Package 'terracliva'

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Title Climate Vatriability tools

Type Package

Description Climate Variability Analysis with spatio-temporal gridded coverages

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Repository CRAN

Depends lmomPi,terra,magrittr,lmom

Imports lubridate,extRemes

Suggests

RoxygenNote 7.2.3

NeedsCompilation no

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R topics documented:

apprast *Computes a function on multi-layer raster, specially thought for Climate Variability Analysis in Spatial Gridded Coverage*

Description

Computes a function on multi-layer raster, specially thought for Climate Variability Analysis in Spatial Gridded Coverage

Usage

```
apprast(x, index = 1, fun = samlmu, ...)
```

Arguments

x	a SpatRast-Class object
index	see app. It can be set equal to "monthly"
fun	function. Default is samlmu. See app,tapp
...	further arguments for fun, app and tapp

Examples

```
library(magrittr)
library(terra)
library(lmomPi)

years <- 1982:2023
dataset_path <- "/home/ecor/local/rpackages/jrc/terracliva/inst/ext_data/precipitation"
dataset_path <- system.file("ext_data/precipitation",package="terracliva")
dataset_yearly <- "%s/yearly/chirps_yearly_goma_%04d.grd" %>% sprintf(dataset_path,years) %>% rast()



out_yearly <- apprast(dataset_yearly)

funpel <- function(x,distrib="pe3") {
  o1 <- samlmu(x)
  o <- o1 %>% pel(distrib=distrib)
  nn <- names(o)
  o <- as.numeric(o)
  names(o) <- paste(distrib,nn,sep="_")
  o <- c(o1,o)
  return(o)
}

out_yearly_pel <- apprast(dataset_yearly,fun=funpel)

library(lubridate)
```

```
dataset_monthly <- "%s/monthly/chirps_monthly_goma_%04d.grd" %>% sprintf(dataset_path,years) %>% rast()
time(dataset_monthly) <-  names(dataset_monthly) %>% paste0("_01") %>% as.Date(format="X%Y_%m_%d")
index_monthly  <- month(time(dataset_monthly)) %>% sprintf(fmt="M%02d")

out_monthly <- apprast(dataset_monthly,index=index_monthly)
out_monthly_pel <- apprast(dataset_monthly,fun=funpel)
```

`dryspellapprast` *Dry Spell Analysis in Spatial Gridded Coverage*

Description

Dry Spell Analysis in Spatial Gridded Coverage

Usage

```
dryspellapprast(x, timex = time(x), fun = dryspellcliva, index = 1, ...)
```

Arguments

`x`	time series (e.g. daily precipitation)
`timex`	corresponding vector of dates for `x`
`index, fun`	further arguments passed to `apprast`
`...`	further arguments for `dryspellcliva`

See Also

`dryspellapprast`

Examples

```
library(magrittr)
library(terra)


years <- 1982:2023
dataset_path <- "/home/ecor/local/rpackages/jrc/terracliva/inst/ext_data/precipitation"
dataset_path <- system.file("ext_data/precipitation",package="terracliva")
dataset_daily <- "%s/daily/chirps_daily_goma_%04d.grd" %>% sprintf(dataset_path,years) %>% rast()
```

```
out <- dryspellapprast(dataset_daily,valmin=2)
## out5 <- dryspellapprast(dataset_daily,valmin=5)
## out9 <- dryspellapprast(dataset_daily,valmin=9)


dataset_daily_n <- dataset_daily
dataset_daily_n[100][1:500] <- 10
out <- dryspellapprast(dataset_daily_n,valmin=2)


## out10 TO BE TESTED # put a  a thresholds!!!!
```

`dryspellcliva` *Dry Spell Analysis*

Description

Dry Spell Analysis

Usage

```
dryspellcliva(
  x,
  timex,
  valmin = 1,
  months = c(12, 1, 2, 3),
  start_day = 1,
  fun_aggr = max,
  thres_value = 150,
  set_thres_value_as_na = FALSE,
  ...
)
```

Arguments

`x`	time series (e.g. daily precipitation)
`timex`	corresponding vector of dates for `x`
`valmin`	minimum value for rainfall
`months`	months of the rainy season
`start_day`	starting day of the month. It can be different from 1.
`fun_aggr`	aggregation function
`thres_value`	threshold value as a maximum length in days for a dry spell.
`...`	further arguments

References

Usman, M.T. and Reason, C.J.C. (2004) Dry Spell Frequencies and Their Variability over Southern Africa. Climate Research, 26, 199-211. https://doi.org/10.3354/cr026199

