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Linking Ecology and Hydrology: a key to solve the PUB problem?

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Application of process based models but also our process understanding is, due to numerical reasons and data requirements as well as incompatibility of measurement and process scale, restricted to the hillslope and small catchment scale. Therefore conceptual hydrological models are nowadays still widely used at the meso-scale although we are well aware that these do not resolve spatial variability of input data and are based on non-observable state measure and oversimplified processes descriptions. The PUB initiative Prediction of Ungauged Basin recently launched by the IAHS, shows that a growing number of scientists feels that currently available tools are insufficient to meet current and future challenges in Hydrology. The overall goal of the PUB initiative is therefore development of models/predictive tools which are abased on understanding how the landscape and it?s dominating structures determine hydrological processes in different hydro-climates, b) based on observable parameters and commensurable state measures and allow c) therefore better predictions and with a minimum amount of necessary calibration. To reach these goals it is, from our point of view, necessary to combine top down and bottom up thinking in hydrology. Following the pattern-process paradigm from theoretical ecology we believe that equilibrium states of a landscape/catchment reflect a balance of external disturbances and ?internal? forces, which lead on the long term to typical, spatially organized patterns of vegetation and soils as response to the hydro-climatic and geological conditions. On the ?short term? these typical patterns and structures in a landscape cause process similarity i.e. a typical process generic spectrum which dominates the water balance/hydrological cycle in a specific landscape and hydro-climate. Future hydrological models should be more landscape specific as in the past i.e. pre-tailored to represent typical structures and

process spectra. On the other hand future hydrological models should be derived from first principles and avoid ad hoc assumptions. Within the context we will discuss examples of how hydrology may benefit from ecological methods/theory e.g. to optimise measurement networks within integrated process studies or for ?dynamical upscaling? of local observations to the catchment scale. We will discuss furthermore a suitable framework for deriving a future generation of hydrological for the mesoscale based on the concept of the representative elementary watershed, how effects of subscale heterogeneity may be represented within this approach as well as the question coupling ecological and hydrological models.