

Package: picMaps (via r-universe)

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Description This package provides objects and functions for making plots and maps easier to create in the Pacific Ocean.
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picMaps-package	<i>Functions To Aid Mapping of PIFSC Data</i>
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Description

This package is a collection of functions that helps gather spatial data for creating maps in the Pacific Ocean.

Note

This software package is developed and maintained by scientists at the NOAA Fisheries Pacific Islands Fisheries Science Center and should be considered a fundamental research communication. The recommendations and conclusions presented here are those of the authors and this software should not be construed as official communication by NMFS, NOAA, or the U.S. Dept. of Commerce. In addition, reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA. While the best efforts have been made to insure the highest quality, tools such as this are under constant development and are subject to change.

Author(s)

Devin S. Johnson <devin.johnson@noaa.gov> (Maintainer)

all_eez	<i>All Pacific Island US EEZ</i>
---------	----------------------------------

Description

All Pacific Island US EEZ

Usage

```
all_eez()
```

am_samoa_eez	<i>American Samoa US EEZ boundary polygon</i>
--------------	---

Description

American Samoa US EEZ boundary polygon

Usage

```
am_samoa_eez()
```

bc_raster

Bhattacharyya distance for 2 raster probability densities

Description

Bhattacharyya distance for 2 raster probability densities

Usage

```
bc_raster(r, s)
```

Arguments

r SpatRaster object
s SpatRaster object

Details

Computes Bhattacharyya distance for 2 raster UD's. The 2 rasters are first normalized to sum to 1.

cenpac

Central Pacific Boundary for Pelagic False Killer Whales

Description

Central Pacific Boundary for Pelagic False Killer Whales

Usage

```
cenpac()
```

etopo_download

Download ETOPO 2022 Bathymetry data

Description

Downloads bathymetry data for map making.

Usage

```
etopo_download(resolution = 60, force = FALSE)
```

Arguments

resolution	numeric resolution in arcsecs (one of 30, or 60). Defaults to 60 arcsecs.
force	Logical. If data has previously been downloaded, it will force a new download and update of the OSM data.

Author(s)

Devin S. Johnson

References

<https://osmdata.openstreetmap.de/data/land-polygons.html>

etopo_rast	<i>Extract Bathymetry Data From Downloaded ETOPO 2022 data.</i>
------------	---

Description

The majority of this function is taken from the topotools package here: <https://github.com/BigelowLab/topotools/tree/main>. It was modified to work within the ‘picMaps’ package.

Usage

```
etopo_rast(x, resolution = 60, ...)
```

Arguments

x	an sf spatial object that will define the extent of the bathymetry raster.
resolution	Resolution of the ETOPO bathymetry raster, either 60 or 30 arc-seconds. Defaults to resolution = 60.
...	Additional arguments passed to terra::project.

References

- NOAA National Centers for Environmental Information. 2022: ETOPO 2022 15 Arc-Second Global Relief Model. NOAA National Centers for Environmental Information. DOI: 10.25921/fd45-gt74. Accessed 2023-03-17.
- <https://github.com/BigelowLab/topotools/tree/main>

fetch_cms_phys_2d	<i>Download Copernicus Marine Service physical oceanography data (2d variables)</i>
-------------------	---

Description

Download Copernicus Marine Service physical oceanography data (2d variables)

Usage

```
fetch_cms_phys_2d(
  region,
  variable,
  layer,
  timerange,
  return_type = "raster",
  progress = FALSE,
  asset = "ARCO",
  username = NULL,
  password = NULL
)
```

