

Package: acdcR (via r-universe)

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Type Package

Title Agro-Climatic Data by County

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Description The functions are designed to calculate the most widely-used county-level variables in agricultural production or agricultural-climatic and weather analyses. To operate some functions in this package needs download of the bulk PRISM raster. See the examples, testing versions and more details from: <<https://github.com/ysd2004/acdcR>>.

Depends R (>= 4.0.0), raster, data.table, stats

License GPL (>= 2)

URL <https://github.com/ysd2004/acdcR>

Encoding UTF-8

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Repository <https://ysd2004.r-universe.dev>

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gddcal

Calculating growing season degree days

Description

The function calculates the growing season degree days (GDDs) using single/double triangulation/sine methods.

Usage

```
gddcal(tL, tU, tMin, tMax, tMin2 = NULL, method = NULL)
```

Arguments

tL	Lower temperature threshold
tU	Upper temperature threshold
tMin	Minimum temperature
tMax	Maximum temperature
tMin2	Minimum temperature for the second half day
method	GDD calculation methods (default = single sine method)

Details

`gddcal` is a function for calculating growing season degree days (GDDs) through four approaches popularly used in agricultural production or relevant fields.

- `method = 'stri'`: single triangulation method
- `method = 'dtri'`: double triangulation method (need `tMin2`)
- `method = 'ssin'`: single sine method
- `method = 'dsin'`: double sine method (need `tMin2`)

The default is the single sine method. i.e., if `method` is not specified, `gddcal` uses the single sine method. For two double methods (`'dtri'` and `'dsin'`), a second half day minimum temperature needs to be specified.

Value

A numeric of growing season degree days (GDDs)

References

Zalom, F. G., P. B. Goodell, Lloyd T. Wilson, W. W. Barnett, and W. J. Bentley. (1983) "Degree-Days, the Calculation and Use of Heat Units in Pest Management." *Division of Agriculture and Natural Resources, University of California*. 1-11.

See Also[gddprism](#)**Examples**

```
## Single Triangulation Method
gddcal(55,90,50,82,'stri')
## Double Triangulation Method
gddcal(55,90,50,82,45,'dtri')
## Single Sine Method
gddcal(55,90,50,82)
gddcal(55,90,50,82,'ssin')
## Double Sine Method
gddcal(55,90,50,82,45,'dsin')
```

gddprism

*Calculating GDDs by PRISM grids or Counties with PRISM raster***Description**

The function calculates the growing season degree days (GDDs) by grids or counties directly from a PRISM raster.

Usage

```
gddprism(
  minprism,
  maxprism,
  year,
  tL,
  tU,
  method = c("stri", "ssin"),
  out = NULL
)
```

Arguments

minprism	A PRISM raster of the minimum temperature
maxprism	A PRISM raster of the maximum temperature
year	year of the PRISM raster of minprism and maxprism
tL	Lower temperature threshold
tU	Upper temperature threshold
method	GDD calculation methods: single sine or single triangulation only (default = single sine method)
out	Output value type: GDDs by PRISM grids or Counties (default = Counties)

Details

`gddprism` is a function for calculating growing season degree days (GDDs) by PRISM grids or Counties directly from a PRISM raster.

Only single methods (single sine or single triangulation) are applicable by specifying `method`.

- `method = 'stri'`: single triangulation method
- `method = 'ssin'`: single sine method (default)

The `out` is to specify the output values.

- `out = 'grid'`: GDDs by PRISM grids projected on the NLCD map
- `out = 'stco'`: GDDs by Counties of 2017 Agricultural Census (default)

If `out` is not specified, `'stco'` is set as default.

When `out='stco'` is specified, the weights are applied as:

- `year < 2004`: agricultural areas in 2001 NLCD
- `year = 2004 or 2005`: agricultural areas in 2004 NLCD
- `year = 2006 or 2007`: agricultural areas in 2006 NLCD
- `year = 2008, 2009, or 2010`: agricultural areas in 2008 NLCD
- `year = 2011 or 2012`: agricultural areas in 2011 NLCD
- `year = 2013, 2014, or 2015`: agricultural areas in 2013 NLCD
- `year = 2016, 2017, or 2018`: agricultural areas in 2016 NLCD
- `year >= 2019`: agricultural areas in 2019 NLCD

To get a PRISM raster, follow the instruction at https://prism.oregonstate.edu/documents/PRISM_downloads_FTP.pdf.

Value

A data.frame including GDDs (`gdd`), PRISM grid numbers (`gridNum`), or FIPS codes (`stco`)

See Also

[gddcal](#), [pptprism](#), [grid2stco](#)

Examples

```
#####
## Note: Need PRISM rasters to run this code
#####
## Not run:
## PRISM data import
maxdata <- raster('./PRISM_tmax_stable_4kmD1_19960701_bil.bil')
mindata <- raster('./PRISM_tmin_stable_4kmD1_19960701_bil.bil')
## Single Sine Methods over Counties
result1 <- gddprism(mindata,maxdata,1996,8,30,'ssin')
result2 <- gddprism(mindata,maxdata,1996,8,30,'ssin','stco')
## Single Sine Method over PRISM grids
result3 <- gddprism(mindata,maxdata,1996,8,30,'ssin','grid')
## Single Triangulation over Counties
result4 <- gddprism(mindata,maxdata,1996,8,30,'stri')
```

```
## End(Not run)
```

grid2stco	<i>Convert PRISM grid data to agricultural area weighted county data</i>
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Description

The function calculates agricultural area weighted county values from PRISM grid data.

