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# Understanding key hydrological processes in a meso-scale semi-arid catchment in Tanzania by using a multi-method approach

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Understanding hydrological processes in poorly or ungauged catchments is of utmost importance for the management of water resources. This paper shows that a high resolution time series of hydrological data (rainfall, evaporation and runoff) collected over a limited period of time (i.e. 1.5 years), can give a good picture of the hydrological processes occurring in a 25 km2 catchment in Tanzania (Vudee catchment). In addition, several techniques, incl. tracer and mapping studies, have been applied to identify flow paths and contribution from different sources. All this information was used for the development of a conceptual hydrological model.

The conceptual model is based on the Lumped Elementary Watershed (LEW) concept, restructured for hourly time steps. An additional flux, representing the drainage into the neighbouring catchment, identified using a multi-method approach, increased the model performance significantly, particularly related to a recession curve occurring at high flows. This corroborates the assumption that there is water draining towards the neighbouring catchment. The model runs show that surface runoff only occurs during heavy rains or directly thereafter, which is consistent with results from hydrograph separation. Overall, the major part of the runoff is generated by groundwater. Moreover, the model shows that the unsaturated zone has a relatively large storage capacity.

At the meso-scale, hydrological processes are governed by a sub-daily timescale. As a result, only a high resolution conceptual model is able to mimic the hydrological processes accurately. By applying the LEW model, incorporating the hydrological processes as observed in the catchment, a better understanding has been obtained of the dominant hydrological processes at this scale. This is a prerequisite for sustainable management of the water resources in a water scarce region.