Simulation of hydrological processes in the Simiyu River, tributary of Lake Victoria, Tanzania

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Abstract

A spatially-distributed hydrologic model (WetSpa) is used to simulate hydrologic processes in the Simiyu River, a tributary of Lake Victoria, Tanzania. The model combines digital maps of topography, land-use and soil texture with observed daily meteorological time series to predict discharge hydrographs and spatial distribution of hydrologic parameters in the basin. The model was calibrated using 3 years of daily observed discharge measured at the mouth of the river at Lake Victoria. The estimated average travel time of the runoff to the outlet of the basin is about 2.4 days and a maximum of 8 days for the most remote areas. The model results show that the surface runoff and interflow provide, respectively, 38.6% and 61.4% of the total discharge, while the contribution of groundwater drainage is about nil. The absence of groundwater drainage is likely due to the high evaporative demand of the atmosphere, which accounts for about 90% of the total precipitation being lost by evapotranspiration. The annual water balance estimated with the model reveals that the total outflow to Lake Victoria is about 475 x 106 m³ per year, which occurs mainly in the wet seasons, i.e. from March to May and from November to January. The discharge volume produced by agricultural land amounts to about 43 x 106 m³ and may carry agrochemicals to Lake Victoria.

Keywords: Hydrologic modelling, Simiyu River, Lake Victoria, WetSpa, Tanzania