Package ‘pRecipe’

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| crop_data | Crop precipitation data sets |

**Description**

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

**Usage**

```r
crop_data(x, y)
```

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

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

```r
## 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**

```r
## 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)
```

---

### csi

**Probability of Detection**

**Description**

Function for calculating the critical success index.

**Usage**

```r
csi(x, ref, th)
```

**Arguments**

- **x**
  
  a data.table generated by `fldmean`

- **ref**
  
  a data.table with data used for evaluation

- **th**
  
  numeric. The value for detection threshold

**Value**

numeric
download_data

Download various precipitation data products

Description

The function download_data downloads the selected data product.

Usage

```r
download_data(
    dataset = "all",
    path = ".",
    domain = "raw",
    timestep = "monthly"
)
```

Arguments

dataset a character string with the name(s) of the desired data set. Suitable options are:
- "all" for all of the below listed data sets (default),
- "20cr" for 20CR v3,
- "chirps" for CHIRPS v2.0,
- "cmap" for CMAP standard version,
- "cmorph" for CMORPH,
- "cpc" for CPC-Global,
- "cru-ts" for CRU_TS v4.06,
- "em-earth" for EM-EARTH,
- "era20c" for ERA-20C,
- "era5" for ERA5,
- "fldas" for FLDAS,
- "ghcn" for GHCN-M v2,
- "gldas-clsm" for GLDAS CLSM,
- "gldas-noah" for GLDAS NOAH,
- "gldas-vic" for GLDAS VIC,
- "gpc" for GPCC v2020,
- "gpcp" for GPCP v2.3,
- "gpm_imerg" for GPM IMERGM Final v06,
- "jra55" for JRA-55,
- "merra2" for MERRA-2,
- "mswep" for MSWEP v2.8,
- "ncep-doe" for NCEP/DOE,
- "ncep-ncar" for NCEP/NCAR,
- "persiann" for PERSIANN-CDR,
download_e_obs

- "precl" for PREC/L,
- "terraclimate" for TerraClimate,
- "trmm-3b43" for TRMM 3B43 v7,
- "udel" for UDEL v501.

path a character string with the path where the database will be downloaded.
domain a character string with the desired domain data set. Suitable options are:
  - "raw" for default available spatial coverage,
  - "global" for data sets with global (land and ocean) coverage,
  - "land" for data sets with land only coverage,
  - "ocean", for data sets with ocean only coverage.
timestep a character string with the desired time resolution. Suitable options are:
  - "monthly",
  - "yearly".

Value

No return value, called to download the required data sets.

Examples

```r
download_data("gldas-vic", tempdir(), timestep = "yearly")
```

**download_e_obs**

*E- OBS data downloader*

**Description**

Function for downloading E-OBS.

**Usage**

```r
download_e_obs(folder_path = ".", time_res = "monthly")
```

**Arguments**

- `folder_path` a character string with the path where the data will be downloaded.
- `time_res` a character string with the desired time resolution. Suitable options are:
  - "monthly",
  - "yearly".

**Value**

No return value, called to download the data set.
far

*False Alarm Rate*

**Description**

Function for calculating the false alarm rate.

**Usage**

```
far(x, ref, th)
```

**Arguments**

- `x` a data.table generated by `fldmean`
- `ref` a data.table with data used for evaluation
- `th` numeric. The value for detection threshold

**Value**

numeric

---

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)
### infoNC

**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**

```r
## 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)
```

---

### Description

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

### Usage

```r
infoNC(x)
```

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

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

### Arguments

- **x** Raster* Object; character
Description

The function `label` adds data set name and source type.

Usage

`label(x, y)`

Arguments

- `x` data.table (see details)
- `y` character (see details)

Details

columns in ‘x’ should be named (if present): "lon", "lat", "date", and "value"

Available options are:

- "20cr" for 20CR v3,
- "chirps" for CHIRPS v2.0,
- "cmap" for CMAP standard version,
- "cmorph" for CMORPH,
- "cpc" for CPC-Global,
- "cru-ts" for CRU_TS v4.06,
- "em-earth" for EM-EARTH,
- "era20c" for ERA-20C,
- "era5" for ERA5,
- "fldas" for FLDAS,
- "ghcn" for GHCN-M v2,
- "gldas-clsm" for GLDAS CLSM,
- "gldas-noah" for GLDAS NOAH,
- "gldas-vic" for GLDAS VIC,
- "gleam" for GLEAM v3.7a,
- "gpcc" for GPCC v2020,
- "gpcp" for GPCP v2.3,
- "gpm_imerg" for GPM IMERGM Final v06,
- "jra55" for JRA-55,
- "merra2" for MERRA-2,
muldpm

- "mswep" for MSWEP v2.8,
- "ncep-doe" for NCEP/DOE,
- "ncep-ncar" for NCEP/NCAR,
- "persiann" for PERSIANN-CDR,
- "precl" for PREC/L,
- "terraclimate" for TerraClimate,
- "trmm-3b43" for TRMM 3B43 v7,
- "udel" for UDEL v501.

Value
data.table

Examples

## Not run:
r <- data.table::data.table("date" = as.Date("2000-01-01"), "value" = 42)
s <- label(r, "mswep")
## End(Not run)

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

```r
## 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

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

Arguments

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

Value

numeric
**Description**

Convenient and aesthetic visualization of data in a boxplot.

