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Modelling discharge dynamics in a tropical mountainous watershed in northern Thailand with SWAT using a new auto-calibration tool

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The majority of hydrological model studies in the past worked in temperate regions with more or less flat landscapes. Few studies have investigated tropical regions with high seasonal variation in rainfall. The SWAT model, nowadays often used, has been developed in the US. In only few cases, it has been used in mountainous or tropical watersheds. One major advantage of the SWAT model is that land use practices and solute transport are already integrated. We simulated discharge dynamics in a mountainous watershed in northern Thailand. The study site is the Mae Sa watershed (18.897° N, 98.855° E). It has an area of 77 km^2. From 2007 to 2010, the discharge of the Mae Sa River was continuously measured at three locations. Spatial distribution of rainfall was observed by means of a network of 14 rain gauges evenly distributed within the watershed. Apart from climate data, the SWAT model was set up with digital maps of land use, soil types and elevation. The sensitivity of model parameters was assessed by a latin-hypercube sensitivity analysis. The standard auto-calibration tool of SWAT is the Parasol tool, which however has some shortcomings. Parasol is only able to calibrate parameters lumped over the whole watershed or for a part of the watershed. We developed a new tool for parameter selection and calibration. The approach combines triangular parameter distributions with multiple Monte-Carlo runs. The ten most sensitive parameters were varied within predefined ranges taken from the ArcSWAT model interface or set according to literature values or expert guesses. The parameter search was performed starting with a default value derived either from the SWAT model or from measurements if available. For calibration we used a data set of measured discharges at the main outlet of the watershed from 2008. For model validation the data sets from 2009 and 2010 were used. Our discharge simulations include 95% probability envelopes based on parameter uncertainty. In our presentation we will focus on the different calibration methods with respect to the results of the discharge simulations and their uncertainties.