Package 'rerddapXtracto'

July 17, 2024

Type Package

Title Extracts Environmental Data from 'ERDDAP™' Web Services

Version 1.2.1

Date 2024-7-17

Description Contains three functions that access environmental data from any 'ERDDAP™' data web service. The rxtracto() function extracts data along a trajectory for a given ``radius'' around the point. The rxtracto_3D() function extracts data in a box. The rxtractogon() function extracts data in a polygon. All of those three function use the 'rerddap' package to extract the data, and should work with any 'ERDDAP™' server. There are also two functions, plotBBox() and plotTrack() that use the 'plotdap' package to simplify the creation of maps of the data.

URL https://github.com/rmendels/rerddapXtracto

BugReports https://github.com/rmendels/rerddapXtracto/issues

Depends R(>= 4.0.0)

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Imports abind, dplyr, ggplot2, httr, maps, methods, ncdf4, parsedate, plotdap (>= 0.0.5), readr, rerddap (>= 0.8.0), sf, sp, stats, utils

Suggests cmocean, gganimate, knitr, lubridate, mapdata, rmarkdown

RoxygenNote 7.3.2

Encoding UTF-8

LazyData TRUE

VignetteBuilder knitr

NeedsCompilation no

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Repository CRAN

Date/Publication 2024-07-17 17:30:02 UTC

Contents

`dataInfo` *dataInfo Data*

Description

pre-Download of 'rerddap' info needed for examples so can run within CRAN Time limits

Usage

```
dataInfo
```

Format

An object of class `info` of length 3.

Details

obtained using dataInfo <- rerddap::info('erdHadISST')

Marlintag38606 *Marlin Tag Data*

Description

Telemetry data of a blue marlin tagged in the Pacific Ocean in 2003

Usage

```
Marlintag38606
```

Format

A data frame with 152 obs. of 7 variables:

date time of observation given as YYYY-MM-DD

lon longitude of observation

lat latitude of observation

lowLon low error on longitude

higLon high error on longitude

lowLat low error on latitude

higLat high error on latitude

Source

Dr. Mike Musyl, Pelagic Research Group LLC

mbnms *MBNMS Boundaries*

Description

A dataset containing the latitudes and longitudes of a polygon that define boundaries of the Monterey Bay National Marine Sanctuary.

Usage

```
mbnms
```

Format

A data frame with 6666 obs. of 2 variables:

Longitude Longitudes of a boundary polygon

Latitude Latitudes of a boundary polygon

Source

https://sanctuaries.noaa.gov/library/imast_gis.html

`MBsst` *MBsst Data*

Description

pre-Download of Pacific West Coast SST fro use in ‘plotBBox()‘ example can run within CRAN Time limits

Usage

```
MBsst
```

Format

An object of class `list` (inherits from `rxtracto3D`) of length 6.

Details

obtained using the ‘rxtracto_3D()‘ command dataInfo <- rerddap::info(’erdMBsstd1day’) parameter <- ’sst’ xcoord <- c(230, 230.1) ycoord <- c(33, 33.1) tcoord <- c(’2006-01-15’, ’2006-01-15’) zcoord <- c(0., 0.) MBsst <- rxtracto_3D(dataInfo, parameter, xcoord = xcoord, ycoord = ycoord, tcoord = tcoord, zcoord = zcoord)

`PB_Argos` *Polar Bear Track Data*

Description

Telemetry data of a tagged polar bear

Usage

```
PB_Argos
```

Format

A data frame with 1919 obs. of 4 variables:

DateTime time of observation

QualClass Quality Flag

Lat latitude of observation

Lon longitude of observation

Source

dryad dataset https://datadryad.org/stash/dataset/doi:10.5061/dryad.4qrfj6q96

Citation Auger-Méthé, Marie; Derocher, Andrew E. (2021). Argos and GPS data for a polar bear track [Dataset]. Dryad. https://doi.org/10.5061/dryad.4qrfj6q96

Associated Paper Auger-Méthé, M., Newman, K., Cole, D., Empacher, F., Gryba, R., King, A. A., Leos-Barajas, V., Mills Flemming, J., Nielsen, A., Petris, G., and Thomas, L.. 2021. A guide to state–space modeling of ecological time series. Ecological Monographs 91(4):e01470. 10.1002/ecm.1470

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plotBBox *plot result of 'rxtracto_3D'*

Description

plotBBox is a function to plot the results from 'rxtracto_3D'()' and 'rxtractogon()'

