Package 'SeaGraphs'

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Type Package

Title Sea Currents to Connectivity Transformation

Version 0.1.2

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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>.

License GPL-3

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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Repository CRAN

Contents

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antpath_sfn	*Antpath plot*

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)
```

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flows_sfn   *Flow plot*

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   *Example component u*

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 *Example mask shapefile*

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)
```

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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

component_u   SpatRaster object with horizontal direction.

component_v   SpatRaster object with vertical direction.

mask_shapefile   Optional sf or SpatVector object for masking component_u and component_v
                 SpatRaster objects. The default value is NULL, indicating that no mask is per-
                 formed.

k_neighbors   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 con-
nectivity 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 ma-
trix 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

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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