SWATplusR 0.2.4: Running SWAT2012 and SWAT+ Projects in R [*]

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The `SWATplusR` package provides tools to link existing SWAT2012 and SWAT+ models with your modeling workflows in R. `SWATplusR` enables you to execute SWAT simulations and to control all relevant parameters of a SWAT simulation, such as changes in model parameters, the simulation periods and time steps, or the simulated variables that should be returned to R. The central goal of `SWATplusR` is to return simulation results in a *tidy* format to facilitate an easy implementation of SWAT simulations, together with other R packages into clean and efficient R programming workflows. To efficiently handle large SWAT projects with large numbers of model evaluations and/or large simulation outputs, `SWATplusR` provides parallel computation and incremental saving and selective loading of simulation results into and from SQLite data bases.

Installation

`SWATplusR` is currently under development. You can install an unreleased version of `SWATplusR` from the package's GitHub repository.
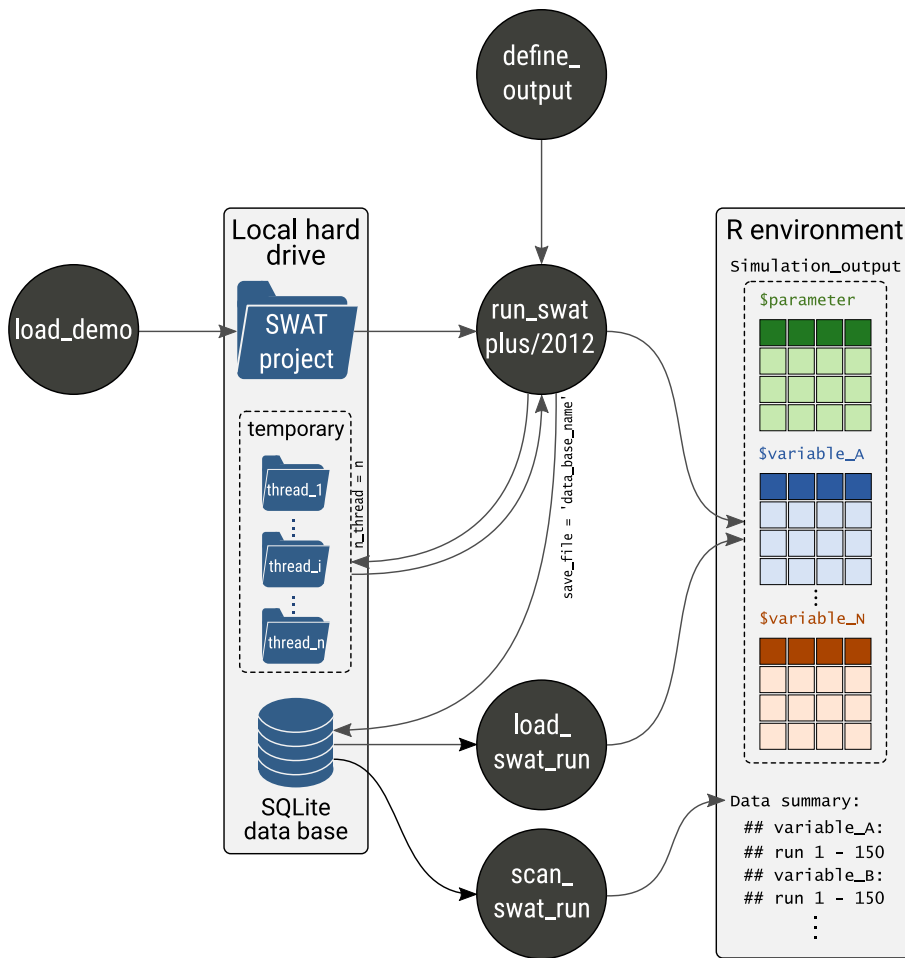
```r
# If you do not have the package devtools installed
install.packages("devtools")

# If access is denied, then the repository might be still set to private
# In that case, please contact me (c.schuerz@posteo.org).
devtools::install_github("chrisschuerz/SWATplusR")
```

Functionality and workflow

The functionality of `SWATplusR` is reduced to a few essential functions that maintain the link between the SWAT project on the local hard drive and the R environment. With `load_demo()` you can retrieve demo data sets of SWAT projects, calibration data, and shape files of the demo catchment. With `run_swat2012()` and `run_swat2012()` you can run a SWAT model located in a local project folder and return simulation outputs to R that were defined with `define_output()`. Simulation results can be saved incrementally to an SQLite data base when a `save_file` is defined in `run_swat*()`. With `load_swat_run()` all or selected parts of the simulation results stored in the data base can be loaded back to R. `scan_swat_run()` scans the content of saved simulations and returns meta data on the saved content.

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[*]This fact sheet refers to the current version 0.2.4 (https://doi.org/10.5281/zenodo.2630510)

define_
output

Local hard
drive

SWAT
project

temporary

/thread_1

/thread_i

/thread_n

n_thread = n

load_demo

run_swat
plus/2012

save_file = 'data_base_name'

R environment

Simulation_output

$parameter

$variable_A

$variable_N

SQLite
data base

load_
swat_run

scan_
swat_run

Data summary:
variable_A:
run 1 - 150
variable_B:
run 1 - 150

Getting started with `SWATplusR`

You can explore the basic functionality of `SWATplusR` in the Get started section. There you can learn the following basics:

- Loading demo data >>

    - SWAT projects >>
    - Observation data >>
    - Spatial catchment data >>

- Performing first SWAT model runs from R >>

    - Output definition >>
    - Exploring the first simulation results >>

- Defining parameter modifications for a SWAT run >>

    - Simulation with a single parameter set >>

- – Simulations with many parameter sets >>
- – Exploring the outputs when the parameter were modified >>

- Saving and loading SWAT simulations >>
- Further input arguments of `SWATplusR` >>

The Articles section is a collection of tutorials for typical topics on SWAT modeling. Here you can learn how to use `SWATplusR` in combination with other R packages to perform tasks such as:

- Parameter sensitivity analysis >>
- Model parameter optimization >>
- Parameter sampling and model calibration >>
- Visualization >>

The Articles section will be updated in the future with further topics that can be relevant for any modeling workflow with `SWATplusR`.

Reporting bugs

This is the first release of the R package. If you encounter any issues with the package, please report the problems (in the best case with a small reproducible example) on the package's issues page.

Citation

Please cite the package when you use it in your work. You can find the bibtex entry for the package here.