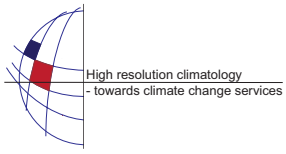
EMS Annual Meeting Abstracts
Vol. 7, EMS2010-682, 2010
10th EMS / 8th ECAC



How the climate means and extremes are projected to change in the Carpathian Basin? An analysis of RegCM simulations using A1B emission scenario

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Fine-scale features of the expected regional climate change can be analyzed and evaluated using regional climate model (RCM) experiments, which are nested in large-scale global climate models. One of the available RCMs has been applied to assess the 21st century climatic trends for the Carpathian basin (located in Eastern/Central Europe) and its vicinity. Model RegCM is a 3-dimensional, sigma-coordinate, primitive equation model, and it was originally developed by Giorgi et al. Currently, it is available from the ICTP (International Centre for Theoretical Physics). For adapting RegCM to the selected domain, the European Centre for Medium-Range Weather Forecast (ECMWF) reanalysis datasets (ERA-40) was used as boundary conditions. According to the validation results for the 1961-1990 period, seasonal mean temperature in the Carpathian Basin is generally underestimated (except winter), the annual bias is less than 0.05 °C for the grid points located within the Hungarian border. Regional seasonal precipitation amounts in 1961-1990 are overestimated by RegCM. The annual bias is +16% for the Hungarian grid points.

In the frame of the CECILIA EU-project, model experiments for three different time slices (1961-1990, 2021-2050, and 2071-2100) have been accomplished for the selected Eastern/Central European subregion. RegCM experiments used 18 vertical levels. The horizontal resolution of RegCM is 10 km, and the selected domain contains 120x100 grid points centering at 47.5°N, 18.5°E. The initial and lateral boundary conditions of the fine-resolution experiments have been provided by the ECHAM-driven RegCM simulations using 25 km horizontal resolution for the A1B emission scenario. The results suggest that the seasonal mean temperature in the selected domain is likely to increase by about 0.6-1.8°C, and 2.4-3.1°C by the middle, and the end of the 21st century, respectively (relative to the 1961-1990 reference period). Frequency of cold temperature extremes is projected to decrease significantly while warm extremes tend to occur more often in the future. Precipitation in the Carpathian basin is generally projected to decrease, especially, in summer, when the expected drying by 2071-2100 is about 18% on spatial average.