Arguments

region	An 'sf' or 'bbox' object. The bounding box will be used as the bounds for CMS data subsetting and download
variable	Variables from the GLOBAL_MULTIYEAR_PHY_001_030 product for download. Must be any subset of 'c("thetao","so","uo","vo")' any other variables will be ignored.
layer	One of "daily" or "monthly" for either temporal resolution.
timerange	A 2 vector of start and end dates. Both must be POSIX.
return_type	One of "stars" or "raster". A 'stars' object is the default.
progress	Output process of download.
asset	See '?CopernicusMarine::cms_download_subset'
username	Copernicus Marine Service account username, see '?CopernicusMarine::cms_download_subset' and '?CopernicusMarine::cms_get_username'
password	Copernicus Marine Service password, see '?CopernicusMarine::cms_download_subset' and '?CopernicusMarine::cms_get_password'

Author(s)

Devin S. Johnson

fetch_cms_phys_3d	<i>Download Copernicus Marine Service physical oceanography data (3d variables)</i>
-------------------	---

Description

Download Copernicus Marine Service physical oceanography data (3d variables)

Usage

```
fetch_cms_phys_3d(
  region,
  variable,
  layer,
  timerange,
  verticalrange = 0,
  return_type = "raster",
  progress = FALSE,
  asset = "ARCO",
  username = NULL,
  password = NULL
)
```

Arguments

region	An 'sf' or 'bbox' object. The bounding box will be used as the bounds for CMS data subsetting and download
variable	Variables from the GLOBAL_MULTIYEAR_PHY_001_030 product for download. Must be any subset of 'c("thetao","so","uo","vo")' any other variables will be ignored.
layer	One of "daily" or "monthly" for either temporal resolution.
timerange	A 2 vector of start and end dates. Both must be POSIX.
verticalrange	Range of depth values to download, e.g., 'c(0,-100)' will download all CMS depth layers between 0-100m. Default is '0' for surface layer.
return_type	One of "stars" or "raster". A 'stars' object is the default.
progress	Output process of download.
asset	See '?CopernicusMarine::cms_download_subset'
username	Copernicus Marine Service account username, see '?CopernicusMarine::cms_download_subset' and '?CopernicusMarine::cms_get_username'
password	Copernicus Marine Service password, see '?CopernicusMarine::cms_download_subset' and '?CopernicusMarine::cms_get_password'

Author(s)

Devin S. Johnson

 fetch_cms_phys_surface

Download Copernicus Marine Service physical oceanography data (surface values)

Description

Download Copernicus Marine Service physical oceanography data (surface values)

Usage

```
fetch_cms_phys_surface(
  region,
  variable,
  layer,
  timerange,
  return_type = "raster",
  progress = FALSE,
  asset = "ARCO",
  username = NULL,
  password = NULL
)
```

Arguments

region	An ‘sf’ or ‘bbox’ object. The bounding box will be used as the bounds for CMS data subsetting and download
variable	Variables from the GLOBAL_MULTIYEAR_PHY_001_030 product for download.
layer	One of “daily” or “monthly” for either temporal resolution.
timerange	A 2 vector of start and end dates. Both must be POSIX.
return_type	One of “stars” or “raster”. A ‘stars’ object is the default.
progress	Output process of download.
asset	See ‘?CopernicusMarine::cms_download_subset’
username	Copernicus Marine Service account username, see ‘?CopernicusMarine::cms_download_subset’ and ‘?CopernicusMarine::cms_get_username’
password	Copernicus Marine Service password, see ‘?CopernicusMarine::cms_download_subset’ and ‘?CopernicusMarine::cms_get_password’

Author(s)

Devin S. Johnson

get_data_loc	<i>Show picMaps Data Storage Directory</i>
--------------	--

Description

This function provides the location where ‘picMaps’ is storing and retrieving spatial data.

