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Assessment of the performance of Soil Water Assessment Tool (SWAT) model for a small agricultural catchment in Austria

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Hydrological models enable comprehensive examination, understanding and quantification of hydrological processes in catchments under the influence of different characteristics. The Soil and Water Assessment Tool (SWAT) has the ability to predict the impact of land management practices on water, sediment and agricultural chemical yield in such catchments.

The objective of this study is to apply the SWAT model on a small agricultural watershed, calibrate and validate it with measured flow, sediment and crop yield data. The model is set up for the HOAL catchment in Petzenkirchen, Lower Austria. The catchment has an area of 66 hectares. The climate is humid with mean annual temperatures of around 10°C, and annual precipitation of around 800 mm. Soils include Cambisols and Planosols with medium to poor infiltration capacities. Gleysols occur close to the stream. At present, 87% of the catchment area is arable land, 5% is used as pasture, 6% is forested and 2% is paved. The agricultural activities mainly involve wheat based crop rotation including winter wheat, winter barley, sweet and silage corn and canola. The catchment is divided into 37 fields and for each field exact information about tillage date and type of implement used, date of planting and harvest, date and amount of fertilization and plant protection are available. This information is incorporated in the model during set up. The procedures of model set up, sensitivity analysis, calibration and validation are outlined. A Sequential Uncertainty Fitting (SUFI-2) procedure within SWAT-CUP is used to auto-calibrate and validate the model. The model calibration (2012-2014) and validation (2015-2017) is based on the observed daily discharge and daily sediment concentration at the watershed outlet. Event based observations of runoff and sediment yield from two sub-watersheds are available as well as measured soil water contents at 30 points and crop yield data from different fields. Stream flow and sediment calibration are performed at the watershed outlet as well as at sub watershed level. Results of the SWAT model capability to predict flow, sediment and crop yield as well as soil water contents in the small watersheds will be presented.