# CALIBRATION AND VALIDATION OF SWAT HYDROLOGICAL MODEL FOR SAPUCAÍ RIVER BASIN, BRAZIL

**Authors:** Matheus Fonseca Durães; Carlos Rogério de Mello and Nilton Curi

Federal University of Lavras, Minas Gerais, Brazil – mattduraes@yahoo.com.br

## INTRODUCTION

Simulating the hydrologic pattern of river basins is one of the most important tools for natural resources management as it allows forecasting the impacts of land use changes on the hydrology of a given basin (Durães et al., 2011).

SWAT was developed by the USDA Agricultural Research Service (ARS), and is a physically-based, continuous time model that is designed to assess the effect of management and climate change on water, sediment, and agricultural chemicals over long periods of time (Arnold and Fohrer, 2005; Jha et al., 2007, Gassman et al., 2007). This model has been applied in Brazil for different purposes and regions

## GOALS

The objective of this study was to perform SWAT calibration and validation procedures in a monthly time step, and then simulating monthly calibrated parameters behavior on a daily time step, aiming to obtain results associated to its suitability in this basin.

## MATERIAL AND METHODS

The study area refers to the Sapucaí river basin (SRB), the most important tributary of the Grande River. It is located in the southern Minas Gerais state, Southeastern Brazil, between the coordinates of -22,554ºS and -22,885° S latitude and -45,701° W and -45,735° W longitude, with an area of 8,882km ². Its outlet is located in the reservoir of the Furnas Hydropower Plant, whose power generation capacity is about of 1,216MW.

