Auswirkung von Klimaänderungen auf hydrometeorologisch relevante Parameter

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Abstract

The crucial question in calculating the evapotranspiration is whether the plant parameters for the future climate conditions are valid and how will the plant development change according to the climate change. To answer this question, the evapotranspiration under variation of the hydro-meteorological and the corresponding plant growth simulated, because the evapotranspiration and thus the entire water balance are quite decisively influenced by the plant growth.

In the present work the model SVAT - MINERVA was applied, which works on a growth model. A long series of climate data is basically used along with anticipated data from the Stations in Mecklenburg-Vorpommern region. These data are derived from the global scenario A1B from Max-Planck Institute Hamburg from which a regional downscaling has been derived. For the determination of the regional impacts of future climate changes on the water system, the statistical downscaling of the Potsdam Institute for Climate Impact Research (PIK) (Gerstengarbe et al. 1997) is used in this research.

The simulation results of model STAR are compared to those of observation are marked by an increase in temperatures of 1 °C, higher rainfall in the winter, decreasing rainfall in June, July and in summer, less global radiation with a shorter duration of sunshine and no significant change in the degree of cloud cover, relative humidity and wind speed.

The sensitivity of the calculation method of evapotranspiration on the possible changes in climate factor was analyzed according to various methods of calculation of evapotranspiration, different seasons to determine which variables are most important, and what possible scenario for climate should be taken into consideration. Thus, the evapotranspiration has a big influence with a percentage of 6.7 % when comparing relative changes of relative humidity of 10 %.

The results of the regional scenarios of the future Gerstengarbe were used as input data for being simulated and then evaluated with the water system model MINERVA. The results show a significant interaction between the changes of the water balance elements evapotranspiration, groundwater recharge and soil moisture with the temperature changes.

It was by simulation of the model MINERVA with a few examples shown that future climate changes may have a significant impact with the temperature rising above all on the development of the plant. The simulation of the water balance elements with MINERVA for the period 2003-2055 compared to the reference period 1952-2001 with the data of model STAR can be summed up by the earliness of the phenological development stages (especially: winter barley), an increase of leaf area index, a decrease of evapotranspiration during the growing season, an increase of evapotranspiration in the winter period, a decrease seepage in summer period and an increase in seepage in the winter time.