Thoithi, W., Blamey, R. C., & Reason, C. J. C. (2021). Dry spells, wet days, and their trends across southern Africa during the summer rainy season. Geophysical Research Letters, 48, e2020GL091041. https://doi.org/10.1029/2020GL091041

Examples

```
library(magrittr)
library(terra)


years <- 1982:2023
dataset_path <- "/home/ecor/local/rpackages/jrc/terracliva/inst/ext_data/precipitation"
dataset_path <- system.file("ext_data/precipitation",package="terracliva")
dataset_daily <- "%s/daily/chirps_daily_goma_%04d.grd" %>% sprintf(dataset_path,years) %>% rast()


prec <- as.numeric(dataset_daily[100])
timeprec <- time(dataset_daily)

out <- dryspellcliva(prec,timeprec)
out10 <- dryspellcliva(prec,timeprec,valmin=10)

precb <- prec
precb[1:500] <- 10
outb <- dryspellcliva(precb,timeprec,valmin=10)
outb <- dryspellcliva(precb,timeprec,valmin=10)
```

`hwmidapprast` *Heat and Cold waves analysis in Spatial Gridded Coverage*

Description

Heat and Cold waves analysis in Spatial Gridded Coverage

Usage

```
hwmidapprast(x, timex = time(x), fun = hwmidcliva, index = 1, ...)

cwmidapprast(x, timex = time(x), fun = cwmidcliva, index = 1, ...)
```

Arguments

x	time series a SpatRast-Class object (e.g. daily maximum or minimum temperature)
timex	corresponding vector of dates for x
index, fun	further arguments passed to apprast
...	further arguments for hwmidcliva or cwmidcliva

See Also

hwmidcliva,cwmidcliva,hwmid

Examples

```
library(magrittr)
library(terra)
library(lmomPi)
library(extRemes)
years <- 1983:2016
tmax_dataset_path <- system.file("ext_data/tmax",package="terracliva")
tmax_dataset_daily <- "%s/daily/chirts_daily_goma_tmax_%04d.grd" %>% sprintf(tmax_dataset_path,years) %>% rast()



o_hw <- hwmidapprast(tmax_dataset_daily)


## COLD WAVE
tmin_dataset_path <- system.file("ext_data/tmin",package="terracliva")
tmin_dataset_daily <- "%s/daily/chirts_daily_goma_tmin_%04d.grd" %>% sprintf(tmin_dataset_path,years) %>% rast()

o_cw <- cwmidapprast(tmin_dataset_daily)
```

---

hwmidcliva *Heat and Cold waves analysis*

Description

Heat and Cold waves analysis

Usage

```
hwmidcliva(
  x,
  timex,
  timex_sim = timex,
  return_vector = TRUE,
```

```
  cold = FALSE,
  start_month = 1,
  ...
)

cwmidcliva(...)
```

Arguments

x	time series (e.g. daily maximum teperature)
timex	corresponding vector of dates for x
timex_sim	corresponding vector of dates in which heat/cold wave magnitude index is calculated
return_vector	logical. If TRUE function returns a vector.
cold	logical cold wave option
start_month	starting month of the year. Default is 1. (TO TEST)
...	further arguments

References

Ceccherini, G., Russo, S., Ameztoy, I., Marchese, A. F., and Carmona-Moreno, C. Heat waves in Africa 1981-2015, observations and reanalysis, Nat. Hazards Earth Syst. Sci., 17, 115–125, 2017 https://doi.org/10.5194/nhess-17-115-2017

Ceccherini, G., Russo, S., Ameztoy, I., Romero, C. P., and Carmona-Moreno, C. Magnitude and frequency of heat and cold waves in recent decades: the case of South America, Nat. Hazards Earth Syst. Sci., 16, 821-831,2016 https://doi.org/10.5194/nhess-16-821-2016

Forzieri, G., Feyen, L., Russo, S. et al. Multi-hazard assessment in Europe under climate change. Climatic Change 137, 105-119 (2016). https://doi.org/10.1007/s10584-016-1661-x

M. Smid, S. Russo, A.C. Costa, C. Granell, E. Pebesma, Ranking European capitals by exposure to heat waves and cold waves, Urban Climate,Volume 27,2019,Pages 388-402, ISSN 2212-0955, https://doi.org/10.1016/j.uclim.2018.12.010. (https://www.sciencedirect.com/science/article/pii/S2212095518302700)