Usage

```
plotBBox(
  resp,
  plotColor = "viridis",
  time = NA,
  myFunc = NA,
  mapData = NULL,
  crs = NULL,
  animate = FALSE,
  cumulative = FALSE,
  name = NA,
  maxpixels = 10000
)
```

Arguments

resp	data frame returned from 'rxtracto_3D'()' or 'rxtractogon()'
plotColor	the color to use in plot from 'cmocean'
time	a function to map multi-time to one, or else identity for animation
myFunc	function of one argument to transform the data
mapData	map data from 'maps' or 'mapdata', must be of class 'map'
crs	valid crs string
animate	if multiple times, if TRUE will animate the maps
cumulative	makes cumulative animation of data
name	name for colorbar label
maxpixels	maximum number of pixels to use in making the map - controls resolution

Value

a 'plotdap' plot

Examples

```
## example code to download data for plotBBox
## dataInfo <- rerddap::info('erdMBsstd1day')
## parameter <- 'sst'
## xcoord <- c(230, 230.1)
## ycoord <- c(33, 33.1)
## tcoord <- c('2006-01-15', '2006-01-15')
## zcoord <- c(0., 0.)
## MBsst <- rxtracto_3D(dataInfo, parameter, xcoord = xcoord, ycoord = ycoord,
##                      tcoord = tcoord, zcoord = zcoord)
##
## low resolution selected to keep time to render down
# suppressWarnings(p <- plotBBox(MBsst, maxpixels = 50))
```

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plotTrack *plot result of 'rxtracto'*

Description

plotTrack is a function to plot the results from 'rxtracto()'

Usage

```
plotTrack(
  resp,
  xcoord,
  ycoord,
  tcoord,
  plotColor = "viridis",
  myFunc = NA,
  mapData = NULL,
  crs = NULL,
  animate = FALSE,
  cumulative = FALSE,
  name = NA,
  shape = 20,
  size = 0.5
)
```

Arguments

resp	data frame returned from 'rxtracto()'
xcoord	passed to 'rxtracto()'

ycoord	passed to 'rxtracto()'
tcoord	passed to 'rxtracto()'
plotColor	the color to use in plot from 'cmocean'
myFunc	function of one argument to transform the data
mapData	map data from 'maps' or 'mapdata', must be of class 'map'
crs	valid crs string
animate	if multiple times, if TRUE will animate the maps
cumulative	makes cumulative animation of data
name	name for colorbar label
shape	shape to use to mark track
size	size of shape to use to mark track

Value

a 'plotdap' plot

Examples

```
## example data download for plotTrack
## tagData <- Marlintag38606
## xpos <- tagData$lon[1:20]
## ypos <- tagData$lat[1:20]
## tpos <- tagData$date[1:20]
## zpos <- rep(0., length(xpos))

## example data download for plotTrack
## swchlInfo <- rerddap::info('erdSWchla8day')
##scwchl <- rxtracto(swchlInfo, parameter = 'chlorophyll', xcoord = xpos,
##        ycoord = ypos, tcoord = tpos, zcoord = zpos, xlen = .2, ylen = .2)
##
# suppressWarnings(p <- plotTrack(swchl, xpos, ypos, tpos, plotColor = 'algae'))
```

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rxtracto *Extract environmental data along a trajectory from an 'ERDDAP™' server using 'rerddap'.*

Description

rxtracto_new uses the R program 'rerddap' to extract environmental data from an 'ERDDAP' server along a (x,y,z, time) trajectory.

Usage

```
rxtracto(
  dataInfo,
  parameter = NULL,
  xcoord = NULL,
  ycoord = NULL,
  zcoord = NULL,
  tcoord = NULL,
  xlen = 0,
  ylen = 0,
  zlen = 0,
  xName = "longitude",
  yName = "latitude",
  zName = "altitude",
  tName = "time",
  interp = NULL,
  verbose = FALSE,
  progress_bar = FALSE
)
```

Arguments

dataInfo	- the return from an 'rerddap::info' call to an 'ERDDAP™' server
parameter	- character string containing the name of the parameter to extract
xcoord	- a real array with the x-coordinates of the trajectory (if longitude in #' decimal degrees East, either 0-360 or -180 to 180)
ycoord	- a real array with the y-coordinate of the trajectory (if latitude in decimal degrees N; -90 to 90)
zcoord	-a real array with the z-coordinate of the trajectory (usually altitude or depth)
tcoord	- a character array with the times of the trajectory in "YYYY-MM-DD" - for now restricted to be time.
xlen	- real array defining the longitude box around the given point (xlen/2 around the point)
ylen	- real array defining the latitude box around the given point (ylen/2 around the point)
zlen	- real array defining the depth or altitude box around the given point (zlen/2 around the point)
xName	- character string with name of the xcoord in the 'ERDDAP™' dataset (default "longitude")
yName	- character string with name of the ycoord in the 'ERDDAP™' dataset (default "latitude")
zName	- character string with name of the zcoord in the 'ERDDAP™' dataset (default "altitude")
tName	- character string with name of the tcoord in the 'ERDDAP™' dataset (default "time")

