Package 'basemaps'

April 16, 2024

Type Package

Title Accessing Spatial Basemaps in R

Version 0.0.7

Depends R (>= 3.5.0)

Date 2024-04-16

Description A lightweight package to access spatial basemaps from open sources such as 'Open-StreetMap', 'Carto', 'Mapbox' and others in R.

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Encoding UTF-8

Imports sf, slippymath, httr, curl, terra, stars, pbapply, magick, utils, grDevices, methods

Suggests raster, ggplot2, png, mapview, mapedit, testthat, covr

BugReports https://github.com/16eagle/basemaps/issues

RoxygenNote 7.3.1

NeedsCompilation no

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Repository CRAN

Date/Publication 2024-04-16 13:00:05 UTC

R topics documented:

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basemap   *Get a spatial basemap*

Description

These functions (down)load and cache a basemap of a defined extent `ext`, `map_service` and `map_type` and return it as an object of the defined class. Alternatively to defining the following arguments, [`set_defaults`](#) can be used to define basemap preferences once for the running session.

Usage

```
basemap(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  class = "plot",
  force = FALSE,
  ...,
  verbose = TRUE
)

basemap_plot(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)

basemap_magick(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)
```

```
basemap_png(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)

basemap_geotif(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)

basemap_terra(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)

basemap_raster(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)
```

```
basemap_stars(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)

basemap_ggplot(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)

basemap_gglayer(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)

basemap_mapview(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...,
  verbose = TRUE
)
```

Arguments

ext	extent to be covered by the basemap as any spatial class supported by st_bbox.
map_service	character, a map service, either "osm", "carto" or "mapbox". Default is "osm".
map_type	character, a map type, e.g. "streets". For a full list of available map types, see get_maptypes.
map_res	numeric, resolution of base map in range from 0 to 1.
map_token	character, authentication token for services that require registration, which are "osm_stamen", "osm_stadia", "osm_thunderforest" and "mapbox". Register at https://stadiamaps.com/ (for stamen and stadia), https://www.thunderforest.com/ and/or https://www.mapbox.com/ to get tokens. Ignored for all other map services.
map_dir	character, cache directory where downloaded basemap tiles will be stored. By default, a temporary directory is used, which is destroyed when the session is terminated.
class	character, output class, either either plot (default), magick, png, geotif or if suggested packages are installed, terra, raster, stars, ggplot, gglayer or mapview.
force	logical, whether to force download over cached files or not. Default is FALSE.
...	additional arguments, including • browse, logical, for class = "png" and interactive sessions only. Whether to open the png file in the system's default PNG viewer or not. Default is TRUE. • col, character vector of colours for transforming single-layer basemaps into RGB, if class = "png" or class = "magick". Default is topo.colors(25). • dpi, numeric vector of length 1 or 2 specifying the resolution of the image in DPI (dots per inch) for x and y (in that order) - it is recycled to length 2. • etc. (see ?gg_raster for valid arguments when using class = "gglayer" or class = "ggplot", including maxpixels to control resolution of ggplot outputs
verbose	logical, if TRUE, messages and progress information are displayed on the console (default).

Value

A basemap of the defined class in Web/Pseudo Mercator Projection (EPSG: 3857)

Note

See get_maptypes for available map services and their sources.

The use of the map services "osm_thunderforest" and "mapbox" require registration to obtain an API token/key which can be supplied to map_token. Register at https://www.thunderforest.com/ and/or https://www.mapbox.com/ to get a token.

