

Package ‘SeaGraphs’

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Type Package

Title Sea Currents to Connectivity Transformation

Version 0.1.3

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Description Transformation of sea currents to connectivity data. Two files of horizontal and vertical currents flows are transformed into connectivity data in the form of 'sfnetwork', shapefile, edge list and adjacency matrix. An application example is shown at Nagkoulis et al. (2025) <[doi:10.1016/j.dib.2024.111268](https://doi.org/10.1016/j.dib.2024.111268)>.

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Encoding UTF-8

URL <https://github.com/cadam00/SeaGraphs>,
<https://cadam00.github.io/SeaGraphs/>

BugReports <https://github.com/cadam00/SeaGraphs/issues>

Imports sfnetworks, sf, terra, leaflet, leaflet.minicharts,
leaflet.extras2, methods, stats

Depends R (>= 4.1.0)

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

Config/testthat/edition 3

VignetteBuilder knitr, rmarkdown

NeedsCompilation no

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antpath_sfn	<i>Antpath plot</i>
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Description

Antpath plot of connections

Usage

```
antpath_sfn(result, lowcut = NULL, uppcut = NULL)
```

Arguments

- result SeaGraph object (i.e. output of [seagraph](#)) or sfnetwork or sf object containing 'from', 'to' and 'weight' column names.
- lowcut Optional percentile of threshold for not plotting connections below this value.
- uppcut Optional percentile of threshold for not plotting connections above this value.

Value

A leaflet antmap map output.

Examples

```
graph_result <- seagraph(component_u = get_component_u(),  
                          component_v = get_component_v(),  
                          mask_shapefile = NULL,  
                          k_neighbors = 7)  
  
antpath_sfn(graph_result)  
  
antpath_sfn(graph_result, lowcut = 0.1, uppcut = 0.9)
```

flows_sfn	<i>Flow plot</i>
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Description

Flow plot of connections

Usage

```
flows_sfn(result, lowcut = NULL, uppcut = NULL)
```

Arguments

result	SeaGraph object (i.e. output of seagraph) or sfnetwork or sf object containing 'from', 'to' and 'weight' column names.
lowcut	Optional percentile of threshold for not plotting connections below this value.
uppcut	Optional percentile of threshold for not plotting connections above this value.

Value

A leaflet flow map output.

Examples

```
graph_result <- seagraph(component_u = get_component_u(),
                          component_v = get_component_v(),
                          mask_shapefile = NULL,
                          k_neighbors = 7)

flows_sfn(graph_result)

flows_sfn(graph_result, lowcut = 0.1, uppcut = 0.9)
```

get_component_u	<i>Example component u</i>
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Description

Example horizontal direction raster.

Usage

```
get_component_u()
```

Details

Example of input component_u used for functions. It is a cropped area of yearly aggregated and normalized horizontal component at Black Sea.

Value

SpatRaster object.

References

Lima, L., Aydogdu, A., Escudier, R., Masina, S., Ciliberti, S. A., Azevedo, D., Peneva, E. L., Causio, S., Cipollone, A., Clementi, E., Cretí, S., Stefanizzi, L., Lecci, R., Palermo, F., Coppini, G., Pinardi, N., and Palazov, A. (2020). Black Sea Physical Reanalysis (CMEMS BS-Currents) (Version 1) [Data set]. Copernicus Monitoring Environment Marine Service (CMEMS). doi:10.25423/CMCC/BLKSEA_MULTIYEAR_PHY_007_004. Last Access: 07/11/2024.

Schulzweida, U. (2023). CDO User Guide (23.0). Zenodo. doi:10.5281/zenodo.10020800.

See Also

[get_component_v](#), [get_mask_shapefile](#)

Examples

```
component_u <- get_component_u()
terra::plot(component_u)
```

get_component_v

Example component v

Description

Example vertical direction raster.

Usage

```
get_component_v()
```

Details

Example of input component_v used for functions. It is a cropped area of yearly aggregated and normalized vertical component at Black Sea.

Value

SpatRaster object.

