Package ‘precintcon’

August 29, 2016

Type Package
Title Precipitation Intensity, Concentration and Anomaly Analysis
Version 2.3.0
Date 2016-05-26
LazyData true
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Description It contains functions to analyze the precipitation
intensity, concentration and anomaly.
URL https://github.com/lucasvenez/precintcon
BugReports https://github.com/lucasvenez/precintcon/issues
Depends R (>= 2.14), ggplot2 (>= 2.0.0), scales
License GPL (>= 2)
Collate 'app.r' 'as.precintcon.annual.r' 'as.annual.r'
   'as.precintcon.daily.r' 'as.daily.r' 'as.precintcon.decade.r'
   'as.decade.r' 'deciles.r' 'as.precintcon.deciles.r'
   'precintcon.deciles.analysis.r' 'as.deciles.r'
   'as.precintcon.fd.r' 'precintcon.fd.r' 'as.fd.r'
   'as.precintcon.monthly.r' 'as.monthly.r'
   'as.precintcon.seasonal.r' 'as.seasonal.r'
   'precintcon.ci.per.year.analysis.r' 'ci.per.year.r'
   'precintcon.ci.analysis.r' 'ci.r' 'cv.r' 'ff.index.r'
   'precintcon.limits.analysis.r' 'limits.r' 'pcd.r'
   'precintcon.pci.analysis.r' 'pci.r' 'pci.seasonal.r'
   'pci.supraseasonal.r' 'pcp.r' 'precintcon.pn.analysis.r' 'pn.r'
   'precintcon.plot.lorenz.r' 'pplot.ci.r'
   'precintcon.plot.deciles.r' 'pplot.deciles.r'
   'precintcon.plot.histogram.r' 'pplot.histogram.r'
   'pplot.lorenz.r' 'pplot.pcd.r' 'precintcon.plot.pci.r'
   'pplot.pci.r' 'pplot.pcp.r' 'precintcon.plot.pn.r' 'pplot.pn.r'
   'precintcon.plot.rai.r' 'pplot.rai.r' 'precintcon.plot.spi.r'
R topics documented:

'app' 'as.annual' 'as.daily' 'as.decade' 'as.deciles' 'as.fd' 'as.monthly' 'as.seasonal' 'ci' 'ci.per.year' 'cv' 'daily' 'ff.index' 'limits' 'monthly' 'pcd' 'pci' 'pci.seasonal' 'pci.supraseasonal' 'pcp' 'pn' 'pplot.deciles' 'pplot.histogram' 'pplot.lorenz' 'pplot.pcd' 'pplot.pci' 'pplot.pcp' 'pplot.pn' 'pplot.spi' 'precintcon.H' 'precintcon.Z' 'precintcon.b' 'precintcon.classification' 'precintcon.gamma' 'precintcon.ln.a' 'precintcon.monthly.aggregation' 'precintcon.plot.lorenz.ungrouped' 'precintcon.pn' 'precintcon.r' 'precintcon.r.squared' 'precintcon.rai.analysis' 'precintcon.read.data' 'precintcon.spi.analysis' 'precintcon.spi.per.year.analysis' 'precintcon.stat.analysis' 'rai' 'read.data' 'spi.per.year' 'spi' 'stat' 'tii' 'trend.test'

RoxygenNote 5.0.1
NeedsCompilation no
Repository CRAN
Date/Publication 2016-07-17 13:49:19

R topics documented:
Description

It calculates the amount and percentage of precipitation contributed by a such percent of rainiest days.

Usage

app(..., percent = 25)

Arguments

percent is the percentage of the rainiest days to be considered (default = 25).

... a set of daily precipitation series.

Value

data.frame containing the following variables:

- dataset is the dataset name of the precipitation serie;
- percentage is the percentage of the rainiest days;
- absolute is the absolute amount of precipitation generated by percentage
- relative is the percentage of precipitation benerated by percentage

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

read.data as.daily ci
as.annual

Examples

```r
##
# Loading the daily precipitation serie
data(daily)

##
# Calculating amount and percentage of precipitation using different parameters
app(daily)
app(daily, percent = 20)
app(daily, percent = c(10, 15, 20, 25))
```

---

as.annual  

Converting to seasonal precipitation serie.

Description

Converts a daily, monthly, or seasonal precipitation serie to an annual serie.

Usage

```r
as.annual(object)
```

Arguments

- `object`  
  a `precintcon.daily`, `precintcon.monthly`, or `precintcon.seasonal` object or a data.frame containing 33 or 3 columns.

Value

A data.frame (`precintcon.annual`) containing the following variables:

- `year` is the year.
- `precipitation` is the precipitation amount in millimeters.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

- `as.daily`  
- `as.monthly`  
- `as.seasonal`  
- `pplot.lorenz`  
- `read.data`
Examples

```r
##
# Loading the daily precipitation serie.
data(daily)

##
# Converting precipitation
as.annual(daily)
```

Description

Converts a `data.frame` to a `precintcon.daily`.

Usage

```r
as.daily(object, na.value = NA)
```

Arguments

- `object`: a `precintcon.daily` or a `data.frame` containing 33 columns.
- `na.value`: the value used for representing non-existent values (Default value: NA).

