

Package: PEcAn.LPJGUESS (via r-universe)

March 14, 2025

Type Package

Title PEcAn Package for Integration of the LPJ-GUESS Model

Version 1.7.3.9000

Description This module provides functions to link LPJ-GUESS to PEcAn.

Imports PEcAn.logger, PEcAn.remote, PEcAn.utils, lubridate (>= 1.6.0),
ncdf4 (>= 1.15), Rcpp (>= 1.0.1), tibble, stringr, utils

Suggests testthat (>= 1.0.2)

SystemRequirements LPJ-GUESS model

OS_type unix

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LazyLoad yes

LazyData FALSE

Encoding UTF-8

RoxygenNote 7.3.2

LinkingTo Rcpp

Config/pak/sysreqs libicu-dev libnetcdf-dev libssl-dev libudunits2-dev

Repository <https://pecanproject.r-universe.dev>

RemoteUrl <https://github.com/PecanProject/pecan>

RemoteRef HEAD

RemoteSha 97e61070b67901b2fa9aa727c73fdaf98a69a70c

RemoteSubdir models/lpjguess

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calculateGridcellVariablePerPFT
calculateGridcellVariablePerPFT

Description

Calculates a per-PFT, gridcell-summed quantity from the LPJ-GUESS state, correctly averaging over patches. This should be put into the SDA procedure.

Usage

```
calculateGridcellVariablePerPFT(
  model.state,
  variable,
  pft.params,
  min.diam = 5
)
```

Arguments

model.state	A large multiply-nested list containing the entire LPJ-GUESS state as read by function readStateBinary.LPJGUESS
variable	A character string specifying what variable to extract. This can be chosen based on the LPJ-GUESS variable name as recorded in the big list of list (that represents describes the model state in R). Once special case is "biomass" which returns the sum of "cmass_leaf", "cmass_root", "cmass_sap" and "cmass_heart"
pft.params	A data frame containing PFT parameters such as allometric coefficients.
min.diam	Minimum tree diameter (in cm) required for inclusion in calculations.

Value

A numeric vector, with one entry per PFT

Author(s)

Matthew Forrest

find_closing	<i>Find Closing Bracket</i>
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Description

Identifies the line number of the matching closing bracket for a given opening bracket.

Usage

```
find_closing(find = "}", line_no, file_in, if_else_check = FALSE)
```

Arguments

find	A character string of the opening bracket.
line_no	A numeric value indicating the line number to start the search.
file_in	A character vector of the file content.
if_else_check	Optional. A logical value indicating whether to check for if/else blocks (default is FALSE).

Value

A numeric value indicating the line number of the matching closing bracket.

find_stream_size	<i>Find Stream Size</i>
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Description

Determines the size (number of variables) in a stream based on the file content.

Usage

```
find_stream_size(
  current_stream_type,
  guessh_in,
  LPJ_GUESS_TYPES,
  LPJ_GUESS_CONST_INTS
)
```

Arguments

current_stream_type
A list containing details of the current stream.

guessh_in
A character vector of LPJ-GUESS header file content.

LPJ_GUESS_TYPES
A character vector of recognized LPJ-GUESS types.

LPJ_GUESS_CONST_INTS
A dataframe mapping LPJ-GUESS constants to their values.

Value

A numeric value representing the size (number of streamed variables).

find_stream_type	<i>Find Stream Type</i>
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Description

Determines the type of a given stream variable in an LPJ-GUESS file.

Usage

```
find_stream_type(
  class = NULL,
  current_stream_var,
  LPJ_GUESS_CLASSES,
  LPJ_GUESS_TYPES,
  guessh_in
)
```

Arguments

class
A character string representing the class of the stream variable (default is NULL).

current_stream_var
A character string representing the current stream variable.

LPJ_GUESS_CLASSES
A character vector of LPJ-GUESS class names.

LPJ_GUESS_TYPES
A character vector of recognized LPJ-GUESS types.

guessh_in
A character vector of LPJ-GUESS header file content.

