Geophysical Research Abstracts
Vol. 17, EGU2015-1131, 2015
EGU General Assembly 2015


# Study of temperature regime in Belarus according to the COSMO model simulations

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Long-term time series of meteorological and hydrological observations for the 1900–2012 period provide information about climatic fluctuations in Belarus. In particular, significant transformation of the temperature regime in Belarus has been observed only since 1970s, and since 1989 the rate of these changes has increased.

We used simulations of the COSMO model in Climate Mode (COSMO-CLM or CCLM) for detailed assessment of climatic transformations in Belarus. CCLM is a non-hydrostatic regional climate model developed from the Local Model (LM) of the German Meteorological Service by the CLM-community. The Model output (produced at the Institute of Coastal Research of HZG; the coastDatII dataset) gives a consistent and homogeneous database used for assessment of weather statistics and climate changes for the 1948 - 2012 period with spatial grid size of 0.22° in rotated coordinates. NCEP1 global reanalysis was used in simulations as forcing and boundary conditions. The observed gridded data (E-Obs v10.0; surface air temperature and precipitation) were used for verification of the model performance.

We calculated mean seasonal temperature over Belarus for the 1955-2012 and 1981-2012 periods of significant transformation of the Belorussian climate. The calculations showed differences in the coastDatII and E-Obs varied within the $\pm$0.6 to 2$^o$C range depending on the season. We found the largest deviations in winter (by 1.7 to 2.0$^o$C). In spring the differences were within the 0.8 to1.0$^o$C range, in summer within the 0.6-0.8$^o$C range and in autumn they were about 1.0 to 1.3$^o$C. For both periods, annual mean regional values differ by 0.9$^o$C. In the annual cycle, the E-Obs values were higher than coastDatII temperatures except the summer season, when the CCLM-derived temperatures exceed the observations. Comparison of seasonal temperature ranges shows a lesser amplitude in CCLM than in E-Obs. Estimates of annual temperature trends for the 1955-2012 period according to the E-Obs dataset are larger by 0.7$^o$C/decade than according to the coastDatII dataset.