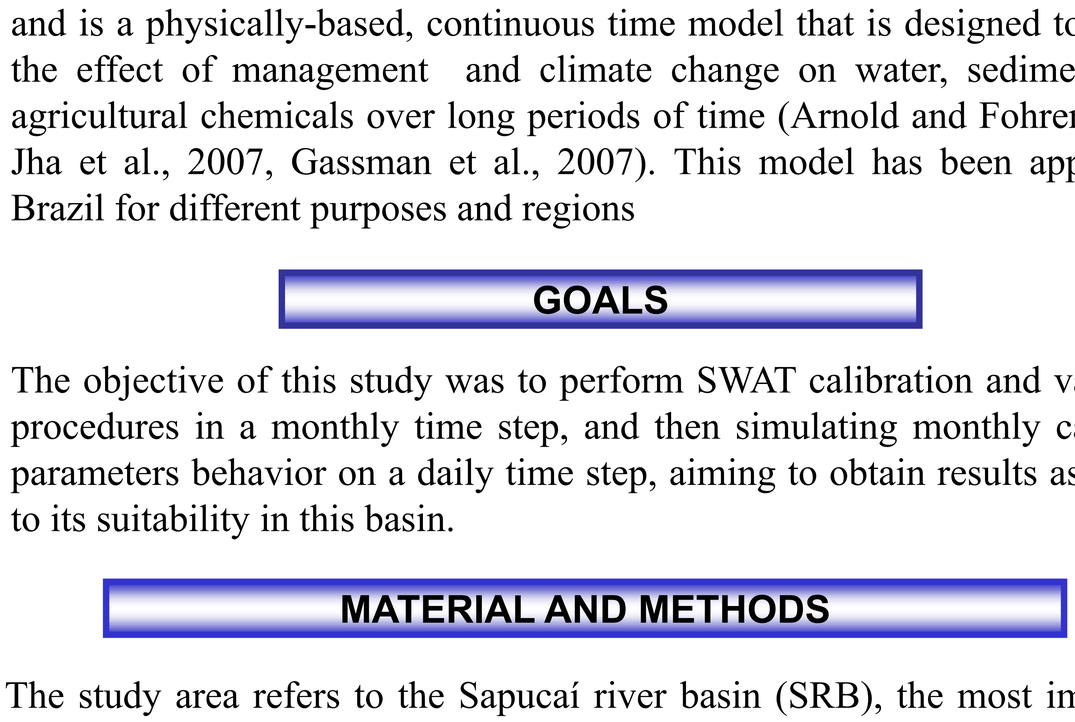


**Figure 1.** Soil classes dominant in SRB and its land use occupation

**ACKNOWLEDGMENTS: UFLA and CNPq**

**SPONSORED by CNPq**

## RESULTS AND DISCUSSION

The results from SWAT model calibration and validation to SRB, considering the Careaçu streamflow gauging station, is shown in Figure 2, respectively, a and b. The modeled hydrograph showed goodness of fit to the observed, which means there was good estimation of monthly discharge in that phase, including the sensitivity of model to peak discharges estimation. In other words, the model was capable of to capture the oscillations related to the intensified rainfall events. However, an underestimation bias was noted during recession periods, particularly in the hydrologic years of 1999-2001, tending to underestimate the base flow.

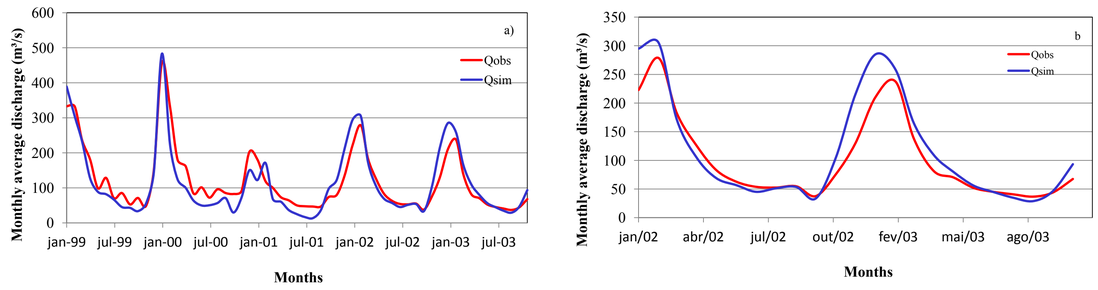


**Figure 2.** Observed and calibrated hydrographs for SRB at Careaçu station (a) and observed and validated hydrographs (b).

In order to simulate daily discharges continuously, it was used the monthly calibrated parameters to estimate the daily flows as an alternative method of calibration. For this purpose, firstly the model was fitted to the SRB in a monthly scale and then, the same parameters value were setup to run a new simulation

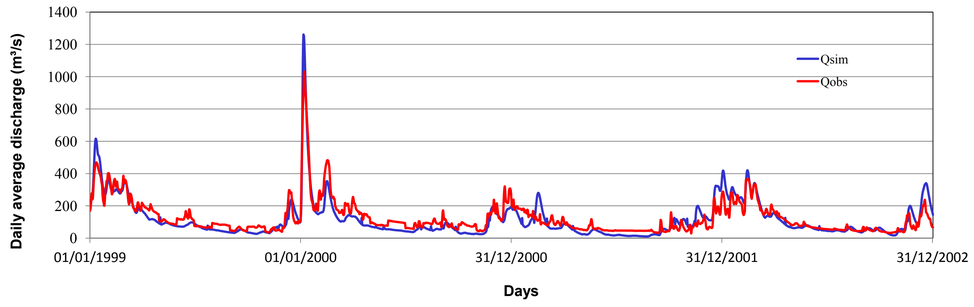


**Figure 3.** Simulated discharge versus observed discharge in SRB at daily time.

## CONCLUSIONS

According to the evaluation of calibration and validation performance using observed rainfall and discharges data sets, the SWAT model have similar performance for simulation of historical streamflows in monthly and daily time steps.

Most statistics used in this study as well as in the literature for evaluation of the performance of models showed a great acceptance of this model in the Sapucaí river basin.

Calibrating SWAT model in a monthly time step works as an alternative to overcome issues when a daily calibration procedures.