Value

A character string indicating the stream type.

find_stream_var	<i>Find Stream Variable</i>
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Description

A helper function that lists streamed variables. It returns the names of streamed variables.

Usage

```
find_stream_var(file_in, line_nos)
```

Arguments

file_in	A character vector representing the file content to search through.
line_nos	A numeric vector of length 2, specifying the start and end lines to search for streamed variables.

Value

A character vector of streamed variable names.

met2model.LPJGUESS	<i>met2model.LPJGUESS</i>
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Description

met2model wrapper for LPJ-GUESS

Usage

```
met2model.LPJGUESS(  
  in.path,  
  in.prefix,  
  outfolder,  
  start_date,  
  end_date,  
  overwrite = FALSE,  
  verbose = FALSE,  
  ...  
)
```

Arguments

<code>in.path</code>	location on disk where inputs are stored
<code>in.prefix</code>	prefix of input and output files
<code>outfolder</code>	location on disk where outputs will be stored
<code>start_date</code>	the start date of the data to be downloaded (will only use the year part of the date)
<code>end_date</code>	the end date of the data to be downloaded (will only use the year part of the date)
<code>overwrite</code>	should existing files be overwritten
<code>verbose</code>	should the function be very verbose
<code>...</code>	additional arguments, currently ignored

Author(s)

Istem Fer

model2netcdf.LPJGUESS *Function to convert LPJ-GUESS model output to standard netCDF format*

Description

Convert LPJ-GUESS output to netCDF

Usage

```
model2netcdf.LPJGUESS(outdir, sitelat, sitelon, start_date, end_date)
```

Arguments

<code>outdir</code>	Location of LPJ-GUESS model output
<code>sitelat</code>	Latitude of the site
<code>sitelon</code>	Longitude of the site
<code>start_date</code>	Start time of the simulation
<code>end_date</code>	End time of the simulation

Author(s)

Istem Fer

pecan2lpjguess	<i>Function to translate pecan param names and units to lpjguess names and units</i>
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Description

Function to translate pecan param names and units to lpjguess names and units

Usage

```
pecan2lpjguess(trait.values)
```

Arguments

trait.values trait.values, list

Value

translated list

Author(s)

Istem Fer

readStateBinary	<i>readStateBinary.LPJGUESS</i>
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Description

read binary state file of LPJ-GUESS

Usage

```
readStateBinary(out.path, npft)
```

Arguments

out.path location on disk where model run outputs are stored
npft number of pfts specified in instruction file

Value

Patchpft_list state variables common to all individuals of a particular PFT

Author(s)

Istem Fer

read_binary_LPJGUESS *Read Binary File for LPJ-GUESS*

Description

Reads a binary file formatted for LPJ-GUESS and extracts relevant data.

Usage

```
read_binary_LPJGUESS(outdir, version = "PaIEON")
```

Arguments

outdir	A character string specifying the output directory containing the binary state files.
version	A character string specifying the LPJ-GUESS version (default is "PaIEON").

Value

A matrix or list containing the extracted data.

read_state *Read State File*

Description

Reads a state file and processes its contents for further use.

Usage

```
read_state(file_path)
```

Arguments

file_path	A character string specifying the path to the state file.
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Value

A list containing the processed state information.

serialize_starts_ends *Serialize Starts and Ends*

Description

Finds the start and end lines for serialization.

Usage

```
serialize_starts_ends(file_in, pattern = "void Gridcell::serialize")
```

Arguments

file_in	A character vector of file lines to search through.
pattern	A character string pattern to look for in the file.

Value

A numeric vector of length 2, giving the start and end line numbers.

split_inputs.LPJGUESS *Split inputs for LPJ-GUESS model*

Description

Splits climate met for LPJGUESS

Usage

```
split_inputs.LPJGUESS(  
  settings,  
  start.time,  
  stop.time,  
  inputs,  
  overwrite = FALSE,  
  outpath = NULL  
)
```

Arguments

settings	PEcAn settings object
start.time	start date and time for each SDA ensemble
stop.time	stop date and time for each SDA ensemble
inputs	list of model inputs to use in write.configs.LPJGUESS
overwrite	Default FALSE
outpath	if specified, write output to a new directory. Default NULL writes back to the directory being read

Value

name of the split met file

Author(s)

Istem Fer

update_state_LPJGUESS *updateState.LPJGUESS*

Description

Adjust LPJ-GUESS state variables based on input parameters.

