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Top-down watershed behavior description

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Watershed is perceived as a system using a top-down approach, i.e. as an *emergent* whole structure without subdivision by small connected parts. There are no mathematical mappings for such large scale structure behavior description. Only some understanding of physical processes is available that is known as a system conceptual structure.

Given a *conceptual model* and system *observation* series, the mathematical model (mappings) structure is proposed to be estimated via Bayesian Estimation of Structure (BESt) method, so that the theoretical understanding is fused with information derived from available measurements. A mathematical structure (mapping) is seen here as a conditional probability density function for a response variable given variables it depends on.

For the study the following conceptual model is used: it takes precipitation, potential evapotranspiration, and temperature as inputs, it has areal soil moisture storage and snow storage as its states, and it produces outflow and actual evapotranspiration as outputs. The model accounts for liquid/solid precipitation and for snow melt. A conceptual model used reflects hydrological *basic* understanding about the processes *without* additional strong assumptions. The appropriateness of the conceptual model is tested on different *time-scales*: monthly, semi-monthly, weekly, and daily using data from a small scale (100 km^2) watershed, Weida catchment, Germany.