Value

A `data.frame` (precintcon.daily) containing the following variables:

- `year` is the year.
- `month` is the month.
- `d1` is the precipitation value in millimeters of the 1st day of the month.
- `d2` is the precipitation value in millimeters of the 2nd day of the month.
- `d3` is the precipitation value in millimeters of the 3rd day of the month.
- `d4` is the precipitation value in millimeters of the 4th day of the month.
- `d5` is the precipitation value in millimeters of the 5th day of the month.
- `d6` is the precipitation value in millimeters of the 6th day of the month.
- `d7` is the precipitation value in millimeters of the 7th day of the month.
- `d8` is the precipitation value in millimeters of the 8th day of the month.
- `d9` is the precipitation value in millimeters of the 9th day of the month.
- `d10` is the precipitation value in millimeters of the 10th day of the month.
- `d11` is the precipitation value in millimeters of the 11th day of the month.
- `d12` is the precipitation value in millimeters of the 12th day of the month.
• `d13` is the precipitation value in millimeters of the 13th day of the month.
• `d14` is the precipitation value in millimeters of the 14th day of the month.
• `d15` is the precipitation value in millimeters of the 15th day of the month.
• `d16` is the precipitation value in millimeters of the 16th day of the month.
• `d17` is the precipitation value in millimeters of the 17th day of the month.
• `d18` is the precipitation value in millimeters of the 18th day of the month.
• `d19` is the precipitation value in millimeters of the 19th day of the month.
• `d20` is the precipitation value in millimeters of the 20th day of the month.
• `d21` is the precipitation value in millimeters of the 21st day of the month.
• `d22` is the precipitation value in millimeters of the 22nd day of the month.
• `d23` is the precipitation value in millimeters of the 23rd day of the month.
• `d24` is the precipitation value in millimeters of the 24th day of the month.
• `d25` is the precipitation value in millimeters of the 25th day of the month.
• `d26` is the precipitation value in millimeters of the 26th day of the month.
• `d27` is the precipitation value in millimeters of the 27th day of the month.
• `d28` is the precipitation value in millimeters of the 28th day of the month.
• `d29` is the precipitation value in millimeters of the 29th day of the month.
• `d30` is the precipitation value in millimeters of the 30th day of the month.
• `d31` is the precipitation value in millimeters of the 31st day of the month.

**Author(s)**

Lucas Venezian Povoa <lucasvenez@gmail.com>

**See Also**

`as.decade as.annual as.seasonal as.monthly`

**Examples**

```r
## Loading the daily precipitation serie.
data(daily)

##
# Converting precipitation
as.daily(daily)
```
Converting a precipitation serie to a decade serie

Description
It converts a daily, monthly or annual precipitation serie to a decade serie.

Usage
as.decade(object)

Arguments
object    a precintcon.daily, precintcon.monthly, precintcon.seasonal, precintcon.annual
          object or a data.frame containing 33 or 3 columns.

Details
It excludes no complete decades for converting the serie, e.g., a serie starting in 1977 and finishing
in 2008 will have the year 1977 to 1979 and 2000 to 2008 excluded, resulting into a serie of the
years 1980 and 1990.

Value
A data.frame (precintcon.decade) containing the following variables:

  • year is the year.
  • precipitation is the decade’s precipitation in millimeters.

Author(s)
Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also
as.precintcon.annual as.precintcon.seasonal as.precintcon.monthly as.precintcon.daily

Examples
##
# Loading the daily precipitation serie.
data(daily)

##
# Converting precipitation
as.decade(daily)
Description

Groups the monthly precipitation into decis, i.e., it splits a precipitation serie into ten equal parts in crescent order, from the lower to the highest precipitation.

Usage

as.precintcon.deciles(object)

Arguments

object a daily or monthly precipitation serie.

Value

A data.frame (precintcon.deciles) containing the following variables:

- D1 corresponds to the precipitation values not exceeding 10% of the lowest values.
- D2 corresponds to the precipitation values not exceeding 20 of the lowest values.
- D3 corresponds to the precipitation values not exceeding 30 of the lowest values.
- D4 corresponds to the precipitation values not exceeding 40% of the lowest values.
- D5 is equals to the median that corresponds to the precipitation values not exceeding 50% of the lowest values.
- D6 corresponds to the precipitation values not exceeding 60% of the lowest values.
- D7 corresponds to the precipitation values not exceeding 70 of the lowest values.
- D8 corresponds to the precipitation values not exceeding 80 of the lowest values.
- D9 corresponds to the precipitation values not exceeding 90 of the lowest values.
- D10 corresponds to the precipitation values not exceeding 100 of the lowest values.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

read.data
as.fd

**Frequency distribution of a precipitation serie**

Description

Calculates the frequency distribution of a daily precipitation serie based on interval.

Usage

as.precintcon.fd(object, interval = 1)

Arguments

- **object**: a daily precipitation serie.
- **interval**: the interval in millimeters for calculating the frequency distribution.

Value

A data.frame (precintcon.fd) containing the following variables:

- **initial.class**: the initial value of the class.
- **final.class**: the final value of the class.
- **midpoint**: the middle point of the class.
- **n**: the absolute frequency, i.e., the number of days in each class.
- **sum.n**: the cumulative frequency, obtained by adding the absolute frequencies of all the classes up to the one under consideration.
- **P**: the pluviometric total of each class, obtained by multiplying **midpoint** by **n**.
- **sum.P**: the cumulative class’s pluviometric total, obtained by adding the pluviometric total of all the classes up to the one under consideration.
- **p.sum.n**: the cumulative percentage of rainy days.
- **p.sum.P**: the cumulative percentage of rainfall amounts.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

read.data as.daily ci
Examples

```r
##
# Loading the daily precipitation serie
data(daily)

##
# Performing the frequency distribution
as.precintcon.fd(daily)
```

Description

Converts a daily precipitation serie to a monthly serie.

Usage

```r
as.monthly(object)
```

Arguments

- `object` a `precintcon.daily` object or a `data.frame` containing 33 or 3 columns

Value

A `data.frame` (precintcon.monthly) containing the following variables:

- year is the year.
- month is the month.
- precipitation is the precipitation amount in millimeters.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

- `pplot.lorenz`
- `read.data`

Examples

```r
## Loading the daily precipitation serie.
#
data(daily)

## Converting precipitation
#
as.monthly(daily)
```
as.seasonal

Convert to seasonal precipitation serie

Description

It converts a daily or monthly precipitation serie to a seasonal serie according to meteorological seasons.

