MicroLow_Ice_1.1 ReadMe

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1. Hardware and Software Requirement

MicroLow_Ice_1.1 is written and can be executed in the free open source computing environment and programming language R, which is available for download on the web (http://www.r-project.org/). The model uses the adaptive time-step solver "lsoda" from the deSolve package (Soetaert et al., 2010) **which must also be installed**.

2. Download MicroLow_Ice_1.1

A package named "MICROLOW_ICE_1.1_source", containing the source code of MicroLow 1.0 and validation data is available at https://github.com/jbradley8365/MICROLOW_ICE_1.1_SOURCE.

The package contains:

The entire "MICROLOW_ICE_1.1_SOURCE" folder should be copied to a local computer such that the directory is: "/Users/jamesbradley/Documents/RFolder/MICROLOW_ICE_1.1_SOURCE" **or** the folder paths contained in 'execute_MICROLOW_ICE_1.1.R' script should be modified (*setwd, path*, *pathte*) according to where the folder is copied to.

3. Description of files

This section provides a brief description of all files present in the folder "MICROLOW_ICE_1.1_SOURCE". This should be read alongside the following publication for clarity on variables, parameters, balance equations etc.:

Bradley J, Trivedi C, Winkel M, Mourot R, Lutz S, Larose C, Keuschnig C, Doting E, Halbach L, Zervas A, Anesio A, Benning L. Active and dormant microorganisms on glacier surfaces. *Geobiology*.

MICROLOW_ICE_1.1_SOURCE **contents:**

ReadMe.docx / ReadMe.pdf
ReadMe guide to model source code and execution.

*execute_* MICROLOW_ICE_1.1.*R*
Model source code, .R script.

icetemp.csv
Forcing data

4. Model Operation

In R, specify working directory to appropriate path e.g.:
"Users/jamesbradley/Desktop/RFolder/ MICROLOW_ICE_1.1_SOURCE /"

Open *execute_* MICROLOW_ICE_1.1.*R* script and execute in console (note: package "deSolve" (Soetaert et al., 2010) must be installed).

5. Output

Model output is created as variables within a dataframe 'out'. By default, output is not saved locally, however this can be done by using a command such as:

write.table(out_list[[1]],file=paste("out","nominal.csv",sep="_"),sep=",",row.names=FALSE)

The dataframe "out" contains the model results, with output provided for every thousand years simulated.

Variable	Description
time	Model run time, hours
B1	B_1 biomass
B2	B_2 biomass
Corg	Dissolved organic carbon
c_Cons_Corg_Growth_B1	*DOC* consumed by B_1 for growth, cumulative
c_Death_total	Death of B_{1-2}, cumulative
c_M_total_Corg	Exogenous maintenance of B_{1-2}, cumulative
c_M_total	Exogenous maintenance of B_{1-2}, cumulative
c_M_B1_Corg	Exogenous maintenance of B_1, cumulative
c_Cons_Corg_total	Total consumption of *DOC*, cumulative
c_Growth_B1	Growth of B_1, cumulative
c_Death_B1	Death of B_1, cumulative
c_B1_D	Deactivation of B_1, cumulative
c_B2_A	Activation of B_2, cumulative
c_Death_B2	Death of B_2, cumulative
Btotal	Total biomass (B_{1-4})

References

Soetaert, K., Petzoldt, T., and Setzer, R. W. (2010). Solving Differential Equations in R: Package deSolve. *J. Stat. Softw.* 33, 1–25.