

# Package: twc (via r-universe)

December 7, 2024

**Title** Terrestrial Water Cycle

**Version** 0.0.1

**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

**LazyData** false

**RoxygenNote** 7.3.2

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

**Config/pak/sysreqs** libgdal-dev gdal-bin libgeos-dev libnetcdf-dev libssl-dev libproj-dev libsqlite3-dev libudunits2-dev

**Repository** <https://imarkonis.r-universe.dev>

**RemoteUrl** <https://github.com/imarkonis/twc>

**RemoteRef** HEAD

**RemoteSha** 82c4c0dfba75858af0963c2f9dce07439cdad711

## Contents

crop_data	2
csi	3
far	3
fldmean	4
infoNC	5
muldpm	5
nse	6
pod	7
pRecipe_masks	7
remap	8
saveNC	9
subset_data	9
tabular	11
trend	11
yearstat	12
<b>Index</b>	<b>14</b>

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crop_data	<i>Crop precipitation data sets</i>
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### 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)
```

---

csi	<i>Probability of Detection</i>
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---

**Description**

Function for calculating the critical success index.

**Usage**

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

**Arguments**

x	a data.table generated by <a href="#">fldmean</a>
ref	a data.table with data used for evaluation
th	numeric. The value for detection threshold

**Value**

numeric

---

far	<i>False Alarm Rate</i>
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**Description**

Function for calculating the false alarm rate.

**Usage**

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

**Arguments**

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

**Value**

numeric

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fldmean	<i>Field mean</i>
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**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

---

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

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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)

## 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

<code>x</code>	Raster* object; data.table (see details); filename (character, see details)
<code>y</code>	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)
```

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saveNC	<i>Save .nc file</i>
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**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)
```

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subset_data	<i>Subset data in space and time</i>
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**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	<i>Transform raster into data.table</i>
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---

**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)
```

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trend	<i>Trends</i>
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**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

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yearstat	<i>Yearly &lt;stat&gt;</i>
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**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)
```

# Index

crop\_data, 2  
crop\_data, character-method (crop\_data), 2  
crop\_data, data.table-method (crop\_data), 2  
crop\_data, Raster-method (crop\_data), 2  
csi, 3  
  
far, 3  
fldmean, 3, 4, 4, 7  
fldmean, character-method (fldmean), 4  
fldmean, data.table-method (fldmean), 4  
fldmean, Raster-method (fldmean), 4  
  
infoNC, 5  
infoNC, character-method (infoNC), 5  
infoNC, Raster-method (infoNC), 5  
  
muldpm, 5  
muldpm, character-method (muldpm), 5  
muldpm, data.table-method (muldpm), 5  
muldpm, Raster-method (muldpm), 5  
  
nse, 6  
  
pod, 7  
pRecipe\_masks, 7  
  
remap, 8  
remap, character-method (remap), 8  
remap, data.table-method (remap), 8  
remap, Raster-method (remap), 8  
  
saveNC, 9  
subset\_data, 9  
subset\_data, character-method (subset\_data), 9  
subset\_data, data.table-method (subset\_data), 9  
subset\_data, Raster-method (subset\_data), 9  
  
tabular, 11  
tabular, character-method (tabular), 11  
tabular, Raster-method (tabular), 11  
trend, 11  
trend, character-method (trend), 11  
trend, data.table-method (trend), 11  
trend, Raster-method (trend), 11  
  
yearstat, 12  
yearstat, character-method (yearstat), 12  
yearstat, data.table-method (yearstat), 12  
yearstat, Raster-method (yearstat), 12