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Modeller's attitude in catchment modelling: a comparative study

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Ten modellers have been invited to predict, independently from each other, the discharge of the artificial Chicken Creek catchment in North-East Germany for simulation period of three years, providing them only soil texture, terrain and meteorological data. No data concerning the discharge or other sources of state variables and fluxes within the catchment have been provided. Modellers had however the opportunity to visit the experimental catchment and inspect areal photos of the catchments since its initial development stage.
This study has been a unique comparative study focussing on how different modellers deal with the key issues in predicting the discharge in ungauged catchments: 1) choice of the model structure; 2) identification of model parameters; 3) identification of model initial and boundary conditions.
The first general lesson learned during this study was that the modeller is just part of the entire modelling process and has a major bearing on the model results, particularly in ungauged catchments where there are more degrees of freedom in making modelling decisions. Modellers' attitudes during the stages of the model implementation and parameterisation have been deeply influenced by their own experience from previous modelling studies. A common outcome was that modellers have been mainly oriented to apply process-based models able to exploit the available data concerning the physical properties of the catchment and therefore could be more suitable to cope with the lack of data concerning state variables or fluxes.
The second general lesson learned during this study was the role of dominant processes. We believed that the modelling task would have been much easier in an artificial catchment, where heterogeneity were expected to be negligible and processes simpler, than in catchments that have evolved over a longer time period. The results of the models were expected to converge, and this would have been a good starting point to proceed for a model comparison in natural, more challenging catchments. This model comparison showed instead that even a small artificial catchment exhibits heterogeneities which lead to similar modelling problems as in natural catchments. We also verified that qualitative knowledge of the potential surface processes, such as that could be gained by visual inspection of the catchment (erosion marks, canopy features, soil crusting, ect.), have been vastly employed by the modellers to guess the dominant processes to be modelled and therefore to make choices on model structure and guesses of model parameters.
The two lessons learned from this intercomparison study are closely linked. The experience of a modeller is crucial in the (subjective) process of deciding upon the dominant processes that seem to be sufficiently important to be incorporated into the model. On the other hand, the cumulated experience will also play an important role in how different pieces of evidence from, for example, field inspections, will modify the initial conceptual understanding.