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Improving the conceptualization of the evaporation flux in conceptual rainfall-runoff models by using remotely sensed catchment scale evaporation estimates.

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If we look at how evaporation is modelled in commonly used lumped conceptual rainfall-runoff models, the static nature of the conceptualization is striking. In this conceptualization the evaporation flux usually is linearly related to the relative soil moisture content until a certain threshold is reached, after which evaporation takes place at the potential rate. The potential evaporation is a function of meteorological parameters, sometimes it includes a surface resistance term or a scaling factor to account for different land use types in the catchment. Vegetation specific variables and the dynamics associated with the seasons (e.g. phenology, effects of soil temperature) are generally not explicitly taken into account. This means that the dynamic character of evaporation in these lumped rainfall-runoff models is only expressed by the dynamics in water availability – i.e. a function of precipitation (model input) and the partitioning of water – and a form of available energy for vaporization. Moreover, the modeled evaporation flux is the aggregated flux over the entire catchment. How can spatial variability in the temporal dynamics be expressed in these models? In other words, to what extent does the modeled evaporation flux represent the 'real' evaporation integrated over the entire catchment?
Since temporally continuous evaporation observations are not available at the scale of the catchment this cannot be tested straightforwardly. What is available is a range of remote sensing techniques for upscaling point measurements of evaporation to the catchment scale or to estimate evaporation from thermal images. In this research catchment scale evaporation estimates from the SEBS algorithm combined with optical remote sensing data are explored. This provides snapshots of the spatial variability of evaporation throughout the year, which can be used to determine homogeneous functional areas within the catchment with comparable temporal dynamics in evaporation. With that information the switch to a semi-distributed model can be made, providing the possibility to capture more of the spatial and temporal character of evaporation by adjusting the conceptualization and/or parameterization of the evaporation flux per 'functional area'. We analyze the value of the ancillary remote sensing evaporation data and whether we can use this data to actually improve the conceptualization of the evaporation flux and therewith model performance.