Package 'twc'

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Title Terrestrial Water Cycle

Version 0.0.2

Description An open-access tool/framework that constitutes the core functions to analyze terrestrial water cycle data across various spatio-temporal scales.

Depends R (>= 4.0.0)

License GPL-3

Encoding UTF-8

RoxygenNote 7.3.2

Imports data.table, doParallel, foreach, lubridate, magrittr, methods, ncdf4, parallel, raster, sf, sp, stats, utils

URL https://github.com/imarkonis/twc

BugReports https://github.com/imarkonis/twc/issues

SystemRequirements PROJ (>= 6, https://proj.org/download.html), GDAL (>= 3, https://gdal.org/download.html), NetCDF(>= 4, https://www.unidata.ucar.edu/software/netcdf/).

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

NeedsCompilation no

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Repository CRAN

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Contents

`crop_data` *Crop precipitation data sets*

Description

The function `crop_data` crops the data sets using a shapefile mask.

Usage

```
crop_data(x, y)

## S4 method for signature 'Raster'
crop_data(x, y)

## S4 method for signature 'data.table'
crop_data(x, y)

## S4 method for signature 'character'
crop_data(x, y)
```

Arguments

x	Raster* object; data.table (see details); filename (character; see details)
y	filename (character). Path to a *.shp file

Details

If ‘x‘ is a data.table, its columns should be named: "lon", "lat", "date", and "value"

If ‘x‘ is a filename, it should point to a *.nc file.

Value

Raster* object; data.table

Examples

```
## Not run:
download_data("gldas-vic", tempdir(), timestep = "yearly")
r <- raster::brick(paste0(tempdir(),
"/gldas-vic_tp_mm_land_194801_201412_025_yearly.nc"))
s <- crop_data(r, "cze.shp")

## End(Not run)
```

`fldmean` *Field mean*

Description

The function `fldmean` computes the spatial weighted average for each timestep.

Usage

```
fldmean(x)

## S4 method for signature 'Raster'
fldmean(x)

## S4 method for signature 'data.table'
fldmean(x)

## S4 method for signature 'character'
fldmean(x)
```

Arguments

`x`	Raster* object; data.table (see details); filename (character, see details)

Details

If ‘x‘ is a data.table, its columns should be named: "lon", "lat", "date", and "value"

If ‘x‘ is a filename, it should point to a *.nc file.

Value

data.table

Examples

```
## Not run:
download_data("gldas-vic", tempdir(), timestep = "yearly")
r <- raster::brick(paste0(tempdir(),
"/gldas-vic_tp_mm_land_194801_201412_025_yearly.nc"))
s <- fldmean(r)

## End(Not run)
```

`infoNC` *Show data content*

Description

The function `infoNC` displays the specification of the desired file.

Usage

```
infoNC(x)

## S4 method for signature 'Raster'
infoNC(x)

## S4 method for signature 'character'
infoNC(x)
```

Arguments

`x`	Raster* Object; character

Value

character

`muldpm` *Multiply by days per month*

Description

The function `muldpm` multiplies the value by days per month.

Usage

```
muldpm(x)

## S4 method for signature 'Raster'
muldpm(x)

## S4 method for signature 'data.table'
muldpm(x)

## S4 method for signature 'character'
muldpm(x)
```

Arguments

x	Raster* object; data.table (see details); filename (character, see details)

Details

'x' object with monthly data in [units/day]

If 'x' is a data.table, its columns should be named: "lon", "lat", "date", and "value"

If 'x' is a filename, it should point to a *.nc file.

Value

Raster* object; data.table

Examples

```
## Not run:
tavg_brick <- raster::brick('terraclimate_tavg.nc')
pet_od <- pet(method = "od", tavg = tavg_brick)
pet_od <- muldpm(pet_od)

## End(Not run)
```

---

nse *Nash–Sutcliffe Efficiency*

Description

Function for calculating the Nash–Sutcliffe efficiency.

Usage

```
nse(x, ref)
```

Arguments

x	a data.table generated by fldmean
ref	a data.table with data used for evaluation

Value

numeric

---

pRecipe_masks *Masks data*

Description

Function for various masks.

Usage

```
pRecipe_masks()
```

Value

data.table

---

rank_repres *Ensemble representativeness ranking*

Description

The function rank_repres ranks the elements of a dataset ensemble in terms of a representativeness metric.

Usage

```
rank_repres(data, method = "all", ensemble = "median")
```

Arguments

data	data.table with three variables: dataset, date, value
method	character with seven options: mean, var (variance), slope, kge (Kling–Gupta Efficiency), tss (Taylor Skill Score), kld (Kullback–Leibler Divergence), all (default)
ensemble	character with two options: mean, median (default)

Details

data is a data.table (time, value) method relates to the metric used to estimate the similarity to the ensemble mean/median. Can be mean, variance, correlation, slope, Kling–Gupta efficiency, Taylor skill score, Kullback–Leibler divergence, and all (for returning all of them)

Value

data.table 2-column (dataset, repres_metric) or 8-column (dataset, mean, variance, ...) in case of method = all

Examples

```
## Not run:
download_data("gldas-vic", tempdir(), timestep = "yearly")
download_data("gpcc", tempdir(), timestep = "yearly")
download_data("ghcn", tempdir(), timestep = "yearly")
r1 <- raster::brick(paste0(tempdir(),
"/gldas-vic-v2-0_tp_mm_land_194801_201412_025_yearly.nc"))
s1 <- fldmean(r1)
s1$dataset <- "gldas-vic"
r2 <- raster::brick(paste0(tempdir(),
"/gpcc-v2022_tp_mm_land_198201_202012_025_yearly.nc"))
s2 <- fldmean(r2)
s2$dataset <- "gpcc"
r3 <- raster::brick(paste0(tempdir(),
"/ghcn-v2_tp_mm_land_190001_201505_025_yearly.nc"))
s3 <- fldmean(r2)
s3$dataset <- "ghcn"
dt <- rbind(r1, r2, r3)
dr <- rank_repres(dt[year(date) >= 1991 & year(date) <= 2012, .(dataset, date, value)])

## End(Not run)
```

---

remap *Spatial aggregation*

Description

The function remap aggregates data into a new grid resolution.

