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Understanding hydrological processes around groundwater dams in Kenya

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Soil and water conservation is a high priority in sub-Saharan Africa. Different types of water retaining structures have become important in this region. They store water in (sub)surface reservoirs for livestock, minor irrigation and domestic use. Structures involved can be divided into two types: “in-stream”, catching water flows in river beds and “off-stream”, catching overland flow. Groundwater dams are in-stream structures; hundreds of these dams have been built in Kenya. The basic principle of a groundwater dam is that water is stored underground, instead of in surface reservoirs. Evaporation losses and contamination risks are thus reduced. Groundwater storage represents an upgrading of existing and hence socially acceptable water sources (scoop holes, hand-dug wells). The sub-surface reservoirs are recharged through flash floods originating from rainfall events. A single flash flood may fully recharge a reservoir. Upon saturation of the reservoir, remaining floods will pass without further infiltration. Most existing hydrological analyses for this type of dams are based on water balance models and tend to ignore spatial and temporal realities in hydrological patterns. These models mainly conclude that dams will always be full. However, combined effects of factors like effective storage, location and use on dam performance are not well understood yet. As existing groundwater models tend to focus on larger scales than of interest for understanding individual dams and demand more input than available, a dedicated model was designed to understand hydrological processes and flows around the dam. Different water use scenarios were studied. This contribution will discuss the model, the scenarios and the results.