**MicroLow 1.0 ReadMe**

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**1. Hardware and Software Requirement**

**MicroLow 1.0** 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/>). MicroLow 1.0 uses the adaptive time-step solver “lsoda” from the deSolve package (Soetaert et al., 2010) **which must also be installed**. On a standard desktop computer running R, the model usually takes less than 1 min to simulate 10 years of succession.

**2. Download MicroLow 1.0**

A package named “MICROLOW\_1.0\_source”, containing the source code of MicroLow 1.0 and validation data is available at <https://github.com/jbradley8365/MICROLOW_1.0_SOURCE>.

The package contains:

The entire “MICROLOW\_1.0\_source” folder should be copied to a local computer such that the directory is: “/Users/jamesbradley/Documents/RFolder/MICROLOW\_1.0\_source/” **or** the folder paths contained in ‘execute\_MICROLOW\_1.0.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\_1.0\_source”. This should be read alongside the following publication for clarity on variables, parameters, balance equations etc.:

Bradley, J. A., Amend, J. P., LaRowe, D. E., (2018) Microbial dormancy and maintenance in marine sediments through deep time. *Geobiology*.

**MICROLOW\_1.0\_source contents:**

*ReadMe.docx / ReadMe.pdf*

ReadMe guide to model source code and execution.

*execute\_MICROLOW\_1.0.R*

Model source code, .R script.

*Biomass.dat*

Validation date.

Column 1: Sediment age (thousands of years)

Column 2: Cellular biomass carbon concentration (μg C cm-3) at drill hole U1370, IODP Expedition 329, converted from cell abundance provided in D’Hondt et al. (2015) (see paper for details).

*Corg.dat*

Validation date.

Column 1: Sediment age (thousands of years)

Column 2: Particulate Organic Carbon (POC) concentration (μg C cm-3) at drill hole U1370, IODP Expedition 329, converted from weight % measurements provided in D’Hondt et al. (2015) (see paper for details).

**4. Model Operation**

In R, specify working directory to appropriate path e.g.: “Users/jamesbradley/Desktop/RFolder/MICROLOW\_1.0\_SOURCE/”

Open *execute\_MICROLOW\_1.0.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, thousands of years |
| B1 | *B1* |
| B2 | *B2* |
| B3 | *B3* |
| B4 | *B4* |
| Corg | *POC* |
| c\_Cons\_Corg\_Growth\_B1 | *POC* consumed by *B1* for growth, cumulative |
| c\_Death\_total | Death of *B1-4*, cumulative |
| c\_M\_total\_Corg | Exogenous maintenance of *B1-4*, cumulative |
| c\_M\_total\_bio | Endogenous maintenance of *B1-4*, cumulative |
| c\_M\_total | Total maintenance of *B1-4*, cumulative |
| c\_M\_B1\_bio | Endogenous maintenance of *B1*, cumulative |
| c\_M\_B1\_Corg | Exogenous maintenance of *B1*, cumulative |
| c\_Cons\_Corg\_total | Total consumption of *POC*, cumulative |
| c\_Growth\_B1 | Growth of *B1*, cumulative |
| c\_Death\_B1 | Death of *B1*, cumulative |
| c\_B1\_D | Deactivation of *B1*, cumulative |
| c\_B2\_A | Activation of *B2*, cumulative |
| c\_Death\_B2 | Death of *B2*, cumulative |
| c\_Death\_B3 | Death of *B3*, cumulative |
| c\_Death\_B4 | Death of *B4*, cumulative |
| c\_B2\_D | Deactivation of *B2*, cumulative |
| c\_B3\_D | Deactivation of *B3*, cumulative |
| c\_B3\_A | Activation of *B3*, cumulative |
| c\_B4\_A | Activation of *B4*, cumulative |
| c\_M\_B2\_bio | Endogenous maintenance of *B2*, cumulative |
| c\_M\_B3\_bio | Endogenous maintenance of *B3*, cumulative |
| c\_M\_B4\_bio | Endogenous maintenance of *B4*, cumulative |
| years | Years simulated |
| rate\_Cons\_Corg\_Growth\_B1 | Rate of *POC* consumed by *B1* for growth (year-1) |
| rate\_Death\_total | Rate of death of *B1-4* (year-1) |
| rate\_M\_total\_Corg | Rate of exogenous maintenance of *B1-4* (year-1) |
| rate\_M\_total\_bio | Rate of endogenous maintenance of *B1-4* (year-1) |
| rate\_M\_total | Rate of maintenance of *B1-4* (year-1) |
| rate\_M\_B1\_bio | Rate of endogenous maintenance of *B1* (year-1) |
| rate\_M\_B1\_Corg | Rate of exogenous maintenance of *B1* (year-1) |
| rate\_Cons\_Corg\_total | Rate of consumption of *POC* (year-1) |
| rate\_Growth\_B1 | Rate of growth of *B1* (year-1) |
| rate\_Death\_B1 | Rate of death of *B1* (year-1) |
| rate\_B1\_D | Rate of deactivation of *B1* (year-1) |
| rate\_B2\_A | Rate of activation of *B2* (year-1) |
| rate\_Death\_B2 | Rate of death of *B2* (year-1) |
| rate\_Death\_B3 | Rate of death of *B3* (year-1) |
| rate\_Death\_B4 | Rate of death of *B4* (year-1) |
| rate\_B2\_D | Rate of deactivation of *B2* (year-1) |
| rate\_B3\_D | Rate of deactivation of *B3* (year-1) |
| rate\_B3\_A | Rate of activation of *B3*(year-1) |
| rate\_B4\_A | Rate of activation of *B4* (year-1) |
| rate\_M\_B2\_bio | Rate of endogenous maintenance of *B2* (year-1) |
| rate\_M\_B3\_bio | Rate of endogenous maintenance of *B3* (year-1) |
| rate\_M\_B4\_bio | Rate of endogenous maintenance of *B4* (year-1) |
| Theta\_S | *θS* |
| Theta\_M | *θM* |
| Btotal | Total biomass (*B1-4*) |

**References**

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