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Derivation of mesoscale water balance model parameters from runoff process maps: consistent scaling of runoff-specific parameter sets.

Catchments often show highly inhomogeneous runoff generation behavior in space. This inhomogeneity is usually not represented by lumped mesoscale water balance models. These models have quite abstract model assumptions and thus the resulting parameters are abstract, too – they do not have obvious dependencies to physical properties of the catchment's soils. As a result, the same parameter set is typically used for the different model elements of a catchment. The model reacts in a homogenous way: it does not represent the spatial variability of the catchment. Then again, maps exist that indicate the dominant runoff processes. Newer approaches derive the process from a set of properties using a model, e. g. artificial neural networks. Thus, the maps cover larger areas and provide spatial information about the distribution of runoff processes in a catchment. To use this information in inhomogeneous model parameter identification, we firstly identified parameter prototypes resulting in a runoff behavior of single model elements that corresponds to the hydrological comprehension of the process. But for usage in different catchments, these parameter prototypes have to be adjusted or scaled. To solve this consistently with respect to the processes indicated by the map, two new parameters have been introduced: balance and damping. They scale and adjust the whole parameter set for all processes without destroying the spatial pattern of the runoff process distribution indicated by the map. Furthermore, the two parameters do have minimal parameter interaction: adjusting the balance does not influence the damping and vice versa. As a result, the representation of spatial runoff process distribution in models has been enhanced and, at the same time, made the model calibration process easier and more transparent.