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Application of a regional climate model mini-ensemble for the Carpathian Basin

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Recently, several regional climate models were adapted in Hungary (at the Hungarian Meteorological Service and at the Eötvös Loránd University) for the local dynamical enhancement of the global climate models for the Carpathian Basin. These models are the ALADIN-Climate model developed by Météo France on the basis of the ALADIN short range modelling system; the PRECIS model originated from the UK Met Office, Hadley Centre; the RegCM model developed by Giorgi et al. available from the ICTP (International Centre for Theoretical Physics), Trieste; and the REMO model developed by the Max Planck Institute for Meteorology in Hamburg. The four regional climate models and the completed numerical experiments are different in terms of dynamical model formulation (the ALADIN-Climate model is a spectral model, while the others are grid-point ones), physical parameterisations and resolution (10 km for ALADIN-Climate and RegCM; 25 km for PRECIS and REMO), integration domain (PRECIS and REMO contain large part of Europe, ALADIN and RegCM focus mainly on the Carpathian Basin) and lateral boundary conditions for the scenario experiments (ARPEGE/OPA with A1B emission scenario for ALADIN-Climate, HadCM3 with A2 and B2 emission scenarios for PRECIS and ECHAM5/MPI-OM with A1B emission scenario for RegCM and REMO) ensuring a reasonable level of variety addressing uncertainties in regional climate modelling. Therefore, the four regional climate models are considered as a small ensemble providing additional information about the various kinds of uncertainties in their past estimations and future projections.

The basic validation experiments are performed with re-analyses (ERA-40), perfect lateral boundary forcings. The climate change simulations are focusing on the past and future either in a time slice (ALADIN-Climate, PRECIS, RegCM) or in a transient (REMO) manner. The control runs of the four models are evaluated for the period of 1961-1990 with respect to the monthly data sets of the Climatic Research Unit (CRU). The future climate of the Carpathian Basin has been assessed by the RCMs for the periods of 2021-2050 and 2071-2100. The presentation will pay special attention to the evaluation of the projections with particular emphasis on their uncertainties for the territory of Hungary.