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Regional climate models for the Carpathian Basin: validation and preliminary results for the future

J. Bartholy (1), G. Csima (2), A. Horanyi (2), A. Hunyady (1), I. Pieczka (1), R. Pongracz (1), G. Szepszo (2), and CS. Torma (1)

(1) Eotvos Lorand University, Department of Meteorology, Budapest, Hungary (bari@ludens.elte.hu, 00-36 1 3722904), (2) Hungarian Meteorological Service, Budapest, Hungary

Due to their coarse spatial resolution, the results from global climate models (GCM) are not capable to provide detailed regional estimations of future climate conditions. The 10-25 km horizontal resolution regional climate models (RCM) nested into GCMs are expected to improve the regional climate scenarios for the European subregions. Expected regional climate change in the Carpathian basin (located in Central/Eastern Europe) is modelled by four different RCMs. (1) Model PRECIS was developed at the UK Met Office, Hadley Centre. (2) Model RegCM was developed by Giorgi et al., it is available from the ICTP (International Centre for Theoretical Physics). (3) Model REMO was developed by the Max Planck Institute for Meteorology, Hamburg. (4) Model ALADIN/Climate was developed by Météo France on the basis of the internationally developed ALADIN modelling system. The latter one is a spectral model, while the other three RCMs use gridpoint derivatives. The horizontal resolution of the model experiments are 10 km in case of RegCM and ALADIN/Climate, and 25 km in case of PRECIS and REMO. Two of the RCMs (RegCM and PRECIS) are run by the Department of Meteorology, Eötvös Loránd University, Budapest, the other two RCMs are run by the Hungarian Meteorological Service: ALADIN/Climate and REMO. First, control runs of RegCM, PRECIS, REMO and ALADIN are compared for the 1961-1990 period using boundary conditions from the European Centre for Medium-Range Weather Forecast (ECMWF) reanalysis datasets (ERA-40). For the validation, monthly data sets of the Climate Research Unit (CRU) of the University of East Anglia are used. Then, future climate of the Carpathian basin have also been simulated by all RCMs: (1) PRECIS experiments are accomplished for 2071-2100 using A2 and B2 emission scenarios, (2) RegCM and ALADIN/Climate experiments are accomplished for 2021-2050 and 2071-2100 using A1B emission scenario, and (3) REMO experiments are accomplished for 1951-2050 using A1B emission scenario. Results of the future climate simulations are compared and evaluated.