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Climate change impacts on the water balance - comparing two hydrological models with different time steps in Hungarian watersheds

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The water balance of selected watersheds in Hungary was analyzed using remote-sensing based CREMAP evapotranspiration maps (1*1 km spatial resolution). In the period of 2000-2008, the evapotranspiration (ET) and runoff (R) were about 90% and 10% of the precipitation amount in the examined watersheds. ET was analyzed in the context of Corine land cover types.
To evaluate the effects of climate change on the water balance, two robust hydrological models were developed with different time steps (long-term and monthly). The models were calibrated using the remote-sensing based CREMAP data. Long-term ET and R averages can be calculated applying a spatially distributed Budyko-model at a resolution of 1*1 km. In the case of the surplus water affected areas where ET exceeds precipitation, ET and R can be calculated with another simple model that works on the analogy of pan evaporation. To evaluate the seasonal changes of ET and soil moisture, a Thornthwaite-type monthly step water balance model was developed. Using precipitation and temperature results of regional climate model simulations as input data, we calculated the projections of the main components of the water balance. Increasing temperatures in the 21st century are projected to cause a slight increase in evapotranspiration relative to the reference period 1981–2010; this may cause a substantial reduction of long-term runoff in the examined watersheds. In the summer period, a significant decrease in soil moisture is expected. It can be more and more often below the water stress level.

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