See Also

hwmid

Examples

```
library(magrittr)
library(terra)
library(lmomPi)
library(extRemes)
years <- 1983:2016
tmax_dataset_path <- system.file("ext_data/tmax",package="terracliva")
tmax_dataset_daily <- "%s/daily/chirts_daily_goma_tmax_%04d.grd" %>% sprintf(tmax_dataset_path,years) %>% rast()
```

```
tmax <- as.numeric(tmax_dataset_daily[100])
timex <- time(tmax_dataset_daily)



o_hw <- hwmidcliva(x=tmax,timex=timex)
o_hw6 <- hwmidcliva(x=tmax,timex=timex,start_month=6)

## COLD WAVE
tmin_dataset_path <- system.file("ext_data/tmin",package="terracliva")
tmin_dataset_daily <- "%s/daily/chirts_daily_goma_tmin_%04d.grd" %>% sprintf(tmin_dataset_path,years) %>% rast()

tmin <- as.numeric(tmin_dataset_daily[100])

o_cw <- hwmidcliva(x=tmin,timex=timex,cold=TRUE)
o_cw2 <- cwmidcliva(x=tmin,timex=timex)
```

`lmapprast` *Precipitation Defivit with L-Moments Climate Variability Analysis in Spatial Gridded Coverage*

Description

Precipitation Defivit with L-Moments Climate Variability Analysis in Spatial Gridded Coverage

Usage

```
lmapprast(x, index = 1, distrib = "pe3", fun = lmcliva, ...)
```

Arguments

`x`	a `SpatRast-Class` object
`index, fun, ...`	further arguments passed to `apprast`
`distrib`	probability distribution function. See `pel`

Note

`x` must have the proper time aggregation for the analysis before the execution of this function.

Examples

```
library(magrittr)
library(terra)
library(lmomPi)

years <- 1982:2023
dataset_path <- "/home/ecor/local/rpackages/jrc/terracliva/inst/ext_data/precipitation"
dataset_path <- system.file("ext_data/precipitation",package="terracliva")
```

```
dataset_yearly <- "%s/yearly/chirps_yearly_goma_%04d.grd" %>% sprintf(dataset_path,years) %>% rast()


out_yearly <- lmapprast(dataset_yearly)


library(lubridate)
dataset_monthly <- "%s/monthly/chirps_monthly_goma_%04d.grd" %>% sprintf(dataset_path,years) %>% rast()
time(dataset_monthly) <-  names(dataset_monthly) %>% paste0("_01") %>% as.Date(format="X%Y_%m_%d")


out_monthly <- lmapprast(dataset_monthly,index="monthly",distrib="pe3")
```

`lmcliva` *Precipitation Defivit with L–Moments Climate Variability Analysis*

Description

Precipitation Defivit with L–Moments Climate Variability Analysis

Usage

```
lmcliva(x, distrib = "pe3", rt = c(2, 5, 10, 20, 50))
```

Arguments

`x`	time series (e.g. precipitation)
`distrib`	probability distribution function. See `pel`
`rt`	return periods for deficit and excess

Note

`x` must have the proper time aggregation for the analysis before the execution of this function.

Examples

```
library(magrittr)
library(terra)
library(lmomPi)

years <- 1982:2023
dataset_path <- "/home/ecor/local/rpackages/jrc/terracliva/inst/ext_data/precipitation"
```

```
dataset_path <- system.file("ext_data/precipitation",package="terracliva")
dataset_yearly <- "%s/yearly/chirps_yearly_goma_%04d.grd" %>% sprintf(dataset_path,years) %>% rast()

prec <- as.numeric(dataset_yearly[100])

out_yearly <- lmcliva(prec)
out_yearly <- lmcliva(prec,distrib="pe3")
ks.test(x=prec,y=cdf,distrib="pe3",para=out_yearly[c(5,6,7)])
```

`monthx` *Month starting from a generic date*

Description

Month starting from a generic date

Usage

```
monthx(x, start_day = 1)
```

Arguments

`x`	Date
`start_day`	first day of the month of the considered Month

Examples

```
x <- Sys.Date()


out <- monthx(x)

out2 <- monthx(x,start_day=16)
```

yearx *Year starting from a generic date*

Description

Year starting from a generic date

Usage

```
yearx(x, start_month = 1, start_day = 1)
```

Arguments

x	Date
start_month	first month of the considered Year.
start_day	first day of the month of the considered Year

Examples

```
x <- Sys.Date()

out <- yearx(x)

out2 <- yearx(x,start_month=6)
```

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