Usage

```
update_state_LPJGUESS(  
  model.state,  
  pft.params,  
  dens.initial,  
  dens.target,  
  AbvGrndWood.initial,  
  AbvGrndWood.target,  
  AbvGrndWood.epsilon,  
  trace,  
  min.diam,  
  HEIGHT_MAX = 150  
)
```

Arguments

model.state	A large multiply-nested list containing the entire LPJ-GUESS state as read by function readStateBinary.LPJGUESS
pft.params	A data.frame containing the parameters for each PFT. Each row represents one PFT (ordering must be consistent with the vectors below. The names of the columns describe the per-PFT parameter and must include: wooddens, crownarea_max, lifeform (1 = tree, 2 = grass), k_latosa, k_rp, k_allom1, k_allom2, k_allom3, crownarea_max and sla. wooddens, crownarea_max, lifeform (1 = tree, 2 = grass), k_latosa, k_rp, k_allom1, k_allom2, k_allom3, crownarea_max and sla.
dens.initial	A numeric vector of the initial stand-level stem densities (indiv/m ²) as named numeric vector with one entry per PFT/species, with the names being the PFT/species codes. These values should be produced using state data assimilation from function XXXXXX.
dens.target	A numeric vector of the target stand-level stem densities (indiv/m ²) as named numeric vector with one entry per PFT/species, with the names being the PFT/species codes. These values should be produced using state data assimilation from function XXXXXX

AbvGrndWood.initial	A numeric vector of the target stand-level above ground wood (kgC/m ²) as named numeric vector with one entry per PFT/species, with the names being the PFT/species codes. These values should be produced using state data assimilation from function XXXXXX
AbvGrndWood.target	A numeric vector of the target stand-level above ground wood (kgC/m ²) as named numeric vector with one entry per PFT/species, with the names being the PFT/species codes. These values should be produced using state data assimilation from function XXXXXX
AbvGrndWood.epsilon	A single numeric specifying how close the final above ground wood needs to be to the target above ground stem biomass for each individual. eg. 0.05 requires that the final above ground wood is within 5 of the target above ground wood
trace	Logical; if TRUE, prints detailed adjustment process information.
min.diam	Minimum tree diameter (in cm) for inclusion in adjustments.
HEIGHT_MAX	Maximum allowed height of an individual. This is the maximum height that a tree can have. This is hard-coded in LPJ-GUESS to 150 m, but for SDA that might be unrealistically big, so this argument allows adjustment.

Details

Adjust LPJ-GUESS state

Value

And updated model state (as a big old list o' lists)

Author(s)

Matthew Forrest

write.config.LPJGUESS *Write LPJ-GUESS configuration files*

Description

Writes a LPJ-GUESS config file.

Usage

```
write.config.LPJGUESS(defaults, trait.values, settings, run.id, restart = NULL)
```

Arguments

defaults	list of defaults to process
trait.values	vector of samples for a given trait
settings	list of settings from pecan settings file
run.id	id of run
restart	Logical, whether to restart the simulation.

Details

Requires a pft xml object, a list of trait values for a single model run, and the name of the file to create

Value

configuration file for LPJ-GUESS for given run

Author(s)

Istem Fer, Tony Gardella

write.insfile.LPJGUESS

Write LPJ-GUESS instruction script

Description

Write LPJ-GUESS instruction script

Usage

```
write.insfile.LPJGUESS(  
  settings,  
  trait.values,  
  rundir,  
  outdir,  
  run.id,  
  restart = NULL  
)
```

Arguments

settings	PEcAn settings list
trait.values	trait.values
rundir	rundir
outdir	outdir
run.id	PEcAn run ID
restart	Logical, whether to restart the simulation.

Value

settings Updated list

Author(s)

Istem Fer

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