Usage

as.seasonal(object)

Arguments

object a precintcon.daily, or precintcon.monthly object or a data.frame containing 33 or 3 columns.

Details

If the serie has no a month of a season, it is waived in conversion, e.g., if a serie has January and February of 1975, but no December of 1974, the first two months are removed of the resulting serie because the season that depends all of them is not complete.

Value

A data.frame (precintcon.seasonal) containing the following variables:

- year is the year.
- season is the season.
- precipitation is the precipitation amount in millimeters.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

pplot.lorenz read.data

Examples

```r
##
# Loading the daily precipitation serie.
data(daily)

##
# Converting precipitation
as.seasonal(daily)
```
ci

Concentration Index

Description
Calculated the Concentration Index (CI) on a daily precipitation serie.

Usage
\texttt{ci(\ldots, \text{interval} = 1)}

Arguments
\begin{itemize}
  \item \texttt{interval} \qquad \text{the interval in millimeters applied for calculating the concentration index. (Default value: 1)}
  \item \ldots \qquad \text{a set of daily precipitation series.}
\end{itemize}

Value
A data.frame containing the following variables:
\begin{itemize}
  \item \texttt{dataset} \qquad \text{the precipitation serie name.}
  \item \texttt{a} \qquad \text{the constant of the exponential curve defined via the least-squares method.}
  \item \texttt{b} \qquad \text{the constant of the exponential curve defined via the least-squares method.}
  \item \texttt{r2} \qquad \text{the determination of coefficient of determination (R\textsuperscript{2}) of the exponential model.}
  \item \texttt{A} \qquad \text{the area over the exponential curve.}
  \item \texttt{S} \qquad \text{the area compressed for the exponential curve.}
  \item \texttt{ci} \qquad \text{the concentration index.}
\end{itemize}

Author(s)
Lucas Venezian Povoa \texttt{<lucasvenez@gmail.com>}

See Also
\texttt{pplot.lorenz read.data as.daily}

Examples
\begin{verbatim}
##
# Loading the daily precipitation serie.
data(daily)

##
# Performing the Concentration Index Analysis
\texttt{ci(daily, interval = 1)}
\end{verbatim}
Description

Calculates the Concentration Index (CI) per year on a daily precipitation serie.

Usage

ci.per.year(object, interval = 1)

Arguments

object a daily precipitation serie.
interval the interval in millimeters applied for calculating the concentration index. (Default value: 1)

Value

A data.frame (precintcon.ci) containing the following variables:

- year is the year.
- ci is the concentration index.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

pplot.lorenz read.data as.daily

Examples

```
##
# Loading the daily precipitation serie.
data(daily)

##
# Performing the Concentration Index Analysis
ci.per.year(daily, interval = 1)
```
Description

It calculates the coefficient of variance of a monthly precipitation.

Usage

cv(object)

Arguments

object is a daily or monthly precipitation serie.

Details

A daily precipitation serie is transformed to a monthly serie.

Value

the coefficient of variance

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

Examples

```r
## Loading the monthly precipitation serie.
data(monthly)

## Calculating the Coefficient of Variance
cv(monthly)
```
Daily precipitation between 1976 and 2010

Description

This data set gives the daily precipitation (in millimeters) between 1976 and 2010, as compiled by the National Water Agency (ANA), Brazil.

Usage

data(daily)

Format

A data frame with 420 observations on the following 33 variables:

- year: the year.
- month: the month.
- d1: the precipitation value in millimeters of the day #1 of the month.
- d2: the precipitation value in millimeters of the day #2 of the month.
- d3: the precipitation value in millimeters of the day #3 of the month.
- d4: the precipitation value in millimeters of the day #4 of the month.
- d5: the precipitation value in millimeters of the day #5 of the month.
- d6: the precipitation value in millimeters of the day #6 of the month.
- d7: the precipitation value in millimeters of the day #7 of the month.
- d8: the precipitation value in millimeters of the day #8 of the month.
- d9: the precipitation value in millimeters of the day #9 of the month.
- d10: the precipitation value in millimeters of the day #10 of the month.
- d11: the precipitation value in millimeters of the day #11 of the month.
- d12: the precipitation value in millimeters of the day #12 of the month.
- d13: the precipitation value in millimeters of the day #13 of the month.
- d14: the precipitation value in millimeters of the day #14 of the month.
- d15: the precipitation value in millimeters of the day #15 of the month.
- d16: the precipitation value in millimeters of the day #16 of the month.
- d17: the precipitation value in millimeters of the day #17 of the month.
- d18: the precipitation value in millimeters of the day #18 of the month.
- d19: the precipitation value in millimeters of the day #19 of the month.
- d20: the precipitation value in millimeters of the day #20 of the month.
- d21: the precipitation value in millimeters of the day #21 of the month.
- d22: the precipitation value in millimeters of the day #22 of the month.
d23 the precipitation value in millimeters of the day #23 of the month.
d24 the precipitation value in millimeters of the day #24 of the month.
d25 the precipitation value in millimeters of the day #25 of the month.
d26 the precipitation value in millimeters of the day #26 of the month.
d27 the precipitation value in millimeters of the day #27 of the month.
d28 the precipitation value in millimeters of the day #28 of the month.
d29 the precipitation value in millimeters of the day #29 of the month.
d30 the precipitation value in millimeters of the day #30 of the month.
d31 the precipitation value in millimeters of the day #31 of the month.

Source

National Water Agency (ANA) http://www2.ana.gov.br/Paginas/default.aspx

Examples

data(daily)
  ## maybe pci(daily); rai(daily) ...