**Usage**

```
plot_box(x, var = "Precipitation", unit = "mm")
```

```r
## S4 method for signature 'Raster'
plot_box(x, var = "Precipitation", unit = "mm")
```

```r
## S4 method for signature 'data.table'
plot_box(x, var = "Precipitation", unit = "mm")
```

```r
## S4 method for signature 'character'
plot_box(x, var = "Precipitation", unit = "mm")
```

**Arguments**

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

`var` is a character string describing the variable to be used for the plot title

`unit` is a character string describing the unit of measurement to be used for the plot title

**Value**

ggplot object

**Examples**

```r
## 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 <- plot_box(r)
```

## End(Not run)
plot_density

Histogram ggplot

Description

Convenient and aesthetic visualization of data in a histogram.

Usage

plot_density(x, var = "Precipitation", unit = "mm")

## S4 method for signature 'Raster'
plot_density(x, var = "Precipitation", unit = "mm")

## S4 method for signature 'data.table'
plot_density(x, var = "Precipitation", unit = "mm")

## S4 method for signature 'character'
plot_density(x, var = "Precipitation", unit = "mm")

Arguments

x Raster* object; data.table (see details); filename (character, see details)
var character (see details)
unit 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.
‘var’ is a character string describing the variable to be used for the axis title.
‘unit’ is a character string describing the unit of measurement to be used for the axis title.

Value

ggplot object

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 <- plot_density(r)

## End(Not run)
Description

Convenient and aesthetic visualization of data in a heatmap.

Usage

plot_heatmap(x, unit = "mm")

## S4 method for signature 'Raster'
plot_heatmap(x, unit = "mm")

## S4 method for signature 'data.table'
plot_heatmap(x, unit = "mm")

## S4 method for signature 'character'
plot_heatmap(x, unit = "mm")

Arguments

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

Details

If ‘x’ is a data.table, its columns should be named: "IOn", "Iat", "date", and "value"
If ‘x’ is a filename, it should point to a *.nc file.
‘unit’ is a character string describing the unit of measurement to be used for the axis title

Value

ggplot object

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 <- plot_heatmap(r)

## End(Not run)
Description

Convenient and aesthetic visualization of data in a line plot.

Usage

plot_line(x, var = "Precipitation", unit = "mm")
## S4 method for signature 'Raster'
plot_line(x, var = "Precipitation", unit = "mm")
## S4 method for signature 'data.table'
plot_line(x, var = "Precipitation", unit = "mm")
## S4 method for signature 'character'
plot_line(x, var = "Precipitation", unit = "mm")

Arguments

x Raster* object; data.table (see details); filename (character, see details)
var character (see details)
unit 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.
`var` is a character string describing the variable to be used for the axis title
`unit` is a character string describing the unit of measurement to be used for the axis title

Value

ggplot object

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 <- plot_line(r)
## End(Not run)
**plot_map**  

Map ggplot

**Description**

Convenient and aesthetic visualization of data in a map

**Usage**

```r
plot_map(x, unit = "mm")
```

```r
## S4 method for signature 'Raster'
plot_map(x, unit = "mm")
```

```r
## S4 method for signature 'data.table'
plot_map(x, unit = "mm")
```

```r
## S4 method for signature 'character'
plot_map(x, unit = "mm")
```

**Arguments**

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

‘unit’ is a character string describing the unit of measurement to be used for the legend title

**Value**

ggplot object

---

**plot_summary**  

Summary ggplot

**Description**

Convenient and aesthetic visualization of data in a summary plot.
Usage

plot_summary(x, var = "Precipitation", unit = "mm")

## S4 method for signature 'Raster'
plot_summary(x, var = "Precipitation", unit = "mm")

## S4 method for signature 'data.table'
plot_summary(x, var = "Precipitation", unit = "mm")

## S4 method for signature 'character'
plot_summary(x, var = "Precipitation", unit = "mm")

Arguments

x Raster* object; data.table (see details); filename (character, see details)
var character (see details)
unit 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.
‘var’ is a character string describing the variable to be used for the axis title
‘unit’ is a character string describing the unit of measurement to be used for the axis title

Value

ggplot object

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 <- plot_summary(r)

## End(Not run)

plot_taylor  Taylor diagram

Description

Convenient and aesthetic visualization of data in a Taylor diagram.
Usage

plot_taylor(x, y, groups = "source", ...)

Arguments

x  
data.table
y  
data.table
groups  
character
...  
see details

Details

'x' columns should be named: "lon", "lat", "date", "value", "dataset", and "source". The last two columns are added using the label.

'y' columns should be named: "lon", "lat", "date", "value", "dataset", and "source". The last two columns are added using the label.

'groups' character to define panels. Suitable options are:

- "source" (default)
- "seasons" (only works properly with monthly data)

'...' extra arguments passed on to openair::TaylorDiagram

Value

plot object

pod  
Probability Of Detection

Description

Function for calculating the probability of detection.

Usage

pod(x, ref, th)

Arguments

x  
a data.table generated by fldmean
ref  
a data.table with data used for evaluation
th  
numeric. The value for detection threshold

Value

numeric
pRecipe_masks  
*Masks data*

**Description**
Function for various masks.

**Usage**
pRecipe_masks()

**Value**
data.table

---

remap  
*Spatial aggregation*

**Description**
The function remap aggregates data into a new grid resolution.

**Usage**
remap(x, y)

```r
## 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."
saveNC

Value

Raster* object; data.table

Examples

```r
## 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)
```

Description

Function to save data compatible with pRecipe in .nc file

Usage

```r
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

```r
## 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))
tabular

Transform raster into data.table

Description

Function to transform a raster brick into a data.table

Usage

```r
tabular(x)
```

## S4 method for signature 'Raster'

```r
tabular(x)
```

## S4 method for signature 'character'

```r
tabular(x)
```

Arguments

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

Value

data.table

Examples

```r
## 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)
### 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

---

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

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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