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Hydrology and Earth System Sciences Discussions

Interactive comment on "Comparing model performance of two rainfall-runoff models in the Rhine basin using different atmospheric forcing data sets" *by* A. H. te Linde et al.

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The referee agrees that HBV is a conceptual model, but states that VIC is not a physically based model. VIC does incorporate a physically based soil-vegetation atmosphere transfer scheme (SVATS), as we state in the paper, but the referee claims that the SVATS is part of the forcing and not of the hydrological model component. The referee further explains on which conceptual model concepts VIC is based, both at the pixel scale of the hydrological component and in the routing component.

We very much appreciate that Ref 1 provided such an elaborate review on VIC and agree on most comments made by the referee. Although it is (and we think it should be) hard to draw a line between atmospherical and hydrological models, we counter argue the statement that the SVATS is part of the forcing. The SVATS is a physically based description of processes occurring at the land and vegetation surface, and it uses meteorological parameters like rainfall, temperature, radiation and wind speed as input parameters. It are those parameters we consider as forcing, which the SVATS in VIC uses to estimate hydrological partitioning, including a description of partioning of available energy, into evaporation rates and remaining volumes for infiltration into the soil. Many hydrological models use these same forcing data (precipitation and temperature), but only an empirical method to estimate evaporation.

We agree to modify the paper by eliminating any description of VIC being a physically based model and will explain VIC as a land-surface model with a physically-based SVATS (Hurkmans et al., 2008).

Another issue Ref 1 raises is the use of models in climate change studies. Ref 1 states that a model used in climate studies should not require calibration, because most of the pixels in the world will not have actual data for calibration. Here we want to discriminate two issues in our reply concerning modeling the effect of climate change on river discharges; 1) modelling gauged or ungauged catchments, and 2) model performance on currently observed discharge. First, next to the observation that many river basins where climate change is a problem, or might become one, are densely populated and often well documented (Kundzewicz et al., 2007), we think that what model to use in ungauged catchments is a discussion that is not inherently related to climate change studies. In case of ungauged catchments, it might be possible to use models that are calibrated for gauged catchments with similar properties and scale, or indeed, one might estimate physically meaningful quantities from maps and not calibrate the model. If the subject of study is a gauged catchment, or multiple gauged catchments, we argue that you should calibrate your model. Calibration methods and focus will depend on the final application of the model (Refsgaard, 1997; Troy et al., 2007). Second, deriving 'lumped physically based models' by lumping the results of 'distributed

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physically based models', as the referee explains is the line in present research, might have restrictions. The issue we raise in our conclusions on calculation time, can be an important restraining factor in model application when many scenarios are explored and long time scales (in the order of 50 - 100 years) are concerned, which is often the case in climate scenario studies. To conclude this issue, we raise the question that if the hydrological model used in climate change scenarios is not able to properly simulate current discharge behavior, what credibility can simulated future discharges ever have?

Hurkmans, R.T.W., De Moel, H., Aerts, J.C.J.H. and Troch, P.A., 2008. Water balance model versus Land surface scheme to model river Rhine discharges. Water Resources Research, 44(W01418).

Kundzewicz, Z.W. et al., 2007. Freshwater resources and their management. In: M.L. Parry, O.F. Conziani, J.P. Palutikof, P.J. Van der Linden and C.E. Hanson (Editors), Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II tot the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, pp. 173-210.

Refsgaard, J.C., 1997. Parameterisation, calibration and validation of distributed hydrological models. J Hydrol, 198: 69-97.

Troy, T., Sheffield, J. and Wood, E., 2007. Temporal and spatial scales in hydrological model calibration, European Geosciences Union General Assembly 2007. Geophysical Research Abstracts. EGU, Vienna, Austria.

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