<table>
<thead>
<tr>
<th>ff.index</th>
<th>$F$ factor</th>
</tr>
</thead>
</table>

Description

It calculates the Approximated Rainfall Erosivity Factor according to the ff index.

Usage

ff.index(object)

Arguments

object is a daily or monthly precipitation serie

Value

the ff index in millimeters

Author(s)

Lucas Venezian Povoa

References

$limits$

**Examples**

```r
##
# Loading the daily precipitation serie.
data(daily)

##
# Calculating ff index
ff.index(daily)
```

<table>
<thead>
<tr>
<th>limits</th>
<th>Limits</th>
</tr>
</thead>
</table>

**Description**

Calculates the upper and lower limit on a set of daily or monthly precipitation series.

**Usage**

`limits(...)`

**Arguments**

... a set of daily or monthly precipitation series.

**Value**

A data.frame containing the following variables:

- `dataset` is the precipitation serie name.
- `max` is the maximum value in the precipitation serie.
- `max.date` is the first date of the maximum precipitation serie.
- `min` is the minimum value in the precipitation serie.
- `min.date` is the first date of the minimum precipitation serie.

**Author(s)**

Lucas Venezian Povoa <lucasvenez@gmail.com>

**See Also**

`read.data.as.daily`
Examples

```r
##
# Loading the monthly precipitation serie.
data(monthly)

##
# Performing the Concentration Index Analysis
limits(monthly)
```

---

**Monthly precipitation between 1950 and 1992.**

Description

This dataset gives the monthly precipitation (in millimeters) between 1950 and 1992, as compiled by the National Water Agency (ANA), Brazil.

Usage

`data(monthly)`

Format

A data frame with 516 observations on the following 3 variables:

- `year` the year.
- `month` the month.
- `precipitation` the precipitation amount in millimeters.

Source

National Water Agency (ANA) [http://www2.ana.gov.br/Paginas/default.aspx](http://www2.ana.gov.br/Paginas/default.aspx)

Examples

```r
data(monthly)
## maybe pci(monthly) ; rai(monthly) ...```
**Description**

Calculates the Precipitation Concentration Degree (PCD) on a daily or monthly precipitation serie.

**Usage**

`pcd(object)`

**Arguments**

- `object`: a daily or monthly precipitation serie.

**Value**

A data.frame containing the following variables:

- `year`: is the year.
- `pcd`: is the percentage of precipitation concentration corresponding to a year. Values closer to 0 mean precipitation dispersion among all months and 1 concentration into only a month.

**Author(s)**

Lucas Venezian Povoa <lucasvenez@gmail.com>

**References**


**See Also**

- `pplot.pcd`
- `read.data`
- `as.daily`
- `as.monthly`

**Examples**

```r
##
# Loading the monthly precipitation serie.
data(monthly)

##
# Performing the Precipitation Concentration Index analysis
pcd(monthly)
```
Description

It calculates the Precipitation Concentration Index (PCI) on a daily or monthly precipitation serie.

Usage

pci(object)

Arguments

object a daily or monthly precipitation serie.

Value

A data.frame containing the following variables:

- year is the year.
- pci is the precipitation concentration index.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

pplot.pci read.data as.daily as.monthly

Examples

##
# Loading the monthly precipitation serie.
data(monthly)

##
# Performing the Precipitation Concentration Index analysis
pci(monthly)
Description

It calculates the Precipitation Concentration Index (PCI) in a seasonal granularity on a daily or monthly precipitation serie.

Usage

pci.seasonal(object, hemisthere)

Arguments

object is a daily or monthly precipitation serie
hemisthere is the hemisthere, "n" for northern and "s" for south, of the precipitation serie

Value

A data.frame containing the following variables:

- year is the year;
- season is the meteorological season; and
- pci.seasonal is the seasonal perception concentration index.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

Examples

```r
##
# Loading the daily precipitation serie
data(daily)

##
# Calculating the seasonal perception concentration index
pci.seasonal(daily, hemisthere = "s")
```
pci.supraseasonal

Supraseasonal Precipitation Concentration Index

Description
It calculates the supraseasonal precipitation concentration index.

Usage
pci.supraseasonal(object, hemisthere = c("n", "s"))

Arguments
object is a daily or monthly precipitation serie.
hemisthere is the hemisthere, "n" for northern and "s" for south, of the precipitation serie.

Value
A data.frame containing the following variables:

- year is the year;
- season is the meteorological supraseason, wet or dry; and
- pci.season is the seasonal perception concentration index.

Author(s)
Lucas Venezian Povoa <lucasvenez@gmail.com>

References

Examples
##
# Loading the daily precipitation serie
data(daily)

##
# Calculating the supraseasonal precipitation concentration index
pci.supraseasonal(daily, hemisthere = "s")
**Precipitation Concentration Period**

Description

Calculates the Precipitation Concentration Period (PCP) on a daily or monthly precipitation serie.

Usage

```r
cp(c(object)
```

Arguments

- `object` a daily or monthly precipitation serie.

Value

A data.frame containing the following variables:

- `year` is the year.
- `pcp` is the precipitation concentration period, in degree, corresponding to a year. Results correspond to a month like below when using the ‘azimuth’ default values: 0 = January, 30 = February, 60 = March, ..., 300 = November, and 330 = December.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

References


See Also

- `plot.pcp`
- `read.data.as.daily`
- `as.monthly`

Examples

```r
##
# Loading the monthly precipitation serie.
data(monthly)

