Eawag
Überlandstrasse 133
8600 Dübendorf
Switzerland
Phone +41 (0)58 765 53 61
Fax +41 (0)58 765 53 75
info@eawag.ch
www.eawag.ch

Eawag Seminar Invitation

Modelling Catchments as Meta-Organisms

Speaker **Prof. dr. ir. Hubert H.G. Savenije,**
Delft University of Technology, Netherlands

When **March 9, 11.00 – 12.00 a.m.**

Where **Forum Chriesbach, room C20, Eawag Dübendorf**

Abstract Hydrological models frequently miss essential characteristics of hydrological functioning. The most important active agent in catchments is the ecosystem, which manipulates and partitions moisture in a way that it supports the essential functions of survival and productivity: infiltration of water, retention of moisture, mobilization and retention of nutrients, and drainage. Ecosystems do this in the most efficient way, establishing a continuous, ever-evolving feedback with the landscape and climatic drivers. In brief, hydrological systems are alive and have a strong capacity to adjust themselves to prevailing and changing environmental conditions. Although most models take Newtonian theory at heart, what they generally miss is Darwinian theory on how an ecosystem evolves and manipulates its environment to maintain crucial hydrological functions.

In addition, catchments, such as many other natural systems, develop emergent patterns of spatial organization, including surface and subsurface drainage patterns. Surprisingly, accounting for such patterns makes models simpler even in highly heterogeneous environments. Models that fail to account for these patterns, miss a critical element of how systems at the interface of atmosphere, biosphere and geosphere function. Moreover, such models are generally far to complex, requiring a myriad of distributed parameters, a lot of computational power and suffering from equifinality, but moreover missing the essential physics of self-organisation, even though they claim to be "physically based".

In contrast to what is widely believed, relatively simple, semi-distributed conceptual models have the potential to accommodate patterns and their temporal evolution in an efficient way. A reason for that being that because their parameters are effective at the modelling scale, and integrate natural heterogeneity, they may be directly inferred from observations at the same scale, reducing the need for calibration. In particular, the emergence of new and more detailed observation systems from space will further permit the development of relatively simple time-dynamic functional relationships that can represent spatial patterns and their evolution over time even in poorly gauged environments.