Usage

```
get_data_loc()
```

get_grad	<i>Find gradient field of a elevation raster</i>
----------	--

Description

Find gradient field of a elevation raster

Usage

```
get_grad(r, scale = TRUE)
```

Arguments

r	SpatRaster object
scale	Logical, Should the gradient be scaled by resolution of the coordinates. Defaults to ‘scale = TRUE’

hawaii_coast	<i>Coast polygons for Main Hawaiian Islands</i>
--------------	---

Description

Coast polygons for Main Hawaiian Islands

Usage

```
hawaii_coast(keep = 0.5, union = TRUE, crs = 4326)
```

Arguments

keep	see osm_coast
union	see osm_coast
crs	A coordinate system object, See st_transform . Defaults to ESPG = 4326 with 0-360 longitude values.

hawaii_eez	<i>Hawaiian Island EEZ boundary polygon</i>
------------	---

Description

Hawaiian Island EEZ boundary polygon

Usage

```
hawaii_eez()
```

hex_size	<i>Calculate cellsize value for hexagon grid</i>
----------	--

Description

Calculates the appropriate cellsize argument for making a hexagon grid with [st_make_grid](#).

Usage

```
hex_size(area = NULL, radius = NULL, sep = NULL)
```

Arguments

area	A value (m ²) for the resulting area of a full hexagon cell
radius	The value for the distance (m) from the centroids to the edge of full hexagon cells.
sep	The distance (m) between centroids of the hexagon grid.

Author(s)

Devin S. Johnson

References

See <https://github.com/r-spatial/sf/issues/1505>

hi_benthic_habitat	<i>Import benthic habitat data for the Main Hawaiian Islands</i>
--------------------	--

Description

Import benthic habitat data for the Main Hawaiian Islands

Usage

```
hi_benthic_habitat()
```

hi_coast_state	<i>HI Official State Coastline</i>
----------------	------------------------------------

Description

HI Official State Coastline

Usage

hi_coast_state()

hi_full_watersheds	<i>Compile full layer of Main Hawaiian Island watersheds</i>
--------------------	--

Description

Compile full layer of Main Hawaiian Island watersheds

Usage

hi_full_watersheds()

hi_ridge_to_reef	<i>Watershed zones out to 3mi</i>
------------------	-----------------------------------

Description

Watershed zones out to 3mi

Usage

hi_ridge_to_reef()

hi_watersheds	<i>Watersheds</i>
---------------	-------------------

Description

Watersheds

Usage

hi_watersheds(type = "DAR")

Arguments

type DAR version ('type="DAR"'; default) or 'type="regular"'.

howland_baker_eez	<i>Howland and Baker Islands US EEZ boundary polygon</i>
-------------------	--

Description

Howland and Baker Islands US EEZ boundary polygon

Usage

howland_baker_eez()

jarvis_eez	<i>Jarvis Islands US EEZ boundary polygon</i>
------------	---

Description

Jarvis Islands US EEZ boundary polygon

Usage

jarvis_eez()

johnston_eez	<i>Johnston Atoll US EEZ boundary polygon</i>
--------------	---

Description

Johnston Atoll US EEZ boundary polygon

Usage

johnston_eez()

lalo	<i>Lalo Islands</i>
------	---------------------

Description

Lalo Islands

Usage

lalo()

longline_exclusion	<i>Main Hawaiian Islands Longline Exclusion Zone</i>
--------------------	--

Description

Main Hawaiian Islands Longline Exclusion Zone

Usage

longline_exclusion()

mariana_coast	<i>Coast polygons for the Mariana Islands</i>
---------------	---

Description

Coast polygons for the Mariana Islands

Usage

mariana_coast(keep = 0.5, union = TRUE, crs = 4326)

Arguments

- keep see [osm_coast](#)
- union see [osm_coast](#)
- crs A coordinate system object, See [st_transform](#). Defaults to EPSG = 4326 with 0-360 longitude values

mariana_eez	<i>Mariana Islands US EEZ boundary polygon</i>
-------------	--

Description

Mariana Islands US EEZ boundary polygon

Usage

mariana_eez()

mhi_region	<i>Main Hawaiian Islands Region Boundary</i>
------------	--

Description

Main Hawaiian Islands Region Boundary

Usage

mhi_region()

nwhi	<i>NW Hawaiian Islands polygons</i>
------	-------------------------------------

Description

NW Hawaiian Islands polygons

Usage

nwhi()

oahu_roads	<i>Oahu roads</i>
------------	-------------------

Description

Oahu roads

Usage

oahu_roads()

osm_coast*Get A Coastline sf Polygon Object For Plotting and Mapping*

Description

Uses downloaded OSM data for constructing an sf polygon coastline data object. Prior to using this function you must run [osm_download](#).

