of Meteorology, Eötvös Loránd University, Budapest, Hungary (prita@elte.hu)

Analysis of global climate model (GCM) simulations suggests that the return period of extreme weather events resulting in large precipitation amount is very likely to increase in Central Europe. This large scale estimation is addressed in our study by using spatially more detailed simulation results of regional climate models (RCMs). For this purpose, we analyse simulated precipitation time series of the ENSEMBLES model experiments on a seasonal scale for 1951-2100 with 25 km horizontal resolution. The evaluation of raw RCM precipitation outputs for 1951-2000 suggests that simulated values usually significantly overestimate the observations in Central/Eastern Europe, except in summer when mostly underestimations were found. These biases of the raw RCM outputs are corrected using quantile matching technique when the monthly empirical distribution functions of each grid point are fitted to the observed distribution (represented by gridded E-OBS data). Then, the calculated bias correcting factors are applied to the outputs of RCM experiments for the future 2000-2100 period taking into account the SRES A1B emission scenario, according to which CO_2 concentration by 2100 is estimated to exceed 700 ppm, i.e. more than twice of the preindustrial level.
The results for the late 21st century clearly suggest that the return period of daily precipitation occurred once in a decade on average in the recent past is very likely to increase by a factor of 1.2-2 in summer. Larger increase is estimated in the southern part of the selected domain than in the northern subregions. In winter, a slight decrease of the return period is projected in the entire Central/Eastern European region. Finally, in spring and autumn individual RCM experiments suggest slightly diverse changes in return periods of large precipitation events, which imply large uncertainty in these seasons.