##
# Performing the Precipitation Concentration Degree analysis
pcd(monthly)
```
Description

Calculates the Percentage of Normal (PN) on a daily or monthly precipitation serie.

Usage

\[ \text{pn(object, interval = 30, scale = "a")} \]

Arguments

- **object**: a daily or monthly precipitation serie.
- **interval**: the number of months applied for calculating the percentage of normal.
- **scale**: the scale used for calculating the percentage of normal, which should be either "w" for weak (not supported yet), "m" for month, "s" for season, or "d" for decades.

Value

A data.frame (precintcon.pn) containing the following variables:

- **year**: is the year.
- **month**: is the month. It exists only whether scale = "m".
- **pn**: is the percentage of normal.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

- `pplot.pn`  
- `read.data.as.daily`  
- `as.monthly`

Examples

```r
##
# Loading the monthly precipitation serie.
data(monthly)
##
# Performing the Percentage of Normal analysis
pn(monthly)
```
### pplot.deciles

**Plot deciles**

**Description**

Plots the deciles of a precipitation serie.

**Usage**

```r
pplot.deciles(..., ylab = "Precipitation", legend.title = "Legend", legend = NULL, fontsize = 10, axis.text.color = "black", export = FALSE, export.name = "deciles_plot.png", width = 8.6, height = 7.5, units = "cm", grouped = FALSE)
```

**Arguments**

- **ylab**: the text for the y axis. (Default value: "Precipitation")
- **legend.title**: the text for the legend title. (Default value: "Legend")
- **legend**: the text vector for the legend items. If NULL the legends will be equals to the variable names. (Default value: NULL)
- **fontsize**: the font size value in pt. (Default value: 10)
- **axis.text.color**: the legend colors. (Default value: "black")
- **export**: the logical value for defining whether the graph should be export to a file or not. (Default value: FALSE)
- **export.name**: the text for defining the exported file name. It is only used if export = TRUE. (Default value: "deciles_plot.png")
- **width**: the number for defining the exported graph width. It is only used if export = TRUE. (Default value: 8.6)
- **height**: the number for defining the exported graph height. It is only used if export = TRUE. (Default value: 7.5)
- **units**: the text for defining the units of the height and width parameters. It is only used if export = TRUE. (Default value: "cm")
- **grouped**: the logical value for defining whether the graphs should be plotted in group.
- **...**: a set of daily or monthly precipitation serie.

**Author(s)**

Lucas Venezian Povoa <lucasevenz@gmail.com>

**See Also**

- *deciles*
- *read.data*
Examples

```r
## Loading the monthly precipitation serie.
#
data(monthly)

## Performing the a set of statistical analysis
#
pplot.deciles(monthly)
```

---

**pplot.histogram**

*Plot histogram*

---

**Description**

Plots the histogram of a precipitation serie.

**Usage**

```r
pplot.histogram(..., density = FALSE, xlab = "Precipitation (mm)",
ylab = "Frequency", legend.title = "Legend",
legend = NULL, fontsize = 10, axis.text.color = "black",
export = FALSE, export.name = "histogram_plot.png",
width = 10, height = 10, units = "cm")
```

**Arguments**

- `density` the logical value for defining whether the graph should be plotted with bars or lines. (Default value: FALSE)
- `xlab` the text for the x axis. (Default value: "Precipitation (mm)")
- `ylab` the text for the y axis. (Default value: "Frequency")
- `legend.title` the text for the legend title. (Default value: "Legend")
- `legend` the text vector for the legend items. If NULL the legends will be equals to the variable names. (Default value: NULL)
- `fontsize` the font size value in pt. (Default value: 10)
- `axis.text.color` the legend colors. (Default value: "black")
- `export` the logical value for defining whether the graph should be export to a file or not. (Default value: FALSE)
- `export.name` the text for defining the exported file name. It is only used if export = TRUE. (Default value: "histogram_plot.png")
- `width` the number for defining the exported graph width. It is only used if export = TRUE. (Default value: 10)
- `height` the number for defining the exported graph height. It is only used if export = TRUE. (Default value: 10)
units: the text for defining the units of the height and width parameters. It is only used if export = TRUE. (Default value: "cm")

... a set of daily or monthly precipitation series.

Author(s)
Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also
read.data

Examples

```r
## Loading the daily precipitation serie.
data(daily)

## Performing a set of statistical analysis
pplot.histogram(daily)
```

---

### pplot.lorenz

Plot Lorenz’s curve

#### Description

Plots the Lorenz’s curve of a precipitation serie.

#### Usage

```r
pplot.lorenz(..., interval = 1, grouped = FALSE,
             xlab = expression(sum(n[i]), i==1),
             ylab = expression(sum(P[i]), i==1),
             legend.title = "Legend", legend = NULL,
             fontsize = 10,
             axis.text.color = "black", export = FALSE,
             export.name = "lorenz_plot.png",
             width = 8.6, height = 7.5, units = "cm")
```

#### Arguments

- `interval`: the interval in millimeters applied for calculating the Lorenz’s curve. (Default value: 1)
- `grouped`: the logical value for defining whether all series should be plotted in the same graph or not. (Default value: FALSE)
- `xlab`: the text for the x axis. (Default value: expression(sum(n[i]), i==1))
- `ylab`: the text for the y axis. (Default value: expression(sum(P[i]), i==1))
- `legend.title`: the text for the legend title. (Default value: "Legend")
legend: the text vector for the legend items. If NULL the legends will be equals to the variable names. (Default value: NULL)

fontsize: the font size value in pt. (Default value: 10)

axis.text.color: the legend colors. (Default value: "black")

export: the logical value for defining whether the graph should be export to a file or not. (Default value: FALSE)

export.name: the text for defining the exported file name. It is only used if export = TRUE. (Default value: "histogram_plot.png")

width: the number for defining the exported graph width. It is only used if export = TRUE. (Default value: 10)

height: the number for defining the exported graph height. It is only used if export = TRUE. (Default value: 10)

units: the text for defining the units of the height and width parameters. It is only used if export = TRUE. (Default value: "cm")

... a set of daily precipitation series.

Author(s)
Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

ci read.data as.daily

Examples