Usage

```
grid2stco(griddata, year)
```

Arguments

griddata	An output data.frame from <code>gddprism</code> or <code>pptprism</code>
year	year of the <code>griddata</code>

Details

`grid2stco` converts an output data.frame from `gddprism` or `pptprism` to the county-level weighted average with agricultural areas in NLCD.

If a single PRISM result is converted from grid to stco, the results are the same with the `stco` specification in `gddprism` or `pptprism`.

This function would be helpful when cumulative precipitation or `gdd` are applied first and then calculate county-level values.

The GDDs and precipitations in Schlenker and Roberts (2009) are replicable with these functions.

The input of `griddata` should have the following variables.

- For an output of `gddprism`: `gridNum`, `stco`, and `gdd`
- For an output of `pptprism`: `gridNum`, `stco`, and `ppt`

With the specified data year of `year`, the weights are applied as:

- `year < 2004`: agricultural areas in 2001 NLCD
- `year = 2004` or `2005`: agricultural areas in 2004 NLCD
- `year = 2006` or `2007`: agricultural areas in 2006 NLCD
- `year = 2008`, `2009`, or `2010`: agricultural areas in 2008 NLCD
- `year = 2011` or `2012`: agricultural areas in 2011 NLCD
- `year = 2013`, `2014`, or `2015`: agricultural areas in 2013 NLCD
- `year = 2016`, `2017`, or `2018`: agricultural areas in 2016 NLCD
- `year >= 2019`: agricultural areas in 2019 NLCD

Value

A data.frame of FIPS codes (`stco`) and growing degree days (GDDs) or precipitation (`ppt`)

References

Schlenker, W. and M. Roberts. (2009) "Nonlinear temperature effects indicate severe damages to U.S. crop yields under climate change." *Proceedings of the National Academy of Sciences (PNAS)*. 15594-15598.

See Also

[gddprism](#), [pptprism](#)

Examples

```
## PRISM data import
#####
## Note: Need a PRISM raster to run this code
#####
## Not run:
pptdata <- raster('./PRISM_ppt_stable_4kmD2_19960701_bil.bil')
## precipitation data by grid and stco
stcores <- pptprism(pptdata,1996,'stco')
gridres <- pptprism(pptdata,1996,'grid')
## Convert the gridres to stcores
converted <- grid2stco(gridres,1996)
## Compare the results
converted$ppt[1:10]
stcores$ppt[1:10]

## End(Not run)
```

pptprism

Calculating precipitation by PRISM grids or Counties with PRISM raster

Description

The function calculates the precipitation (mm) by grids or counties directly from a PRISM raster.

Usage

```
pptprism(mmprism, year, out = NULL)
```

Arguments

mmprism	A PRISM raster of the precipitation
year	year of the PRISM raster
out	Output value type: precipitation by PRISM grids or Counties (default = Counties)

Details

pptprism is a function for calculating precipitation (mm) by PRISM grids or Counties directly from a PRISM raster.

The out is to specify the output values.

- out = 'grid': precipitation by PRISM grids projected on the NLCD map
- out = 'stco': precipitation by Counties of 2017 Agricultural Census (default)

If out is not specified, 'stco' is set as default.

When out='stco' is specified, the weights are applied as:

- year < 2004: agricultural areas in 2001 NLCD
- year = 2004 or 2005: agricultural areas in 2004 NLCD
- year = 2006 or 2007: agricultural areas in 2006 NLCD
- year = 2008, 2009, or 2010: agricultural areas in 2008 NLCD
- year = 2011 or 2012: agricultural areas in 2011 NLCD
- year = 2013, 2014, or 2015: agricultural areas in 2013 NLCD
- year = 2016, 2017, or 2018: agricultural areas in 2016 NLCD
- year >= 2019: agricultural areas in 2019 NLCD

To get a PRISM raster, follow the instruction at https://prism.oregonstate.edu/documents/PRISM_downloads_FTP.pdf.

Value

A data.frame including precipitation (ppt), PRISM grid numbers (gridNum), or FIPS codes (stco)

See Also

[gddprism](#), [grid2stco](#)

Examples

```
#####
## Note: Need a PRISM raster to run this code
#####
## Not run:
## PRISM data import
pptdata <- raster('./PRISM_ppt_stable_4kmD2_19960701_bil.bil')
## precipitation over Counties
result <- pptprism(pptdata,1996)
result2 <- pptprism(pptdata,1996,'stco')
## precipitation over PRISM grids
result3 <- pptprism(pptdata,1996,'grid')

## End(Not run)
```

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