interp	- array (size 2) of character strings - c(interpolation type, neighborhood) Uses the new ERDDAP interpoation option to get values See Vignette for details Default is Null, do not use the interpolation option
verbose	- logical variable (default FALSE) if the the URL request should be verbose
progress_bar	- logical variable (default FALSE) should a progress bar be displayed

Value

If success a dataframe containing:

- column 1 = mean of data within search radius
- column 2 = standard deviation of data within search radius
- column 3 = number of points found within search radius
- column 4 = time of returned value
- column 5 = min longitude of call (decimal degrees)
- column 6 = max longitude of call (decimal degrees)
- column 7 = min latitude of call (decimal degrees)
- column 8 = max latitude of call (decimal degrees)
- column 9 = requested time in tag
- column 10 = median of data within search radius
- column 11 = median absolute deviation of data within search radius

else an error string

Examples

```
## toy example to show use
## but keep execution time down
##
# dataInfo <- rerddap::info('erdHadISST')
##
parameter <- 'sst'
xcoord <- c(-130.5)
ycoord <- c(40.5)
tcoord <- c('2006-01-16')
# extract <- rxtracto(dataInfo, parameter = parameter, xcoord = xcoord,
#                   ycoord = ycoord, tcoord= tcoord
#                   )
##
## bathymetry example
## 2-D example getting bathymetry
dataInfo <- rerddap::info('etopo360')
parameter <- 'altitude'
# extract <- rxtracto(dataInfo, parameter, xcoord = xcoord, ycoord = ycoord)
```

`rxtractogon` *Extract environmental data in a polygon using 'ERDDAP™' and 'rerddap'.*

Description

`rxtractogon` uses the R program 'rerddap' to extract environmental data from an 'ERDDAP™' server in a polygon through time.

Usage

```
rxtractogon(
  dataInfo,
  parameter,
  xcoord = NULL,
  ycoord = NULL,
  zcoord = NULL,
  tcoord = NULL,
  xName = "longitude",
  yName = "latitude",
  zName = "altitude",
  tName = "time",
  verbose = FALSE,
  cache_remove = TRUE
)
```

Arguments

`dataInfo`	- the return from an 'rerddap:info' call to an 'ERDDAP™' server
`parameter`	- character string containing the name of the parameter to extract
`xcoord`	- array giving longitudes (in decimal degrees East, either 0-360 or -180 to 180) of polygon
`ycoord`	- array giving latitudes (in decimal degrees N; -90 to 90)of polygon
`zcoord`	- a real number with the z-coordinate(usually altitude or depth)
`tcoord`	- 2-array of minimum and maximum times as 'YYYY-MM-DD'
`xName`	- character string with name of the xcoord in the 'ERDDAP™' dataset (default "longitude")
`yName`	- character string with name of the ycoord in the 'ERDDAP™' dataset (default "latitude")
`zName`	- character string with name of the zcoord in the 'ERDDAP™' dataset (default "altitude")
`tName`	- character string with name of the tcoord in the 'ERDDAP™' dataset (default "time")
`verbose`	- logical variable (default FALSE) if the the URL request should be verbose
`cache_remove`	- logical variable (default TRUE) whether to delete 'rerddap' cache

Value

If successful a structure with data and dimensions

- extract$data - the masked data array dimensioned (lon,lat,time)
- extract$varname - the name of the parameter extracted
- extract$datasetname - ERDDAP dataset name
- extract$longitude - the longitudes on some scale as request
- extract$latitude - the latitudes always going south to north
- extract$time - the times of the extracts

else an error string

Details

rxtractogon extracts the data from the smallest bounding box that contains the polygon, and then uses the function "point.in.polygon" from the "sp" package to mask out the areas outside of the polygon. rxtractogon only works with datasets defined on a latitude and longitude grid.

