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Seonggyu Park

Dept. Civil-Env. Eng., Colorado State University, Fort Collins, CO, United States., envpsg@colostate.edu

Anders Nielsen

Aarhus University, Department of Bioscience, Vejlsovej, Silkeborg, Denmark., an@bios.au.dk

Ryan Bailey

Dept. Civil-Env. Eng., Colorado State University, Fort Collins, CO, United States., ryant.bailey@colostate.edu

Dennis Trolle

Aarhus University, Department of Bioscience, Vejlsovej, Silkeborg, Denmark., trolle@bios.au.dk

Katrin Bieger

*Blackland Research & Extension Center, Texas A&M AgriLife, Temple, TX, United States,
kbieger@brc.tamus.edu*

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QSWATMOD: A QGIS-based graphical user interface for application and evaluation of SWAT-MODFLOW models

Seonggyu Park¹, Anders Nielsen², Ryan T. Bailey¹, Dennis Trolle², Katrin Bieger³

¹Department of Civil and Environmental Engineering, Colorado State University, Fort Collins, CO, United States (envpsg@colostate.edu)

²Aarhus University, Department of Bioscience, Vejlsvvej, Silkeborg, Denmark (an@bios.au.dk)

¹Department of Civil and Environmental Engineering, Colorado State University, Fort Collins, CO, United States (ryant.bailey@colostate.edu)

²Aarhus University, Department of Bioscience, Vejlsvvej, Silkeborg, Denmark (trolle@bios.au.dk)

³Blackland Research & Extension Center, Texas A&M AgriLife, Temple, TX, United States (kbieger@brc.tamus.edu)

Abstract: A large number of integrated groundwater-surface water flow models have been developed in recent years to explore water availability under various land use, climate, and population scenarios in river basins. However, the use of these models has been limited due to their complexity in data management, preparing input files, and viewing and interpreting model outputs. One of these models is SWAT-MODFLOW, a recently developed modelling code that is being used in regions worldwide for water resources analysis. In this study, we present QSWATMOD, a QGIS-based Graphical User Interface (GUI) for SWAT-MODFLOW model that couples the land surface hydrology model SWAT with the groundwater flow model MODFLOW. QSWATMOD, written in Python, creates the linkage files between SWAT and MODFLOW models, runs the simulation, and displays results in a user-friendly geographic information system (GIS) environment. QSWATMOD is equipped with several Python libraries that assist in storing and retrieving user and default values, and performing the linkage and simulation processes. QSWATMOD uses various geo-processing functionalities (e.g., selection, intersection, union, estimation of geometry) of the open source geographic information system, QGIS. The use of QSWATMOD is demonstrated through two case studies: a 471 km² regional site in the Middle Bosque River Watershed in central Texas and the 334 km² Little River Experimental Watershed (LREW) near Tifton, Georgia. As the number of SWAT-MODFLOW users grows worldwide, QSWATMOD can be a valuable tool to assist users in creating and managing SWAT-MODFLOW projects.

Keywords: SWAT-MODFLOW; Graphical user interface; QGIS