Package 'ExposR'

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Title Models Topographic Exposure to Hurricane Winds

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Description The EXPOS model uses a digital elevation model (DEM) to estimate exposed and protected areas for a given hurricane wind direction and inflection angle. The resulting topographic exposure maps can be combined with output from the HURRECON model to estimate hurricane wind damage across a region. For details on the original version of the EXPOS model written in 'Borland Pascal', see: Boose, Foster, and Fluet (1994) <doi:10.2307/2937142>, Boose, Chamberlin, and Foster (2001) <doi:10.1890/0012-9615(2001)071[0027:LARIOH]2.0.CO;2>, and Boose, Serrano, and Foster (2004) <doi:10.1890/02-4057>.

Depends R (>= 4.0.0)

License GPL-3

Encoding UTF-8

Imports graphics, grDevices, raster, rgdal, utils

Suggests knitr, qpdf, testthat (>= 3.0.0), rmarkdown

URL https://github.com/expos-model/ExposR

BugReports https://github.com/expos-model/ExposR/issues

RoxygenNote 7.2.0

VignetteBuilder knitr

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R topics documented:

`expos_model` *Modeling Functions*

Description

expos_model uses a raster file of elevation values, a specified wind direction, and a specified inflection angle to create a raster file of wind exposure values (0 = missing data, 1 = protected, 2 = exposed). The user can specify if coordinates are lat/long; otherwise lat/long is assumed if X values are between -180 and 180 and Y values are between -90 and 90. If lat/long, horizontal and vertical units are assumed to be degrees and meters, respectively; otherwise horizontal and vertical units must be the same. Columns are assumed to be closely aligned with true North (0 degrees); if not, the map orientation (azimuth) must be specified in degrees. The name of the input file is assumed to be "dem.tif".

expos_damage uses output from the EXPOS and HURRECON models to create a raster of hurricane wind damage where topographic exposure at each location is determined by peak wind direction. If a location is protected, the enhanced Fujita scale rating from HURRECON is reduced by a specified amount. This function requires a hurricane file in GeoTiff format created by HURRECON, exposure files created by EXPOS for the eight cardinal wind directions (N, NE, E, etc), and a reprojection file in CSV format (reproject.csv) that contains lat/long coordinates in degrees for the lower left and upper right corners of the digital elevation model.

Usage

```
expos_model(
  wind_direction,
  inflection_angle,
  lat_long = NULL,
  orient = 0,
  save = TRUE,
  exp_path = NULL
)

expos_damage(
  hurricane,
  inflection_angle,
  protect,
  save = TRUE,
  exp_path = NULL
)
```

Arguments

wind_direction	wind direction (degrees)
inflection_angle	inflection angle (degrees)
lat_long	whether coordinate system is latitude/longitude
orient	map orientation (degrees)
save	whether to save results to file
exp_path	path for current set of model runs
hurricane	hurricane name (as it appears in tif file)
protect	how much to reduce damage in protected areas (number of Fujita scale ratings)

Value

raster of modeled exposure values

raster of modeled wind damage values

Examples

```
exp_path <- system.file("", package="ExposR", mustWork=TRUE)
expos_model(wind_direction=135, inflection_angle=6, save=FALSE, exp_path=exp_path)
```

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expos_plot *Plotting Functions*

Description

expos_plot creates a plot of a raster file. The user can specify if coordinates are lat/long; otherwise lat/long is assumed if X values are between -180 and 180 and Y values are between -90 and 90. Optional arguments include plot title, horizontal units, vertical units, vector boundary files, and color palette.

Usage

```
expos_plot(
  filename,
  title = "",
  lat_long = NULL,
  h_units = "meters",
  v_units = "meters",
  vector = TRUE,
  colormap = "default",
  exp_path = NULL
)
```

Arguments

filename	name of input raster file
title	plot title
lat_long	whether coordinate system is latitude/longitude
h_units	horizontal units
v_units	vertical units
vector	whether to display vectory boundary files
colormap	color palette
exp_path	path for current set of model runs

Value

no return value

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expos_set_path *Utility Functions*

Description

expos_set_path sets the path for the current set of model runs.

expos_get_path returns the current path for a set of model runs.

Usage

```
expos_set_path(exp_path)

expos_get_path()
```

Arguments

exp_path	path for current model runs

Value

no return value

current path

`expos_summarize` *Summarizing Functions*

Description

expos_summarize displays summary information for a specified raster file, including the number of rows and columns, spatial extent, cell height and width, and minimum and maximum value. The user can specify if coordinates are lat/long; otherwise lat/long is assumed if X values are between -180 and 180 and Y values are between -90 and 90.

Usage

```
expos_summarize(filename, lat_long = NULL, console = TRUE, exp_path = NULL)
```

Arguments

`filename`	name of input raster file
`lat_long`	whether coordinate system is latitude/longitude
`console`	whether to display results in console
`exp_path`	path for current set of model runs

Value

a string containing summary information

Index