

Regional Analysis of Conceptual Rainfall Runoff Models for Runoff Simulation In Ungauged Catchments: The Case Of Upper Ewaso Ng'iro Drainage Basin in Kenya

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Abstract

Two rainfall-runoff models were calibrated and regionalized using data from upper Ewaso Ng'iro drainage basin in Kenya. The two models were Nash Cascade-Diskin Infiltration (NCDI) model and Nash Cascade-Green Ampt Infiltration (NCGAI) model. Both models have physical and conceptual parameters. The former were derived from catchment characteristics by overlaying land cover and soil types within the framework of GIS. The latter were optimized using Schuffled Complex Evolution (SCE-UA) optimization algorithm. The conceptual parameters so determined were correlated with catchment physical parameters in a regionalisation process.

This involved, in the case of suction at the wetting front and hydraulic conductivity, deriving the parameter values from soil texture. The remaining conceptual parameters were regionalised through stepwise optimization and adjustment of boundary conditions. The parameters realised were correlated with catchment characteristics through regression analysis in which values of R² ranging from 0.92 to 0.99 were obtained. The regionalised models were then used to simulate runoff from the five catchments upon which satisfactory results were realised.

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