```r
## Loading the daily precipitation serie.
data(daily)

## Performing the a set of statistical analysis
pplot.ci(daily, interval = 1)
```

---

**pplot.pcd**

*Plot Precipitation Concentration Degree*

Description

Plots the Precipitation Concentration Degree per year of a precipitation serie.

Usage

```r
pplot.pcd(..., xlab = "Year", ylab = "PCD",
          ylim = c(0,360), legend = NULL, fontsize = 10, axis.text.color = "black",
          export = FALSE, export.name = "pcd_plot.png", width = 8.6,
          height = 7.5, units = "cm")
```
**Arguments**

xlab  the text for the x axis. (Default value: "Year")

ylab  the text for the y axis. (Default value: "PCD")

ylim  the limits of the y axis. (Default value: c(0, 360))

legend  the text vector for the legend items. If NULL the legends will be equals to the variable names. (Default value: NULL)

fontsize  the font size value in pt. (Default value: 10)

axis.text.color  the legend colors. (Default value: "black")

export  the logical value for defining whether the graph should be export to a file or not. (Default value: FALSE)

export.name  the text for defining the exported file name. It is only used if export = TRUE. (Default value: "pcd_plot.png")

width  the number for defining the exported graph width. It is only used if export = TRUE. (Default value: 8.6)

height  the number for defining the exported graph height. It is only used if export = TRUE. (Default value: 7.5)

units  the text for defining the units of the height and width parameters. It is only used if export = TRUE. (Default value: "cm")

...  a set of daily or monthly precipitation series.

**Author(s)**

Lucas Venezian Povoa <lucasvenez@gmail.com>

**References**


**See Also**

pcd read.data

**Examples**

```r
## Loading the daily precipitation serie.
data(daily)

##
# Plotting PCD index per year
pplot.pcd(daily)
```
pplot.pci

**Plot Precipitation Concentration Index**

**Description**
Plots the Precipitation Concentration Index of a precipitation serie.

**Usage**
```
pplot.pci(..., xlab = "Years", ylab = "PCI", legend = NULL,
    fontsize = 10, axis.text.color = "black", export = FALSE,
    export.name = "pci_plot.png", width = 10, height = 10, units = "cm")
```

**Arguments**
- `xlab`: the text for the x axis. (Default value: "Years")
- `ylab`: the text for the y axis. (Default value: "PCI")
- `legend`: the text vector for the legend items. If NULL the legends will be equals to the variable names. (Default value: NULL)
- `fontsize`: the font size value in pt. (Default value: 10)
- `axis.text.color`: the legend colors. (Default value: "black")
- `export`: the logical value for defining whether the graph should be export to a file or not. (Default value: FALSE)
- `export.name`: the text for defining the exported file name. It is only used if export = TRUE. (Default value: "pci_plot.png")
- `width`: the number for defining the exported graph width. It is only used if export = TRUE. (Default value: 10)
- `height`: the number for defining the exported graph height. It is only used if export = TRUE. (Default value: 10)
- `units`: the text for defining the units of the height and width parameters. It is only used if export = TRUE. (Default value: "cm")
- `...`: a set of daily precipitation series.

**Author(s)**
Lucas Venezian Povoa <lucasvenez@gmail.com>

**See Also**
- `read.data`
Examples

```r
# Loading the daily precipitation serie.
data(daily)

# Performing the a set of statistical analysis
pplot.pci(daily)
```

---

**Description**

Plots the Precipitation Concentration Period per year of a precipitation serie.

**Usage**

```r
pplot.pcp(..., xlab = "Year", ylab = "PCP", ylim = c(0,360), legend = NULL, fontsize = 10,
axis.text.color = "black", export = FALSE, export.name = "pcd_plot.png",
width = 8.6, height = 7.5, units = "cm")
```

**Arguments**

- `xlab`: the text for the x axis. (Default value: "Year")
- `ylab`: the text for the y axis. (Default value: "PCD")
- `ylim`: the limits of the y axis. (Default value: c(0, 360))
- `legend`: the text vector for the legend items. If NULL the legends will be equals to the variable names. (Default value: NULL)
- `fontsize`: the font size value in pt. (Default value: 10)
- `axis.text.color`: the legend colors. (Default value: "black")
- `export`: the logical value for defining whether the graph should be export to a file or not. (Default value: FALSE)
- `export.name`: the text for defining the exported file name. It is only used if export = TRUE. (Default value: "pcd_plot.png")
- `width`: the number for defining the exported graph width. It is only used if export = TRUE. (Default value: 8.6)
- `height`: the number for defining the exported graph height. It is only used if export = TRUE. (Default value: 7.5)
- `units`: the text for defining the units of the height and width parameters. It is only used if export = TRUE. (Default value: "cm")
- `...`: a set of daily or monthly precipitation series.
Author(s)
Lucas Venezian Povoa <lucasvenez@gmail.com>

References

See Also
pcp read.data

Examples
##
# Loading the daily precipitation serie.
data(daily)

##
# Plotting PCP per year
pplot.pcp(daily)

---

pplot.pn  

Plot Percent of Normal

Description
Plots the Percent of Normal of a precipitation serie.

Usage
pplot.pn(..., interval = 30, scale = "a", xlab = NA, ylab = "PN", fontsize = 10, axis.text.color = "black", legend = NULL, export = FALSE, export.name = "pn_plot.png", width = 10, height = 10, units = "cm")

Arguments

- **interval**: the number of months applied for calculating the percentage of normal.
- **scale**: the scale used for calculating the percentage of normal, which should be either "w" for weak (not supported yet), "m" for month, "s" for season, or "d" for decades.
- **xlab**: the text for the x axis. (Default value: NA)
- **ylab**: the text for the y axis. (Default value: "PN")
- **fontsize**: the font size value in pt. (Default value: 10)
- **axis.text.color**: the legend colors. (Default value: "black")
plot.rai

Legend

- **legend**: the text vector for the legend items. If NULL the legends will be equals to the variable names. (Default value: NULL)
- **export**: the logical value for defining whether the graph should be export to a file or not. (Default value: FALSE)
- **export.name**: the text for defining the exported file name. It is only used if export = TRUE. (Default value: "pci_plot.png")
- **width**: the number for defining the exported graph width. It is only used if export = TRUE. (Default value: 10)
- **height**: the number for defining the exported graph height. It is only used if export = TRUE. (Default value: 10)
- **units**: the text for defining the units of the height and width parameters. It is only used if export = TRUE. (Default value: "cm")

... a set of daily or monthly precipitation serie.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also

read.data

Examples

