

LWFBrook90R

Run the [LWF-BROOK90](#) hydrological model from within R

Installation

Before installing the package, the following imported packages need to be installed from CRAN:

```
install.packages("data.table")
install.packages("vegperiod")
install.packages("sirad")
install.packages("foreach")
install.packages("doSNOW")
```

Recommended installation

It is recommended to download and install the latest stable release from <https://github.com/pschmidtwalter/LWFBrook90R/releases>

```
install.packages("path/to/package/LWFBrook90R_0.2.0.tar.gz", repos = NULL, type = "source")
```

For installing the source package in R under Windows, [Rtools](#) is required. If Rtools is not available, install the (.zip) binary package:

```
install.packages("path/to/package/LWFBrook90R_0.2.0.zip", repos = NULL, type = "binary")
```

You can also install the latest stable release directly from GitHub, using the devtools package:

```
if (!requireNamespace("devtools")) {
  install.packages("devtools")
}
devtools::install_url("https://github.com/pschmidtwalter/LWFBrook90R/releases/
                      download/v0.2.0/LWFBrook90R_0.2.0.tar.gz",
                      dependencies = T, build_vignettes = T)
```

Development version

Instead of installing the latest stable release, you can also install the latest development version using the devtools package:

```
devtools::install_github(repo = "pschmidtwalter/LWFBrook90R",
                         dependencies = T, build_vignettes = T)
```

After installation, use `vignette("intro_lwfbrook90r")` to see the manual.

Basic usage

Load LWFBrook90R:

```
library(LWFBrook90R)
```

To run an example, load meteorological and soil data from the Solling Beech Experimental site distributed with the package:

```
data("slb1_meteo")
data("slb1_soil")
```

Set up lists containing default model control options and model parameters:

```
options.b90 <- setoptions_LWFB90()
param.b90 <- setparam_LWFB90()
```

Set start and end dates in model control options:

```
options.b90$startdate <- as.Date("2002-01-01")
options.b90$enddate <- as.Date("2003-12-31")
```

Derive soil hydraulic properties from soil physical properties using a pedotransfer function:

```
soil <- cbind(slb1_soil, hydpar_puh2(clay = slb1_soil$clay,
                                     silt = slb1_soil$silt,
                                     sand = slb1_soil$sand,
                                     bd = slb1_soil$bd,
                                     oc.pct = slb1_soil$c_org))
```

Run LWF-Brook90 with the created model input objects and capture results in `b90.results.slb1`:

```
b90.results.slb1 <- runLWFB90(project.dir = "example_run_b90/",
                              param.b90 = param.b90,
                              options.b90 = options.b90,
                              climate = slb1_meteo,
                              soil = soil)
str(b90.results.slb1, max.level = 1)
```

Status

R-Code

The package works as intended and is fully documented. However, there are some points to be accomplished in the near future:

- ☒ enable use of Clapp-Hornberger hydraulic parameterization in addition to the default Mualem-van Genuchten
- ☒ Use of sub-day resolution precipitation interval data.
- ☐ implement unit tests (currently functionality is tested mostly through vignette building)
- ☐ Run the `check` with Travis.

Fortran-Code

- ☒ Model output results tested against the output from the original ‘b90.exe’ Windows command line Fortran program.
- ☒ Cleaning up `declared but not used` variables
- ☒ Use of sub-day resolution precipitation interval data.
- ☒ Optional writing of model log-file that contains the former commandline-feed.
- ☒ Implementation of an error-routine. No stop calls in Fortran code.
- ☐ Return model output directly back to R. Currently, the executable code writes its own output text-files, which raises a warning on CRAN-check (no Stdin/Stdout writing)

Authors

Paul Schmidt-Walter, Volodymyr Trotsiuk, Klaus Hammel, Martin Kennel, Tony Federer.

Tony Federer’s original [Brook90 Fortran 77 code](#) (Brook90_v3.1F, License: CC0) was enhanced by Klaus Hammel and Martin Kennel at Bavarian State Institute of Forestry (LWF) around the year 2000. Since then, LWF-BROOK90 is distributed by [LWF](#) upon request as a pre-compiled Fortran command line program together with in MS Access User Interface. In 2019, Volodymyr Trotsiuk converted the Fortran 77 code to Fortran 95 and implemented the connection to R. Paul Schmidt-Walter’s *brook90r* package for LWF-Brook90 input data generation, model execution and result processing was adapted and extended to control this interface function.

License

GPL-3 for all Fortran and R code. *brook90r* has GPL-3, while LWF-Brook90 was without license until recently. Lothar Zimmermann and Stephan raspe (LWF), as well as all Fortran contributors agreed to assign GPL-3 to the Fortran code.