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Stream Flow Modeling In Gin River Basin Using Swat Cup

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Abstract

Around the world, human activity and natural forces are reducing available water resources. Rivers play a vital role to provide the water requirements of humans and nature. The stream flow of a river is affected by both natural and human factors. River (stream) flow is generally simulated by using mathematical models, and they can be used to evaluate the response of rivers to changes in flow parameters. River Gin Ganga in the south of Sri Lanka, draining an area of 865.5 km², is subject to rapid changes in land use apart from climate variability. In order to simulate the stream flow of Gin Ganga a SWAT (Soil and Water Assessment Tool) model (consisting of 43 sub-basins) was set-up, calibrated and validated. The model is calibrated (1983-1989) and validated (1990-1994) against monthly measured discharge at one location by using Sequential Uncertainty Fitting version 2 (SUFI-2) techniques. The performance of the calibration was evaluated using five objective functions including the coefficient of determination (R^2), Nash-Sutcliff (NS) efficiency P-factor, R-factor and coefficient of determination divided by coefficient of regression (bR^2). The model simulates the stream flow for 22 years. The Curve Number (CN2) parameter of the model was identified as the most sensitive and critical parameter (which had a positive correlation with runoff) for model calibration. The calibrated model may be further improved with measured river discharge data at other locations (if and when available). The model can be further used for analyzing: impacts of climatic and land use changes, sediment yields, water quality and flood risk.

Keywords: Gin Ganga, Modelling, Stream flow, SUFI-2, SWAT