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Evaluation of Climate Change projections to assess the potential water budget in Central Europe considering climate model uncertainty

J.C. Stagl and F. F. Hattermann

Potsdam Institute for Climate Impact Research, Climate Impacts & Vulnerabilities - Research Domain II, Potsdam, Germany (stagl@pik-potsdam.de, hattermann@pik-potsdam.de)

The uncertainties embedded in the estimation of future climate are large and only partly quantifiable. Nonetheless, adaptation to climate change requires robust information about possible regional changes. For the hydrological impact assessment dynamical or statistical downscaled global climate scenarios serve as boundary condition. Though different Global Climate Models use similar basic physical equations, they produce results, which may vary even for the same emission scenario. In order to pursue probable climate change scenarios on regional scale, as much of the uncertainty as possible should be taken into account.

An evaluation of warming scenario effects on the potential water availability in Central Europe was undertaken in order to provide first-cut estimates of regional impacts. Larger-scale studies of hydro-climatical impacts can evaluate possible future changes and identify regional sensitivities. A useful index measuring changes in the potential water budget is the Climatic Water Balance (CWB = precipitation minus potential evapotranspiration). To provide an overview of the future hydrological development in Central Europe the CWB was chosen to serve as indicator for the extent of water yield in the area and to identify inter-seasonal changes in the potential water availability.

As it is difficult to evaluate the credibility of individual climate projections, multi-model probabilistic approaches are preferable when assessing uncertainty in climate change impacts. The multi-model ensemble climate projections from the ENSEMBLES Project allowed the authors to quantify the uncertainty deriving from climate model data. Earth system models of different European institutes were combined to produce sets of climate simulations with several models, which have been developed quasi-independently. For this study 14 different RCM/GCM-combinations all using the SRES A1B emission scenario have been used to evaluate the Climatic Water Balance on a 25km spatial resolution. The results serve to quantify the range of predictive uncertainty and to allocate robust trends. After estimating the climatic forcing data uncertainty the findings will be integrated in the hydrological modeling process. As further step Climate Change impacts on characteristic biodiversity (key species) shall be derived by applying ecologically meaningful indicators.