# Package 'ExposR'

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**Title** Models Topographic Exposure to Hurricane Winds

**Version** 1.2

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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, terra, 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** 7.3.2

**VignetteBuilder** knitr

**Config/testthat/edition** 3

**NeedsCompilation** no

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**Repository** CRAN

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`expos_model` *Modeling Functions*

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## 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*

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### 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*

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### 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

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