Package ‘ClimateNAr’

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Title ClimateBC/NA R applications

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Description Provides R applications for downloading spatial climate data for specific climate variables, inquiring climate variables through web API and desktop API (CMD Line access) for British Columbia (BC), western North America (WNA), and North America (NA) using ClimateBC and ClimateNA.

System Requirements ClimateBC or ClimateNA installed for CMD Line access.

URL https://climatena.ca/downloads/ClimateNAr.zip

R topics documented:

Package installation

ClimateNA R package is not registered in CRAN. It needs to be downloaded here and installed locally. The package can be installed locally in one of the three options:

1. Through R console interface: Packages => Install package(s) from local files.
2. Through R code: install.packages('path/ClimateNA.zip', repos=NULL, type='source'). For example: install.packages('C:/temp/climatenaAPI.zip', repos=NULL, type='source')
3. Simply unzip the folder to the R library folder on your computer.

R Functions

rasterDownload

Description

rasterDownload is to download raster files for specific variables for BC, WNA, or NA generated by ClimateBC and ClimateNA (available for selected periods and climate change scenarios).

Usage

rasterDownload (region='BC',res='800m',period='Normal_1961_1990',varList=varList,sDir='C:/temp')

Arguments

region	The region of interest. It can be `'BC'`, `'WNA'` or `'NA'`.
res	Spatial resolution. The default is `'800m'`. The `'800m'` is available for `'BC'` and `'WNA'`, and the `'4000m'` is available for NA.
period	The period of the climate data. The default is "Normal_1961_1990". The available options include: "Normal_1971_2000", "Normal_1981_2010", and "Normal_1981_2020" for historical periods, all the 8GCMs_ensembles (for example: "8GCMs_ensemble_ssp126_2011-2040"). More options may be added later on.
varList	A list of climate variables to download.
sDir	The directory to be created to save the downloaded files.

Examples

```
>library(ClimateNAr)
>varList <- c('mat', 'map','td')
>rasterDownload(region='BC',res='800m',
period='Normal_1961_1990',varList=varList,sDir='C:/temp')
```

rasterStack

Description

rasterStack is to generate a raster stack from raster files for model spatial predictions. It also converts variables from integers to their original decimal values if applicable. Please use *summary()* or *plot()* function to confirm the conversion is complete for all the relevant variables.

Usage

rasterStack(wd, varList, rType='tif', vConvert=TRUE)

Arguments

wd	The working directory where the raster files are located.
varList	A list of variables to be included in the stack.
rType	Raster type of the raster files. The default is Tiff files. It can also be ArcGIS grid files.
vCovert	If set to TRUE (or T), it will convert relevant variables from integers to their original decimals.

Examples

```
>library(ClimateNAr)
>wd <- 'C:/temp/Normal_1961_1990SY/'
>varList <- c('mat', 'map', 'td')
>stk <- rasterStack(wd,varList,rType='tif',vConvert=T);stk
#need to check the file location to make sure the 'wd' is correctly
specified.
```

ClimateNA_cmdLine

Description

ClimateNA_cmdLine is to run ClimateBC or ClimateNA using CMD Line feature in R, which allows integrating the climate models into a programming workflow. It can use most of the features of ClimateBC/NA. In addition, if this function is used to generate climate data in raster format (.asc), it also converts the .asc files into georeferenced .tif files with lat/lon projection (WGS84) and reduces the file size substantially.

Usage

ClimateNA_cmdLine <- function(exe = "ClimateNA_v7.30.exe", wkDir, period = 'Normal_1961_1990.nrm', MSY = 'Y', inputFile, outputFile)

Arguments

exe	The .exe file. It can be "ClimateNA_v7.30.exe" or "ClimateBC_v7.30.exe" the default value is "ClimateNA_v7.30.exe".
wkDir	The root directory of ClimateNA or ClimateBC in a format of "C:\\Climatena_v730\\".
Period	The period of the climate data. The default is "Normal_1961_1990.nrm". It can also be another historical normal (.nrm), decadal (.dcd), annual (.ann), and future period (.gcm).
MSY	The time scale of the climate variables. The default is 'Y' for annual variables. It can also be 'M' for monthly, 'S' for seasonal, 'SY' for annual and seasonal, or 'MSY' for all.
inputFile	The input file name and location. it can be either a .csv or .asc file, like: 'C:\\Climatena_v730\\InputFiles\\input_test.csv' or 'C:\\ClimateModels\\Climatena_v730\\InputFiles\\na50k.asc'.
outputFile	The output file name and location. It depends on the type of input file. If the input file is a .csv file, the output file should also be a .csv file, like: 'C:\\ClimateModels\\Climatena_v730\\test\\test_Normal_1961_1990.csv'. If the inputFile is an .asc file, the outputFile is a folder name like: 'C:\\Climatena_v730\\test\\'.

