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Penalty function for measure of contemporary and future climate differences

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The problem of finding the locations on the globe where contemporary climate matches the future climate projections of particular region (Latvia) is addressed. The penalty function iss developed assuming usage of 30-year long time series of gridded climate parameters. The penalty function is constructed for measurement of climate deviations in two geographical locations; it accounts for seasonal cycle of temperature and precipitation regime.
The mapping of climate comparison is done between two datasets: (1) the contemporary climate (1961-1990) on the whole globe, (2) the future climate projections (2021-2100) for the Latvia. The global contemporary data from the ECMWF reanalysis data sets were used (ERA-40). The future climate projections for the Latvia were constructed by the following approach:
a) The ensemble of the regional climate model (RCM) runs from the EU ENSEMBLES project was considered.
b) The RCM outputs (temperature and precipitation) were bias corrected via statistical downscaling method (Sennikovs and Bethers, 2009) for the contemporary climate represented by the observed data series over the territory of Latvia. The downscaling method included the equalization of cumulative distrbution functions of the observed and modeled data series in a moving time window.
c) The bias correction method was applied for the future climate projections by RCMs.
d) The ramking of the severity of climate change by different models was performed for the ensemble of future climate projections. Moderate, average and significant climate change were considered as the 17th, 50th and 83rd percentile of the ensemble members.

The result of the study was the distribution of the penalty function characterising the deviation of the moderately, averagely and significantly changed Latvia climate from the the contemporary climate over the globe.

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References

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