

Package ‘NUCOMBog’

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Title NUtrient Cycling and COMpetition Model Undisturbed Open Bog
Ecosystems in a Temperate to Sub-Boreal Climate

Version 1.0.1

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Description Modelling the vegetation, carbon, nitrogen and water dynamics of undisturbed open bog ecosystems in a temperate to sub-boreal climate. The executable of the model is available on request at the corresponding author.

Depends R (>= 3.0.0), snowfall

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Maintainer J.W.M. Pullens <jeroenpullens@gmail.com>

LazyData true

RoxygenNote 5.0.1

NeedsCompilation no

Author J.W.M. Pullens [aut, cre],
M. Bagnara [aut],
F. Hartig [aut]

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getData	<i>Function to retrieve data from the monthly output file created by NUCOMBog</i>
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Description

This function returns the data from the monthly output file created by NUCOMBog.

The original model provides net primary production (NPP) as an output, the model has been modified to provide autotrophic respiration aswell. In this way the net ecosystem exchange (NEE) can be calculated, since $NEE = NPP - \text{autotrophic respiration}$. The micrometeorological sign convention is used in this model, e.g. a negative value for NEE means carbon uptake. All fluxes are in gram carbon per square meter per month ($\text{gC m}^{-2} \text{ month}^{-1}$). The model gives water table depth (WTD) in meters and positive values mean below ground level.

The possible outputs of the model are Net Primary Production (NPP), Net Ecosystem Exchange (NEE), heterotrophic respiration (hetero_resp) and water table depth (WTD). The desired output needs to be specified in the setup_NUCOM function.

The getData function is integrated in all runnucom functions.

Usage

```
getData(setup, startval)
```

Arguments

setup	setup_structure described in setup_NUCOM
startval	When a spinup is used for the model and not all output is necessary, this "startval" parameter can be used to cut the output off, i.e. the starting row from which the "outmo.txt" file is loaded. Default is 1.

Author(s)

JWM Pullens

Source

The model can be sent upon request at [jeroenpullens\[at\]gmail\[dot\]com](mailto:jeroenpullens[at]gmail[dot]com)

Examples

```
## Not run:  
getData(setup=test_setup_singlecore,startval=1)  
  
## End(Not run)
```

runNUCOM	<i>Run NUCOMBog</i>
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Description

Code to run NUCOMBog on a single core.

Usage

```
runNUCOM(setup, parameters = NULL)
```

Arguments

setup	The setup structure created by setup_NUCOM function needs to be inserted here, for more information see the setup_NUCOM function help, by typing "?NUCOMBog::setup_NUCOM".
parameters	The parameters which are used in the model. If no parameter values are given the default values will be used. The parameters have to have the format of a dataframe with column names: "names" and "values". See example data available at https://github.com/jeroenpullens/NUCOMBog_data . The default parameters are from Heijmans et al. 2008.

Author(s)

JWM Pullens

Source

The model can be sent upon request at jeroenpullens[at]gmail[dot]com

References

Heijmans, M., Mauquoy, D., van Geel, B., and Berendse, F. (2008). Long-term effects of climate change on vegetation and carbon dynamics in peat bogs. *Journal of Vegetation Science*, 19(3)

Examples

```
## Not run:
names<-c("CO2ref", "gram_Beta", "eric_MaxGr")
initialParameters <- c(380,0.5,65)
initialParameters<-data.frame(names,initialParameters)
names(initialParameters)<-c("names", "values")

runNUCOM(setup = test_setup_singlecore,parameters=initialParameters)

## with predefined parameters:
runnucom(setup = test_setup_singlecore,parameters=NULL)

## End(Not run)
```

runparallelNUCOM *Run parallel NUCOM*

Description

Code to run NUCOMBog parallel on multiple cores.

Usage

```
runparallelNUCOM(setup, clustertype, numCores = 1, parameters)
```

Arguments

setup	The setup needs to be made before by running the setup_NUCOM function.
clustertype	Clustertype: The model has only been tested on SOCK cluster, which is the set to default.
numCores	Number of Cores on which are model needs to be run (NOTE: Non-parallel runs can only be run on 1 core). Default is 1.
parameters	The parameters which are used in the model. If no parameter values are given the default values will be used. The parameters have to have the format of a dataframe with colum names: "names" and "values", see example https://github.com/jeroenpullens/NUCOMBog_data . The default parameters are from Heijmans et al. 2008.

Author(s)

JWM Pullens

Source

The model can be sent upon request at jeroenpullens[at]gmail[dot]com

References

Heijmans, M., Mauquoy, D., van Geel, B., and Berendse, F. (2008). Long-term effects of climate change on vegetation and carbon dynamics in peat bogs. *Journal of Vegetation Science*, 19(3)

Examples

```
## Not run:
!!the variable "test_setup" is from the function setupNUCOM, see the help for more information!!

parallel<-runparallelNUCOM(setup = test_setup,
                           clustertype = "SOCK",
                           numCores = 1,
                           parameters=initialParameters)

## End(Not run)
```

setupNUCOM	<i>make setup_NUCOM</i>
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Description

Code to make the setup structure needed run the model.

Usage

```
setupNUCOM(mainDir, climate, environment, inival, start, end, type,  
            numFolders = 1, parallel = F, separate = F, startval = 1)
```

Arguments

mainDir	Working directory
climate	climate input (monthly) format: year, month, air temperature, precipitation, potential evapotranspiration (tab seperated). The potential evapotranspiration needs to be calculated by using the Penman open water evapotranspiration.
environment	environment input (yearly) format: year, atmospheric co2 values, nitrogen deposition
inival	initial values of biomass
start	year in which the simulation starts
end	year in which the simulation ends
type	Which output is needed? For more information see the help of the getData function.
numFolders	The amount of folders that needs to be created (in case of parallel computing)
parallel	Run the model on parallel cores? TRUE/FALSE, default is FALSE.
separate	Does the model needs to be run for all parameters seperate? Default is FALSE
startval	From which row does the output need to be loaded. Default is 1.

Value

A list with paths and filenames and parameter values which can be implemented in the runnucom and the runnucomParallel function.

Author(s)

JWM Pullens

Source

The model can be sent upon request at jeroenpullens[at]gmail[dot]com

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