Geophysical Research Abstracts,
Vol. 11, EGU2009-7791, 2009
EGU General Assembly 2009

A method of correction of regional climate model data for hydrological modelling

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Reasonable and consistent meteorological input data is a crucial factor for modelling of the river run-off at the catchment scale. The regional climate models (RCM) provide sufficient information for the hydrological modelling of impact of expected climate change on the river run-off. However, one must avoid direct usage of RCM data for the forcing of hydrological models without analysing RCM compliance with observations for the reference period. The aim of this study was to provide reasonable meteorological input data for the hydrological models to predict river run-off changes in the future.

We considered the calculations made by European RCMs organised in a database at Danish Meteorological Institute under European Commission research project "PRUDENCE" EVK2-CT2001-00132. We used the observations of air temperature and precipitation for the period 1961-1990 by Hydrometeorological Agency of the former USSR in Eastern Baltic at 32 meteorological stations for comparison with RCM data. Generally, all models reasonably represent the seasonal cycle of temperature, though they overestimate winter precipitation and underestimate summer precipitation in the study area.

We employed a method of RCM data correction, based on the shifting of the occurrence distribution of particular daily parameter (temperature or precipitation). Two cumulative probability curves – one of the observed data, and one of RCM data – were constructed for each day-of-the-year, for each parameter in each observation station. The correction function was constructed in a way to have equal probabilities of particular daily parameter. The correction functions are spatially interpolated, giving the possibility to create modified RCM. The time-series for the future climatic scenarios are obtained assuming that histogram modification algorithm is the same for present and future climate.