Hydrology and Earth System Sciences Discussions

Interactive comment on "*HESS Opinions* "Topography driven conceptual modelling (FLEX-Topo)"" *by* H. H. G. Savenije

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I enjoyed very much reading this opinion paper as well as the reviewer opinions and Hubert's responses. This is the kind of discussion the theme editors of this special issue hoped to initiate.

I pretty much agree with Hubert's opinion that the landscape is organised in sense that landuse and hillslope morphology are not independent (even if I agree there might be dissent about the concrete landuse patterns Hubert proposed in his paper). I would like to add that also soil and hillslope morphology are not independent, as topography controls lateral redistribution of weathered material, similar depth to groundwater depends - which affects chemical weathering and soil formation, depends on topography.

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A second important point in the paper is spatial organisation in the landscape controls spatial organisation of hydrological processes and I agree that dominating processes are controlled by typical structures/ elements in the landscape. Again I would like to add that the dominant structure depends on scale and the hillslope is, as Hubert pointed out, of key importance in intermediate systems.

This brings us to an important point that has not been addressed neither in the classification schemes of Naef or Uhlenbrook, nor in Huberts blueprint: upslope and mid landscape elements get connected by means of lateral flows during rainfall driven conditions. A realistic model structure that moves beyond a pure response model should to my perception allow for lateral exchange and represent the controlling structures.

A core idea of the proposed flexible model approach is a reduction of the degrees of freedom of the model identification and estimation process. I agree that this can be achieved by improving the realism of the model structure in a sense that it accounts for the dominating structures. This brings us to the "proof of the pudding" image that Hubert introduced in his reviewer responses: a realistic model should to my perception be based on a realistic representation of key structures in the model geometry. This is well known in hydromechanics but, to my surprise, strongly ignored in hydrology. For instance the spectrum of residence times is determined by subsurface storage volumes/ flow paths and the spectrum of flow velocities in the subsurface (time=path/velocity). By constraining the size of subsurface store based on available estimates (geological maps or geophysical exploration) we can thus reduce the uncertainty in flow velocities. I would like to challenge the author to provide his opinion on how to include structural/geometrical data into his model blueprint.

Best regards,

Erwin Zehe

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