References

Lima, L., Aydogdu, A., Escudier, R., Masina, S., Ciliberti, S. A., Azevedo, D., Peneva, E. L., Causio, S., Cipollone, A., Clementi, E., Cretí, S., Stefanizzi, L., Lecci, R., Palermo, F., Coppini, G., Pinardi, N., and Palazov, A. (2020). Black Sea Physical Reanalysis (CMEMS BS-Currents) (Version 1) [Data set]. Copernicus Monitoring Environment Marine Service (CMEMS). doi:10.25423/CMCC/BLKSEA_MULTIYEAR_PHY_007_004. Last Access: 07/11/2024.

Schulzweida, U. (2023). CDO User Guide (23.0). Zenodo. doi:10.5281/zenodo.10020800.

See Also

[get_component_u](#), [get_mask_shapefile](#)

Examples

```
component_v <- get_component_v()  
terra::plot(component_v)
```

get_mask_shapefile	<i>Example mask shapefile</i>
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Description

Example mask shapefile.

Usage

```
get_mask_shapefile()
```

Details

Example of input mask_shapefile used for functions. It is a bounding box subset of [get_component_u](#) and [get_component_v](#) SpatRaster objects.

Value

sf and data.frame object.

Examples

```
mask_shapefile <- get_mask_shapefile()  
plot(mask_shapefile)
```

seagraph

*Sea Currents To Connectivity Transformation***Description**

Sea Currents To Connectivity Transformation

Usage

```
seagraph(component_u, component_v, mask_shapefile = NULL, k_neighbors = 7L)
```

Arguments

<code>component_u</code>	SpatRaster object with horizontal direction.
<code>component_v</code>	SpatRaster object with vertical direction.
<code>mask_shapefile</code>	Optional sf or SpatVector object for masking <code>component_u</code> and <code>component_v</code> SpatRaster objects. The default value is NULL, indicating that no mask is performed.
<code>k_neighbors</code>	integer object with the number k of nearest neighbors to use. The default is 7L.

Details

Sea currents data of the input are transformed into weighted directed graph connectivity data. Each centroid of `component_u` and `component_v` is considered as a separate graph node. These connectivity data are provided in `sfnetwork`, `sf`, edge list and adjacency matrix form. An additional `data.frame` with correspondence between indices and coordinates for edge list and adjacency matrix is returned as well. The weights in all outputs are minmax-scaled in $[0 - 1]$.

Extent, resolution and coordinate system of both must have the same for both `component_u` and `component_v`; otherwise an error stops the function's execution. In case that a `mask_shapefile` is provided, then it is internally assured that it has the same resolution or coordinates with `component_u` and a warning is prompted.

Value

SeaGraph object, which is a list containing the following elements:

- `sfnetwork`: `sfnetwork` object representing both graph and coordinates of the connectivity map.
- `sf`: `sf` and `data.frame` object representing 'LINESTRING' rows of connections between nodes.
- `edge_list`: matrix object representing the edge list, where source ('from'), destination ('to') and weight ('weight') for each connection are returned.
- `adj_mat`: matrix object representing the weighted adjacency matrix of the nodes.
- `ID_coords`: `data.frame` object with the correspondence between indices and coordinates for edge list (`edge_list`) and adjacency matrix (`adj_mat`).

References

Nagkoulis, N., Adam, C., Mamoutos, I., Katsanevakis, S., and Mazaris, A. D. (2025). An ecological connectivity dataset for Black Sea obtained from sea currents. *Data in Brief*, 58, 111268. [doi:10.1016/j.dib.2024.111268](https://doi.org/10.1016/j.dib.2024.111268)

See Also

[antpath_sfn](#), [flows_sfn](#)

Examples

```
graph_result <- seagraph(component_u = get_component_u(),
                          component_v = get_component_v(),
                          k_neighbors = 7)

## Example of mask usage
masked_result <- seagraph(component_u = get_component_u(),
                          component_v = get_component_v(),
                          mask_shapefile = get_mask_shapefile(),
                          k_neighbors = 7)
```

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