```r
##
# Loading the daily precipitation serie.
data(daily)

##
# Performing the a set of statistical analysis
pplot.pn(daily)
```

**pplot.rai**

_Plot Rainfall Anomaly Index_

Description

Plots the Rainfall Anomaly Index of a precipitation serie.

Usage

```r
pplot.rai(..., granularity = "m", xlab = "Month", ylab = "RAI",
ylim = c(-3,3), legend = NULL, fontsize = 10,
axis.text.color = "black", export = FALSE,
export.name = "rai_plot.png", width = 8.6,
height = 7.5, units = "cm")
```
Arguments

granularity  the granularity applied for calculating the rainfall anomaly index, which should be either "a" for annual granularity or "m" for monthly granularity ". (Default value: "m")

xlab  the text for the x axis. (Default value: "Month")

ylab  the text for the y axis. (Default value: "RAI")

ylim  the limits of the y axis. (Default value: c(-3, 3))

legend  the text vector for the legend items. If NULL the legends will be equals to the variable names. (Default value: NULL)

fontsize  the font size value in pt. (Default value: 10)

axis.text.color  the legend colors. (Default value: "black")

export  the logical value for defining whether the graph should be export to a file or not. (Default value: FALSE)

export.name  the text for defining the exported file name. It is only used if export = TRUE. (Default value: "rai_plot.png")

width  the number for defining the exported graph width. It is only used if export = TRUE. (Default value: 8.6)

height  the number for defining the exported graph height. It is only used if export = TRUE. (Default value: 7.5)

units  the text for defining the units of the height and width parameters. It is only used if export = TRUE. (Default value: "cm")

...  a set of daily or monthly precipitation series.

Author(s)

Lucas Venezian Povoa <lucasvenez@gmail.com>

References


See Also

read.data

Examples

##
# Loading the daily precipitation serie.
data(daily)

##
# Performing the a set of statistical analysis
pplot.rai(daily, granularity = "m")
**pplot.spi**  

*Plot Standardized Precipitation Index*

---

**Description**

Plots the Standardized Precipitation Index of a precipitation serie.

**Usage**

```r
pplot.spi(..., period = 3, distribution = "Gamma", xlab = "Months", ylab = "SPI", ylim = c(-3,3), legend = NULL, fontsize = 10, axis.text.color = "black", export = FALSE, export.name = "spi_plot.png", width = 8.6, height = 7.5, units = "cm")
```

**Arguments**

- `period`: the number of months to be aggregated for calculating the standardized precipitation index. (Default value: 3)
- `distribution`: it has no effect yet. (Default value: "Gamma")
- `xlab`: the text for the x axis. (Default value: "Months")
- `ylab`: the text for the y axis. (Default value: "SPI")
- `ylim`: the limits of the y axis. (Default value: c(-3, 3))
- `legend`: the text vector for the legend items. If NULL the legends will be equals to the variable names. (Default value: NULL)
- `fontsize`: the font size value in pt. (Default value: 10)
- `axis.text.color`: the legend colors. (Default value: "black")
- `export`: the logical value for defining whether the graph should be export to a file or not. (Default value: FALSE)
- `export.name`: the text for defining the exported file name. It is only used if export = TRUE. (Default value: "spi_plot.png")
- `width`: the number for defining the exported graph width. It is only used if export = TRUE. (Default value: 8.6)
- `height`: the number for defining the exported graph height. It is only used if export = TRUE. (Default value: 7.5)
- `units`: the text for defining the units of the height and width parameters. It is only used if export = TRUE. (Default value: "cm")

... a set of daily or monthly precipitation series.

**Author(s)**

Lucas Venezian Povoa <lucasvenez@gmail.com>
See Also

read.data

Examples

```r
##
# Loading the daily precipitation serie.
data(daily)

