



## **Hydrological change: Three case studies in Germany to elaborate its relevance and modelling possibilities**

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This contribution presents three examples of hydrological change issues in Germany and discusses their identifiability from available data, relevance of transient boundary conditions and the options for an explorative, process-oriented modelling. The three studies are: changing seasonal runoff patterns along the Rhine River, development of the Nutrient conditions in the Middle-Havel River-lake-system, and runoff and erosion input from the Wahnbach-Catchment into a reservoir. To understand the underlying hydrological system and the changing mechanisms, analysis of time series data has been performed and process models applied. The latter ones comprise a consecutively coupled series of individual models (so-called one-way-coupling). Model systems able to reflect feedback effects (so-called two-way-couplings) are still in the development stage. It became clear that the applied model systems were able to reproduce the observed dynamics of the hydrological cycle and selected matter fluxes. However, one has to be aware that the simulated time periods and scenarios represent rather moderate transient conditions, why the one-way-coupling seems to be applicable. Furthermore, it was shown that the modelling uncertainty is considerable large. Nevertheless, this uncertainty can be distinguished from effects of an altered internal systems dynamics or from changed boundary conditions, which is a basis for the usability of such model systems for prognostic purposes.