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Temporal stability of catchment model parameters – implications for climate impact analyses

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Analyses of climate impacts on water resources on regional or national scales, which are needed to give guidelines to future water resources management, are often based on driving conceptual hydrological models with climate change scenarios. Model parameters are commonly calibrated to observed runoff in the past, assuming that these model parameters may be also representative for the future hydrological conditions.
The objective of this study is to analyse the temporal stability of the parameter sets of a conceptual hydrological model for 270 Austrian catchments with catchment areas from 10 to 130000km^2. In Austria mean air temperature increased in the last 30 years of about 1.5°C, which resulted in higher evaporation rates and changing wetness conditions. To analyse the effect of the changes on hydrological modelling the model is calibrated to consecutive 5 years periods from 1976 to 2006 and changes in model parameters and model performance are analysed. There are significant time trends of the model parameters of snow and soil moisture accumulation. For example, the parameter of the non-linearity of runoff generation is, on average, increased for about two times. A comparison with independent data shows, that the increase in the parameter values reflects the changes in the hydrological conditions in the last 30 years. The change in the hydrological condition largely effects the prediction of runoff, e.g. using parameter sets calibrated to the colder period in the late 70th overestimates today floods of about 30%. Consequences for future climate impact analyses are discussed.