Examples

```
>library(ClimateNAr)
>wkDir = 'C:\\ClimateModels\\Climatena_v730\\'
>exe <- "ClimateNA_v7.30.exe"
>inputFile = 'C:\\Climatena_v730\\InputFiles\\input_test.csv'
>outputFile = 'C:\\ Climatena_v730\\test\\test_Normal_1961_1990.csv'
>period = 'Normal_1961_1990.nrm'
>ClimateNA_cmdLine(exe, wkDir, period, MSY='Y',inputFile, outputFile)

>inputFile = 'C:\\Climatena_v730\\InputFiles\\na50k.asc'
>outputFile = 'C:\\Climatena_v730\\test\\'
>period = 'Normal_1961_1990.nrm'
>ClimateNA_cmdLine(exe,wkDir,period,MSY='SY',inputFile, outputFile)
```

ClimateNA_API

Description

ClimateNA_API is to get climate variables for a single location from ClimateBC or ClimateNA web API.

Usage

ClimateNA_API(ClimateBC_NA='NA', lonLatEl, period='Normal_1961_1990.nrm', MSY='Y')

Arguments

ClimateBC_NA	To specify either to use ClimateBC or ClimateNA web API. The default is ClimateBC_NA = 'NA' for ClimateNA. It can also be ClimateBC_NA = 'BC' for ClimateBC.
lonLatEl	Coordinates and elevation of a location, for example: lonLatEl <- c(48.98,-115.02,200).
period	The period of the climate data. The default is 'Normal_1961_1990.nrm'. It can also be another historical or future period. Most period options of the desktop version are available.
MSY	The time scale of the climate variables. The default is 'Y' for annual variables. It can also be 'M' for monthly, 'S' for seasonal, 'SY' for annual and seasonal, or 'MSY' for all.

Limitations

All computing process occurs on the server for requests from all users and can easily crash the server. To prevent from using this function loops, the number of requests cannot be more than 2 times per second.

Examples

```
>library(ClimateNAr)
>latLonEl <- c(48.98,-115.02,1000)
>clm <- ClimateNA_API(ClimateBC_NA='BC',
latLonEl,period='Normal_1961_1990.nrm',MSY='Y');
>head(clm);dim(clm)
```

ClimateNA_API2

Description

ClimateNA_API2 is to get climate variables for multiple locations from ClimateBC or ClimateNA web API.

Usage

ClimateNA_API2(ClimateBC_NA='NA', inputFile, period='Normal_1961_1990.nrm', MSY='Y');

Arguments

ClimateBC_NA	To specify either to use ClimateBC or ClimateNA web API. The default is ClimateBC_NA = 'NA' for ClimateNA. It can also be ClimateBC_NA = 'BC' for ClimateBC.
inputFile	An .CSV input file consists of coordinates and elevation of locations. It has the same format as the .CSV input file for desktop ClimateBC or ClimateNA.
period	The period of the climate data. The default is 'Normal_1961_1990.nrm'. It can also be another historical or future period. Most period options of the desktop version are available.
MSY	The time scale of the climate variables. The default is 'Y' for annual variables. It can also be 'M' for monthly, 'S' for seasonal, 'SY' for annual and seasonal, or 'MSY' for all.

Limitations

All computing process occurs on the server for requests from all users and can easily crash the server. To prevent this, a two-way throttling measure is implemented. First, the input file *x* cannot have more than 100 entries. Second, the number of requests cannot be more than 10 times per hour and 100 times per day.

Examples

```
>library(ClimateNAr)
>input_file <- 'C:/temp/locations.csv'
>clm <- ClimateNA_API2 (ClimateBC_NA='NA', inputFile=input_file,
period='Normal_1961_1990.nrm',MSY='Y');
>head(clm);dim(clm)
```