Usage

```
remap(x, y)

## S4 method for signature 'Raster'
remap(x, y)

## S4 method for signature 'data.table'
```

```
remap(x, y)

## S4 method for signature 'character'
remap(x, y)
```

Arguments

x	Raster* object; data.table (see details); filename (character, see details)
y	numeric

Details

If ‘x‘ is a data.table, its columns should be named: "lon", "lat", "date", and "value"

If ‘x‘ is a filename, it should point to a *.nc file.

Value

Raster* object; data.table

Examples

```
## Not run:
download_data("gldas-vic", tempdir(), timestep = "yearly")
r <- raster::brick(paste0(tempdir(),
"/gldas-vic_tp_mm_land_194801_201412_025_yearly.nc"))
s <- remap(r, 1)

## End(Not run)
```

---

saveNC *Save .nc file*

Description

Function to save data compatible with pRecipe in .nc file

Usage

```
saveNC(x, file, name = "tp", longname = "Total precipitation", units = "mm")
```

Arguments

x	Raster* object
file	character
name	character
longname	character
units	character

Value

No return value, called to save a file

Examples

```
## Not run:
save_nc(dummie_brick, "gpcp_tp_mm_global_197901_202205_025_monthly.nc")

## End(Not run)
```

`subset_data` *Subset data in space and time*

Description

The function `subset_data` subsets the data in space within a bounding box, and/or in time within a year range.

Usage

```
subset_data(x, box = NULL, yrs = NULL)

## S4 method for signature 'Raster'
subset_data(x, box = NULL, yrs = NULL)

## S4 method for signature 'data.table'
subset_data(x, box = NULL, yrs = NULL)

## S4 method for signature 'character'
subset_data(x, box = NULL, yrs = NULL)
```

Arguments

`x`	Raster* object; data.table (see details); filename (character, see details)
`box`	numeric. Bounding box in the form: (xmin, xmax, ymin, ymax)
`yrs`	numeric. Time range in the form: (start_year, end_year)

Details

If ‘x‘ is a data.table, its columns should be named: "lon", "lat", "date", and "value"

If ‘x‘ is a filename, it should point to a *.nc file.

If subsetting only in space or time then the arguments must be passed by name. I.e., `subset_data(x, box = ...)` (space) or `subset_data(x, yrs = ...)` (time)

Value

Raster* object; data.table

Examples

```
## Not run:
download_data("gldas-vic", tempdir(), timestep = "yearly")
r <- raster::brick(paste0(tempdir(),
"/gldas-vic_tp_mm_land_194801_201412_025_yearly.nc"))
sd <- subset_data(r, c(12.24, 18.85, 48.56, 51.12), c(2000, 2010))
ss <- subset_data(r, box = c(12.24, 18.85, 48.56, 51.12))
st <- subset_data(r, yrs = c(2000, 2010))

## End(Not run)
```

---

tabular *Transform raster into data.table*

Description

Function to transform a raster brick into a data.table

Usage

```
tabular(x)

## S4 method for signature 'Raster'
tabular(x)

## S4 method for signature 'character'
tabular(x)
```

Arguments

x	Raster* object; filename (character, see details)

Value

data.table

Examples

```
## Not run:
download_data("gldas-vic", tempdir(), timestep = "yearly")
r <- raster::brick(paste0(tempdir(),
"/gldas-vic_tp_mm_land_194801_201412_025_yearly.nc"))
s <- tabular(r)

## End(Not run)
```

`trend` *Trends*

Description

The function `trend` computes linear slope.

Usage

```
trend(x)

## S4 method for signature 'Raster'
trend(x)

## S4 method for signature 'data.table'
trend(x)

## S4 method for signature 'character'
trend(x)
```

Arguments

`x`	Raster* object; data.table (see details); filename (character, see details)

Details

If ‘x‘ is a data.table, its columns should be named: "lon", "lat", "date", and "value"

If ‘x‘ is a filename, it should point to a *.nc file.

Value

Raster* object; data.table

`yearstat` *Yearly <stat>*

Description

The function `yearstat` aggregates the data from monthly to yearly.

Usage

```
yearstat(x, stat = "sum")

## S4 method for signature 'Raster'
yearstat(x, stat = "sum")

## S4 method for signature 'data.table'
yearstat(x, stat = "sum")

## S4 method for signature 'character'
yearstat(x, stat = "sum")
```

Arguments

x	Raster* object; data.table (see details); filename (character, see details)
stat	character

Details

If 'x' is a data.table, its columns should be named: "lon", "lat", "date", and "value"

If 'x' is a filename, it should point to a *.nc file.

'stat' is a character string describing the desired aggregation function. Suitable options are:

- "max"
- "mean"
- "median"
- "min"
- "sum" (default)

Value

Raster* object; data.table

Examples

```
## Not run:
download_data("gldas-vic", path = tempdir())
r <- raster::brick(paste0(tempdir(),
"/gldas-vic_tp_mm_land_194801_201412_025_monthly.nc"))
s <- yearstat(r, "mean")

## End(Not run)
```

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