Usage

```
osm_coast(x, keep = 0.2, union = FALSE)
```

Arguments

x	An sf spatial object. The coastline will be cropped to the bounding box.
keep	The amount of data retained after simplification with ms_simplify
union	Logical. Should the returned object be returned as a single sf MULTIPOLYGON object

Author(s)

Josh M. London and Devin S. Johnson

osm_download*Download Open Street Map Coastline Shapefile from Daylight Map Distribution*

Description

Downloads OSM data for plotting telemetry data and use distributions.

Usage

```
osm_download(force = FALSE, clean_shp = TRUE)
```

Arguments

force	Logical. If data has previously been downloaded, it will force a new download and update of the OSM data.
clean_shp	Logical. If 'TRUE' the original shape file will be deleted and only the '.gpkg' file will be retained.

Author(s)

Devin S. Johnson and Josh M. London

References

<https://osmdata.openstreetmap.de/data/land-polygons.html>

osm_install	<i>Download Open Street Map Coastline Shapefile from Daylight Map Distribution</i>
-------------	--

Description

Downloads OSM data for plotting telemetry data and use distributions.

Usage

```
osm_install(zip_file, force = FALSE, clean_shp = TRUE)
```

Arguments

zip_file	path to the OSM data .zip file 'land-polygons-complete-4326.zip'. If left unspecified, the user will see a directory browser to navigate to it. See the url in the references to download it by hand. Also, see ' osm_download ' to download and install it.
force	Logical. If data has previously been downloaded or installed, it will force a new install and update of the OSM data.
clean_shp	Logical. If 'TRUE' the original shape file will be deleted and only the '.gpkg' file will be retained.

Author(s)

Devin S. Johnson and Josh M. London

References

Get information here: <https://osmdata.openstreetmap.de/data/land-polygons.html> and download with this link <https://osmdata.openstreetmap.de/download/land-polygons-complete-4326.zip>

palmyra_kingman_eez	<i>Palmyra Kingman US EEZ boundary polygon</i>
---------------------	--

Description

Palmyra Kingman US EEZ boundary polygon

Usage

```
palmyra_kingman_eez()
```

papahanaumokuakea	<i>Papahānaumokuākea boundary polygon</i>
-------------------	---

Description

Papahānaumokuākea boundary polygon

Usage

papahanaumokuakea()

pfkwmgmt	<i>Pelagic False Killer Whale Management Area Polygon</i>
----------	---

Description

Pelagic False Killer Whale Management Area Polygon

Usage

pfkwmgmt()

raster_fill	<i>Fill raster holes and NAs with local interpolation</i>
-------------	---

Description

Fill raster holes and NAs with local interpolation

Usage

raster_fill(r)

Arguments

r SpatRaster object

Details

Uses focal means to infill holes and NAs

raster_z	<i>Z transform a raster</i>
----------	-----------------------------

Description

Z transform a raster

Usage

```
raster_z(r)
```

Arguments

r A spatRaster object from the terra package

set_data_storage	<i>Set Data Storage Directory</i>
------------------	-----------------------------------

Description

The directory specified by path will be used to store downloaded spatial data. By storing the data in a separate directory from the installed package it will not need to be re-downloaded when the package is updated. You simply need to rerun this function to let the package functions know where the data is located.

Usage

```
set_data_storage(path = "~/picmaps_data")
```

Arguments

path A directory path specifying where spatial data will be stored for the package

st_bbox_list	sf::st_bbox for a list of sf or sfc objects.
--------------	--

Description

sf::st_bbox for a list of sf or sfc objects.

