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# RCM-based Potential Evaporation Estimates and their Importance for Low-flow Simulations under Changing Climate Conditions

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Recent climate-change impact studies indicate considerable changes in flow regimes within this century. In high latitudes, regimes with snowmelt-driven spring floods will likely feature reduced peak flows and increased winter base streamflow. Furthermore, reductions in summer precipitation accompanied by warmer temperature and increased evapotranspiration are likely to lead to longer and more severe low-flow periods during summer, which in turn can cause problems for society. However, the correct simulation of low-flow conditions under changing climate conditions is challenging to simulate for the following reasons: (1) The modeling chain including climate models, regional downscaling, bias correction and hydrological modeling provides a basis for a variety of uncertainties. (2) The combined influence of evapotranspiration and a wide range of climatic, topographic as well as geological controls on different gain and loss processes is still not fully understood. (3) Potential evaporation is an important input variable when simulating low-flow events. But it is not obvious how to best derive this variable from RCMs, i.e. directly or through empirical or physically-based relationships to other climate variables.

Our study evaluated the impact of a changing climate on low-flow conditions in five meso-scale catchments in Sweden. Streamflow was simulated with help of the HBV model driven with bias-corrected climate variables obtained from an ensemble of regional climate models (RCMs). Several potential-evapotranspiration estimates ranging from simple empirical approaches to data-intensive and rather sophisticated process-oriented methods were tested for the control period 1961-1990 and the climate-change scenario A1B 2021-2050.

We present simulated streamflow characteristics and their variability in dependence of different driving potential evaporation estimates. Preliminary results indicate that potential evaporation provided by climate-model simulations are strongly biased and not suitable for direct use in hydrological models. Using a differential split sample approach to evaluate the potential evaporation methods with respect to future changed conditions shows that some of the relationships to other climate variables (especially empirical formulae) do not necessarily hold under different climate conditions.