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Process representation in hydrological models: Results from an online survey in Germany

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Different hydrological models are characterised by variations in structure, conceptualisation, parameterisation etc. Due to the individual focus and process simplifications, each model has typical strengths and weaknesses. Since there is ongoing research to improve process knowledge in models, it is in particular needed to overcome model limitations. However, up to now, there is no universal assessment available on which processes are needed to be represented better in different types of hydrological models. Thus, the most relevant deficits need to be identified representatively for a large set of different models in order to relate them to model characteristics.
Having this in mind, the working group „process representation in hydrological models“ within the German Hydrological Society (DHG) has carried out an online survey. The overall aim of this study was to collect strengths and weaknesses in hydrological models employed by German-speaking researchers. Within the questionnaire, models were asked to be characterised in terms of spatial and temporal scale as well as of typical applications. Further, it was detected how and in which complexity different hydrological processes are implemented in models. Subsequently, major limitations were inquired for each model. The aim was to search for causes of model deficits and ways to remedy them.
In our contribution, we present the major results from this online survey. Apparently, the complexity of how a certain process is implemented largely varies between the models. Based on the survey, it is possible to distinguish models in terms of their characteristics and how the different hydrological processes are implemented. Current limitations of process representation in hydrological models can be derived. This allows us to identify processes which are currently not adequately implemented in order to claim the potential for future research and to prioritize future work on model improvements. Since more than twenty models were included in this survey, ideas can be developed to remedy limitations by looking at components from other models. We hope for a fruitful discussion on current limitations of process representations in hydrological models and how to resolve them.