Usage

```
st_bbox_list(x, union = TRUE, as_sfc = FALSE)
```

Arguments

x	A list of sf or sfc objects.
union	Logical. Should the bounding box of the union be returned instead of a list of bounding boxes.
as_sfc	Logical. Should the bounding box (boxes) be returned as sfc objects.

Author(s)

Devin S. Johnson

st_check_lon	Check for 0-360 Lat/Lon data
--------------	------------------------------

Description

Check for 0-360 Lat/Lon data

Usage

```
st_check_lon(x)
```

Arguments

x	An 'sf', 'sfc', 'bbox' object
---	-------------------------------

st_divide_poly	<i>Divide a polygon into k equal-area polygons</i>
----------------	--

Description

Uses k-means clustering and Voronoi tessellation to divide a polygon into k equal-area polygons.

Usage

```
st_divide_poly(polygon, k, n_samples = 10000)
```

Arguments

polygon	The 'sf' polygon object to be divided
k	The number of resulting polygons
n_samples	The number of sample points to perform k-means clustering and divide the polygon.

Author(s)

Google Gemini

st_expand	<i>Expand Spatial Bounding Box</i>
-----------	------------------------------------

Description

Expand an sf bounding box by an expansion factor

Usage

```
st_expand(bbox, ef)
```

Arguments

bbox	An sf bounding box. See sf::st_bbox .
ef	Expansion factor, must be positive and length 1, 2 or 4. If length(ef)==1 then the expansion factor is applied equally in all 4 directions. If length(ef)==2 then the first refers to the x coordinate and the second is associated with y coordinate expansion. If length(ef)==4 then the first 2 refer to expansion to the west and east of the x coordinate, and the last 2 to expand the y coordinate in the south and north direction respectively.

Author(s)

Josh M. London

st_not_within	<i>Predicate function for st_filter</i>
---------------	---

Description

Predicate function to use with `st_filter` such that elements of one spatial object are selected if they are not contained at all in the other. See [sf::st_within](#)

Usage

```
st_not_within(x, y, sparse = TRUE, prepared = TRUE, ...)
```

Arguments

x	object of class sf, sfc or sfg
y	object of class sf, sfc or sfg; if missing, x is used
sparse	logical; should a sparse index list be returned (TRUE) or a dense logical matrix? See sf::st_within .
prepared	logical; prepare geometry for x, before looping over y? See sf::st_within .
...	passed on to s2_options

st_overlap_dateline	<i>Check if spatial data bounds overlap dateline</i>
---------------------	--

Description

Check if spatial data bounds overlap dateline

Usage

```
st_overlap_dateline(x)
```

Arguments

x	An 'sf' spatial data object
---	-----------------------------

st_partition_by_inner_polygons

Divide a polygon into Voronoi tessellations based on closeness to inner polygons instead of points

Description

Divide a polygon into Voronoi tessellations based on closeness to inner polygons instead of points

Usage

```
st_partition_by_inner_polygons(
  outer_poly,
  inner_polys,
  inner_id,
  sample_density = 5000
)
```

Arguments

outer_poly	The 'sf' polygon object to be divided
inner_polys	An 'sf' data frame containing inner polygons to partition the outer polygon
inner_id	A column in 'inner_polys' which will label the outer polygon partitions.
sample_density	The density of points used to fill the inner polygons to perform the partitioning. Defaults to 'sample_density = 5000'.

Author(s)

Google Gemini and Devin S. Johnson

st_union_list sf:::st_union for a list of sf or sfc objects.

Description

sf:::st_union for a list of sf or sfc objects.

Usage

```
st_union_list(x)
```

Arguments

x	A list of sf or sfc objects.
---	------------------------------

Author(s)

Devin S. Johnson

wake_eez

Palmyra Kingman US EEZ boundary polygon

Description

Palmyra Kingman US EEZ boundary polygon

Usage

wake_eez()

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