Hydrol. Earth Syst. Sci. Discuss., 7, C3553–C3555, 2010
www.hydrol-earth-syst-sci-discuss.net/7/C3553/2010/

Hydrology and Earth System Sciences Discussions

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

S. Bàrdossy (Referee)

bardossy@iws.uni-stuttgart.de

Received and published: 22 November 2010

I enjoyed vey much reading the discussion paper by H.H.G. Savenije. It is of great importance to publish opinion papers which do not only present new models with applications but concepts how to develop new ones. In this sense my thoughts should not be understood as a review but as an opinion.

To the issue:

Modelling is not an exercise without purpose. Only the physically based models developed from the ants' perspective claim to be universal (thus purposeless). Complex questions such as water quality modelling or prediction of the effects of changes in land

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

use require different approaches for runoff modelling. This point is of great importance for model choice.

Topography is of central importance for hydrology. The interaction between topography and water takes place on different time scales. On long time scales water forms the landscape changes the topography through erosion and deposition (with the tendency to bring the hills down). On short time scales topography determines the flow of water on a large extent.

A clear advantage in using topography for hydrological modelling is the availability of accurate topographical maps in digital form. Land use information is also available in high resolution in a somewhat less accurate form.

The relationship between topography and land use is evident – but in my opinion not as simple as described in this paper. Landscapes in Europe show strong anthropogenic influences. Land use is not only topography driven – the agricultural policy made in Brussels has a substantial effect on land use changes.

Forests play a decisive role for hydrology. Reforestations and afforestativs (in the recent past) had (and will have) a substation influence on runoff production. I do not fully agree with the arguments concerning well draining hillshopes under forests. Forrest strips can often be found along water flows. These can tolerate long periods of saturated overland conditions. I am not a forest specialist but I think forests can tolerate more than other vegetation – even in surplus water. Further the precipitation in the dormant season (in some regions falling in the form of snow) does not cause any problems of excess water. In case of relatively dry summer climates drainage is counter productive. Thus the assumption that forested hillshopes are mainly responsible for runoff production might only be valid under specific climatic and geological conditions. Plateaus might contribute to runoff for example in the Andes where high plateaus with practically no vegetation but substantial precipitation provide a considerable amount of runoff.

The influence of geology is more difficult to understand than that of the topography.

HESSD

7, C3553–C3555, 2010

One reason for this is that for the below surface conditions (soils and geology) we do not have as accurate observations as on the surface. Nevertheless the influence of geology can be dominant, for example if one is confronted with the nightmare of hydrological modelling in karstic areas. Drainage density maps are sometimes good indicators for subsurface geological conditions.

Climate is a major driver to which ecosystems have to adjust. Obviously climate and topography lead to specific patterns with corresponding effects in hydrology.

The model concept presented in this paper is reasonable and simple. Under specific circumstances it might offer a good alternative to existing concepts. But in my opinion the purpose and the available data are also very decisive for the choice of an appropriate modelling tool. My experience shows that the most important tasks of hydrological modelling are the clear formulation of the problem and the understanding of main hydrological processes of the region. Model choice is important, but looking at the computer code of many hydrological models one might conclude that the essential equations are contained in less than 5 % of the code – the rest in organisation exchange – input and output preparation. Thus my philosophy remains "anarchistic" to find (or devise) and apply a model specific for the problem, natural conditions and available data. The presented work provides a reasonable extension of the available tools for which I am grateful to the author.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 4635, 2010.