

Modeling the Influence of Vegetation Dynamics on the hydrology of Awash River Basin using Semi-distributed Hydrologic Model

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Abstract

The effects of vegetation dynamics on hydrologic processes can be viewed as a two way stimulus-response of a watershed to moisture and energy flux. This study used the semi-distributed USGS Flood/Famine Early Warning System Stream Flow Model (FEWS-SFM) to evaluate the influence of vegetation dynamics on the hydrologic response of the Awash River basin, Ethiopia. The modeling result shows the basin loss is the most sensitive parameter. The Nash and Sutcliff goodness of fit criteria (E) was used for testing the model performance. E = 0.63 was obtained for the calibration and the verification yield E = 0.6 for a daily time series of five years, respectively. The output hydrographs exhibited the rising and falling limb of the simulated and calibrated hydrographs reveal higher deviation from the observed hydrograph. The beginning of wet season is where the model failed to capture the measured flow patterns, and this is the time of vegetation bloom in grasslands and agricultural lands. Being not in grid-based hydraulics, the sensitivity of change in vegetation cover in plot level are not visible unless a long time series data of all the necessary quantities are present. The analysis indicates the need to couple explicit eco-hydrological dynamics in rainfall-runoff simulation and further study is underway to understand the process.

Key terms: Eco-hydrology, Awash River, FEWS-SFM, Hydrologic Model

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