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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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As suggested by the author during the EGU Leonardo Conference in Luxembourg, we submit our contribution to the open discussions on the paper "Topography driven conceptual modelling (FLEX-Topo)".

We appreciate the author's attempt to identify a practical classification scheme, since identification and classification of the dominant mechanisms controlling runoff generation are of great importance if we are to successfully advance hydrologic sciences beyond the individual study catchment (e.g. McDonnell & Woods, 2004; Wagener et al., 2007). We also agree that such approaches necessarily involve generalizations and simplifications to embrace the enormous complexity and variability found in environ-

mental systems (Sivapalan, 2005). However, such simplifications need to be carefully balanced and justified. We have a few remarks on the suggested approach that a priori limits such classification efforts to one of the most readily-measured catchment entity: topography. We believe this work could be improved by addressing the following questions: What are the major studies in the past that have already focused on topographic controls? How are the terms cited in this opinion explicitly defined (wetland, topography, geology, etc)? In which biomes and at what scale should topography emerge as the dominant mechanism controlling runoff generation? How does the model structure account for landscape connectivity?

Context in the literature:

Scientific opinions should reflect the historic and contemporary paradigms relating to the topic (topography in this case). The reconciliation of this opinion with the literature should build a framework upon which the final conclusion of the suggested topography-based classification scheme rests. The previous work of others which demonstrated the importance, and potential inadequacies, of topography in explaining runoff are not included (e.g. Beven & Kirkby, 1979; Buttle et al 2001). Others have sought to identify classification schemes and have arrived at markedly different conclusions than this opinion (Devito et al., 2005). As such it is not yet clear how the proposed concept would advance our current understanding of hydrologic modeling.

Definition of scientific terms:

It is altogether confusing to use terms in a manner that is inconsistent with their use in other disciplines (i.e. wetlands). While topography is the named focus of the opinion, it is not explicitly defined and in many ways more resembles to geomorphology, a study of the processes which give rise to the form and shape of a landscape. The terms “hillslope”, “plateau” and “wetland” lack adequate description. Hillslope and plateau are distinctly geomorphic descriptors while wetland is an ecologically-defined habitat, which can be located on plateaus, hillslopes or in a floodplain. Also, is the term “geol-

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ogy" most adapted to illustrate subsurface runoff processes? Subsurface flow in some systems occurs mainly in the soil and underlying saprolite and not in the geological setting.

Scaling question:

It is not clear at which scale, or in which biome, the author intends the classification scheme to be applied. Is topographic classification suitable at scales and across all biomes? Are tropical hillslopes comparable to hillsopes of cold, temperate climates? Is this classification suitable for all slope values and shapes? Also, landuse on these topographically-defined areas varies globally. In some regions, significant hill slope areas also are used for pasture and agriculture, even when steeply sloped.

Model structure and connectivity:

There is one problem that appears after a close look at the suggested model structure. Three different independent model entities are presented and defined according to the classification scheme. None of the different reservoirs between these three model structures appear connected to each other. This would imply that, for instance, groundwater recharge on the plateau would have no impact at all on the groundwater balance of the wetland whereupon the latter would be completely dependant on the rainfall input that fell solely on the wetland area. The model structure does not appear to incorporate connectivity amongst landscape components, despite the increasing importance of connectivity in hydrologic modeling (Bracken and Croke, 2007).

Literature:

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Comment by L. Pfister, F. Fenicia, J. Frentress, L. Gourdol, C. Hissler, J.-F. Iffly, J. Juilleret, R. Krier, N. Martínez-Carreras and S. Wrede

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