Examples

```
## toy example to show use
## and keep execution time low
# dataInfo <- rerddap::info('erdHadISST')
parameter <- 'sst'
tcoord <- c("2016-06-15")
xcoord <- mbnms$Longitude[1:3]
ycoord <- mbnms$Latitude[1:3]
# sanctSST <- rxtractogon (dataInfo, parameter=parameter, xcoord = xcoord,
#                          ycoord = ycoord,  tcoord= tcoord)
#
## MBMS bathymetry example
xcoord <- mbnms$Longitude
ycoord <- mbnms$Latitude
dataInfo <- rerddap::info('etopo180')
parameter = 'altitude'
xName <- 'longitude'
yName <- 'latitude'
# bathy <- rxtractogon (dataInfo, parameter = parameter, xcoord = xcoord, ycoord = ycoord)
```

`rxtracto_3D` *Extract environmental data in a 3-dimensional box from an 'ERDDAP™' server using 'rerddap'.*

Description

`rxtracto_3D` uses the R program 'rerddap' to extract environmental data from an 'ERDDAP' server in an (x,y,z, time) bounding box. The same call could be made directly in rerddap, but function is maintained as it is used in the polygon routine.

Usage

```
rxtracto_3D(
  dataInfo,
  parameter = NULL,
  xcoord = NULL,
  ycoord = NULL,
  zcoord = NULL,
  tcoord = NULL,
  xName = "longitude",
  yName = "latitude",
  zName = "altitude",
  tName = "time",
  verbose = FALSE,
  cache_remove = TRUE
)
```

Arguments

dataInfo	- the return from an 'rerddap:info' call to an 'ERDDAP™' server
parameter	- character string containing the name of the parameter to extract
xcoord	- a real array with the x-coordinates of the trajectory (if longitude in #' decimal degrees East, either 0-360 or -180 to 180)
ycoord	- a real array with the y-coordinate of the trajectory (if latitude in decimal degrees N; -90 to 90)
zcoord	- a real array with the z-coordinate (usually altitude or depth)
tcoord	- a character array with the times of the trajectory in "YYYY-MM-DD" - for now restricted to be time.
xName	- character string with name of the xcoord in the 'ERDDAP™' dataset (default "longitude")
yName	- character string with name of the ycoord in the 'ERDDAP™' dataset (default "latitude")
zName	- character string with name of the zcoord in the 'ERDDAP™' dataset (default "altitude")
tName	- character string with name of the tcoord in the 'ERDDAP™' dataset (default "time")
verbose	- logical variable (default FALSE) if the the URL request should be verbose
cache_remove	- logical variable (default TRUE) whether to delete 'rerddap' cache

Value

If successful a structure with data and dimensions:

- extract$data - the data array dimensioned (lon,lat,time)
- extract$varname - the name of the parameter extracted
- extract$datasetname - ERDDAP™ dataset name

- extract$longitude - the longitudes on some scale as request
- extract$latitude - the latitudes always going south to north
- extract$time - the times of the extracts

else an error string

Examples

```
## toy example to show use
## and keep execution time low
##
# dataInfo <- rerddap::info('erdHadISST')
parameter <- 'sst'
xcoord <- c(-130.5, -130.5)
ycoord <- c(40.5, 40.5)
tcoord <- c('2006-01-16', '2006-01-16')
# extract <- rxtracto_3D(dataInfo, parameter, xcoord = xcoord, ycoord = ycoord,
#                        tcoord = tcoord)

## bathymetry example
## 2-D example getting bathymetry
dataInfo <- rerddap::info('etopo360')
parameter <- 'altitude'
# extract <- rxtracto_3D(dataInfo, parameter, xcoord = xcoord, ycoord = ycoord)
```

`swchl` *swchl Data*

Description

pre-Download of Pacific West Coast SST fro use in ‘plotTrack()‘ example can run within CRAN Time limits

Usage

```
swchl
```

Format

An object of class `list` (inherits from `rxtractoTrack`) of length 13.

Details

obtained using the ‘rxtracto()‘ command tagData <- Marlintag38606 xpos <- tagData$lon[1:20] ypos <- tagData$lat[1:20] tpos <- tagData$date[1:20] tpos <- tagData$date[1:20] zpos <- rep(0., length(xpos)) swchlInfo <- rerddap::info(’erdSWchla8day’) swchl <- rxtracto(swchlInfo, parameter = ’chlorophyll’, xcoord = xpos, ycoord = ypos, tcoord = tpos, zcoord = zpos, xlen = .2, ylen = .2)

tidy_grid *convert result of 'rxtracto_3D' or 'rxtractogon' to tidy long-format*

Description

`tidy_grid` is a function to convert result of 'rxtracto_3D' or 'rxtractogon' to "tidy" long-format

Usage

```
tidy_grid(response)
```

Arguments

`response`	data frame returned from 'rxtracto_3D'()' or 'rxtractogon()'

Value

a dataframe in long-format

Examples

```
MBsst_tidy <-tidy_grid(MBsst)
```

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