

Hydrological Response of a Catchment to Climate and Land Use Changes in Tropical Africa: Case Study South Central Ethiopia

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A hydrological model at catchment scale was used to investigate the impact of climatic and land use changes on water resources in tropical Africa using a distributed precipitation-runoff modelling system. The model divides a catchment into homogeneous hydrological response units, providing the ability to impose changes in climate or land use spatially. Model parameters were either estimated from different existing data, as data in the region is generally sparse, or calibrated against measured discharge data available over 11 years (1985–1995). The model simulation-period was divided into calibration (1986–1990) and validation (1991–1995) periods. The model provided relatively good fits between measured and simulated discharge at daily and monthly scales. Based on sensitivity analysis, a 10% decrease in rainfall produced a 30% reduction on the simulated hydrologic response of the catchment, while a 1.5 °C increase in air temperature would result in a decrease in the simulated discharge of about 15%.

The model also showed, that discharge at the outlet of the studied river basin would decrease by around 8% when current land use, predominantly cultivation and grazing, would be converted into woodland.

To facilitate the utilisation of the model for decision making and water resources management, it should be tested under different environmental scenarios. Rainfall measurements and stage-discharge rating curves should be given priority to improve model performance.