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Simulation and analysis of the impact of projected climate change on the spatially distributed waterbalance in Thuringia, Germany

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Abstract. The impact of projected climate change on the long-term hydrological balance and seasonal variability in the federal German state of Thuringia was assessed and analysed. For this study projected climate data for the scenarios A2 and B1 were used in conjunction with a conceptual hydrological model. The downscaled climate data are based on outputs of the general circulation model ECHAM5 and provide synthetic climate time series for a large number of precipitation and climate stations in Germany for the time period of 1971 to 2100. These data were used to compute the spatially distributed hydrological quantities, i.e. precipitation, actual evapotranspiration and runoff generation with a conceptual hydrological model. This paper discusses briefly the statistical downscaling method and its validation in Thuringia and includes an overview of the hydrological model. The achieved results show that the projected climate conditions in Thuringia follow the general European climate trends – increased temperature, wetter winters, drier summers. But, in terms of the spatial distribution and interannual variability regional differences occur. The analysis showed that the general increase of the winter precipitation is more distinct in the mid-mountain region and less pronounced in the lowland whereas the decrease of summer precipitation is higher in the lowland and less distinct in the mid-mountains. The actual evapotranspiration showed a statewide increase due to higher temperatures which is largest in the summer period. The resulting runoff generation in winter was found to increase in the mid-mountains and to slightly decrease in the lowland region. In summer and fall a decrease in runoff generation was estimated for the entire area due to lower precipitation and higher evapotranspiration rates. These spatially differentiated results emphasize the need of high resolution climate input data and distributed modelling for regional impact analyses.

Full Article in PDF (PDF, 4475 KB)

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