##
# Performing the a set of statistical analysis
pplot.spi(daily)
```

precintcon | Precipitation Intensity, Concentration and Anomaly Analysis

Description

It contains functions to analyze the precipitation intensity, concentration and anomaly.

Author(s)

Lucas Venezian Povo< <lucasvenez@gmail.com>
Jonas Teixeira Nery <jonas@ourinhos.unesp.br>

References


Description
Calculates the Rainfall Anomaly Index (RAI) on a daily or monthly precipitation serie.

Usage
rai(object, granularity = "m")

Arguments
object  a daily or monthly precipitation serie.
granularity  the granularity applied for calculating the rainfall anomaly index, which should be either "m" for monthly granularity or "a" for annual granularity. (Default value: "m")

Value
A data.frame (precintcon.rai) containing the following variables:
- year is the year.
- month is the month. This attribute exists only when granularity = "m".
- rai is the rainfall anomaly index.

Author(s)
Lucas Venezian Povoa <lucasvenez@gmail.com>

References

See Also
pplot.rai read.data

Examples
##
# Loading the monthly precipitation serie.
data(monthly)

##
# Performing the Rainfall Anomaly Index analysis
rai(monthly, granularity = "m")
read.data

Load a precipitation series

Description

Load a file with a daily or monthly precipitation series.

Usage

read.data(file, sep = ",", dec = ".", header = TRUE, na.value = NA)

Arguments

file a string containing the file path.
sep the character applied for delimited columns. (Default value: ",")
dec the character applied for defined decimal point. (Default value: ".")
header a logical value defining whether the first line of the file refers to column names. (Default value: TRUE)
na.value the value used for representing missing values. (Default value: NA)

Value

A data frame containing a representation of the data in the file. The file is addressed as precintcon.daily or precintcon.monthly depending of its structure.

The file should contains three columns when loading monthly series and thirty three columns when loading daily series.

The first columns refers to years and the second one refers to months. When dealing with daily datasets, the thirty one remaining columns refers to the amount of precipitation in the days of the months. Otherwise, the remaining column refers to the amount of precipitation in each month.

Author(s)

Lucas Venezian Povoa <lucassvenez@gmail.com>

See Also

daily monthly read.table read.csv read.csv2

Examples

##
# Loading a serie on Windows
## Not run: d1 <- read.data("C:\PRECINTCON\203040.csv", sep = ";", dec = ".", header = TRUE)

##
# Loading a serie on Unix-like
## Not run: d1 <- read.data("/home/precintcon/203040.csv", sep = ";", dec = ".", header = TRUE)
**Description**

Calculates the Standardized Precipitation Index (SPI) on a daily or monthly precipitation serie.

**Usage**

```r
spi(object, period = 3, distribution = "Gamma")
```

**Arguments**

- `object`: a daily or monthly precipitation serie.
- `period`: the number of months to be aggregated in the calculation of the standardized precipitation index. (Default value: 3)
- `distribution`: it has no effect yet. (Default value: "Gamma")

**Value**

A data.frame (precintcon.spi) containing the following variables:

- `year` is the year.
- `month` is the month.
- `spi` is the standardized precipitation index.

**Author(s)**

Lucas Venezian Povoa <lucasvenez@gmail.com>

**See Also**

- `precintcon.plot.spi`
- `read.data`

**Examples**

```r
##
# Loading the monthly precipitation serie.
data(monthly)

##
# Performing the Standardized Precipitation Index
spi(monthly, period = 3)
```
Description
Calculates the Standardized Precipitation Index (SPI) per year on a daily or monthly precipitation serie.

Usage
spi.per.year(object, period = 3, distribution = "Gamma", FUN = mean)

Arguments
- object: a daily or monthly precipitation serie.
- period: the number of months to be aggregate in the calculation of the standardized precipitation index. (Default value: 3)
- distribution: (it has no effect yet).
- FUN: the function used to summarize the standardized precipitation index per year. (Default function: mean).

Value
A data.frame (precintcon.spi.per.year) containing the following variables:

- year is the year.
- spi is the standardized precipitation index.

Author(s)
Lucas Venezian Povoa <lucasvenez@gmail.com>

See Also
spi read.data

Examples

```r
##
# Loading the monthly precipitation serie.
data(monthly)

##
# Performing the Standardized Precipitation Index
spi.per.year(monthly, period = 3)
```
Basic statistics for precipitation datasets.

Description

Perform the calculation of basic statistics of precipitation datasets.

Usage

`stat(...)`

Arguments

... a set of daily or monthly precipitation serie.

Value

A data.frame (precintcon.stat) containing the following variables:

- `dataset` is the precipitation serie name.
- `mean.daily` is the daily average precipitation. It exists only for daily datasets.
- `sd.daily` is the standard deviation of a daily precipitation serie. It exists only for daily datasets.
- `var.daily` is the variance of a daily precipitation serie. It exists only for daily datasets.
- `mean.monthly` is the monthly average precipitation.
- `sd.monthly` is the standard deviation of a monthly precipitation serie.
- `var.monthly` is the variance of a monthly precipitation serie.
- `total` is the total precipitation.

Author(s)

Lucas Venezian Povoa <lucasevnez@gmail.com>

Examples

```r
##
# Loading the monthly precipitation serie.
data(monthly)

##
# Plotting the deciles.
stat(monthly)
```
**Description**

It calculates the temporaly irregularity index according to the function \( \frac{\text{sum}(\log(P_{i+1}/P_i))}{(n-1)} \), where \( P_i \) is the precipitation amount of year \( i \), and \( n \) is the number of years.

**Usage**

\[ \text{tii}(\text{object}) \]

**Arguments**

- object is a daily or monthly precipitation serie

**Details**

Daily or monthly precipitation series are transformed to annual series.

**Value**

the temporaly irregularity index according to the function \( \frac{\text{sum}(\log(P_{i+1}/P_i))}{(n-1)} \)

**Author(s)**

Lucas Venezian Povoa

**Examples**

```r
##
# Loading the monthly precipitation serie
data(monthly)

##
# Calculating the Temporaly Irregularity Index
tii(monthly)
```
**trend.test**

*Mann-Kendall Trend Test*

**Description**

It calculates a trend test using the rank-based nonparametric Mann-Kendall method.

**Usage**

`trend.test(object, significance.level = 0.05)`

**Arguments**

- `object` is a daily or monthly precipitation serie.
- `significance.level` is the significance level to be considered in the analysis. It is usually equals to 5% (default: 0.05).

**Value**

A trend test index.

**Author(s)**

Lucas Venezian Povoa <lucasvenez@gmail.com>

**References**


**See Also**

`ci ci.per.year pci read.data`
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