Examples

```
library(basemaps)

# example extent
data(ext)

# view all available maps
get_maptypes()

# set defaults for the basemap
set_defaults(map_service = "osm", map_type = "terrain_bg")
# for "osm_stamen", "osm_stadia", osm "thunderforest" and "mapbox" maps, you need a API token.
# Register for free at stadiamaps.com, thunderforest.com and mapbox.com to get tokens.

## Not run:
# load and return basemap map as raster (default)
map <- basemap(ext)

# or explicitly as different classes such as:
basemap_magick(ext)
basemap_raster()
basemap_stars()

# or as files:
basemap_geotif()
basemap_png()

# or as plots:
basemap_plot(ext)
basemap_mapview()

# including ggplot2:
basemap_ggplot(ext)

# or as ggplot2 layer:
library(ggplot2)
ggplot() +
  basemap_gglayer(ext) +
  scale_fill_identity() +
  coord_sf()

# or, when combined with an sf vector object,
# make sure to use Web/Pseudo Mercator (EPSG 3857), as this is
# the CRS in which all basemaps are returned (see "Value"):
library(sf)
ext <- st_transform(ext,  crs = st_crs(3857))
ggplot() +
  basemap_gglayer(ext) +
  geom_sf(data = ext, color = "red", fill = "transparent") +
  coord_sf() +
  scale_fill_identity()
```

```
## End(Not run)
```

---

cache   *Flush* basemaps *cache*

Description

This function flushes the `basemaps` cache and thereby removes all previously queried and/or com-
posited products from the map directories (temporary or user-defined using the argument `map_dir`)
used during the current session.

Usage

```
flush_cache()
```

Value

None.

Examples

```
library(basemaps)
flush_cache()
```

---

data   *Example extent*

Description

The example datasets contain the sf objects `ext` and `ext_eur` that can be used to call basemap and
the associated functions.

Usage

```
data(ext)

data(ext_eur)
```

Format

`sf` object

An object of class `sf` (inherits from `data.frame`) with 1 rows and 3 columns.

---

defaults   *Set, get and reset* basemaps *defaults*

Description

These functions set, get or reset the defaults of all map arguments passed to basemap and associated functions.

Usage

```
set_defaults(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL
)

get_defaults()

reset_defaults()
```

Arguments

ext	extent to be covered by the basemap as any spatial class supported by st_bbox.
map_service	character, a map service, either ″osm″, ″carto″ or ″mapbox″. Default is ″osm″.
map_type	character, a map type, e.g. ″streets″. For a full list of available map types, see get_maptypes.
map_res	numeric, resolution of base map in range from 0 to 1.
map_token	character, authentication token for services that require registration, which are ″osm_stamen″, ″osm_stadia″, ″osm_thunderforest″ and ″mapbox″. Register at https://stadiamaps.com/ (for stamen and stadia), https://www.thunderforest.com/ and/or https://www.mapbox.com/ to get tokens. Ignored for all other map services.
map_dir	character, cache directory where downloaded basemap tiles will be stored. By default, a temporary directory is used, which is destroyed when the session is terminated.

Value

For get_defaults, a list of defaults, otherwise none.

Examples

```
library(basemaps)
data(ext)

# set defaults for the basemap
set_defaults(ext = ext, map_service = "osm", map_type = "terrain_bg")

# get defaults
get_defaults()

## Not run:
# load and return basemap map as raster (default)
map <- basemap()

## End(Not run)

# reset defaults
reset_defaults()
```

---

draw_ext   *Draw extent*

Description

This function lets you draw an extent on an interactive map. It is a simple wrapper around mapedit::drawFeatures()
written by Tim Appelhans et al.

Usage

```
draw_ext()
```

Value

An sf object

Examples

```
## Not run:
library(basemaps)

# draw extent interactively
ext <- draw_ext()

# set defaults for the basemap
set_defaults(ext = ext, map_service = "osm", map_type = "terrain_bg")
# for mapbox maps, you need a map_token. Register for free at mapbox.com to get a token

# load and return basemap map as raster (default)
```

```
map <- basemap()

## End(Not run)
```

---

get_maptypes   *Get all supported map types*

Description

This function returns every supported map type that can be used as input to the map_type argument
of [set_defaults](), [basemap]() or associated functions.

Usage

```
get_maptypes(map_service = NULL)
```

Arguments

map_service   character, optional, either "osm", "osm_stamen", "osm_stadia", "osm_thunderforest",
                  "carto", "mapbox" or "esri". Otherwise, a list of map types for both services
                  is returned.

Value

A character vector of supported map types

Source

"osm": Open Street Map contributors (<https://www.openstreetmap.org/copyright>), Open Topo
Map (<https://opentopomap.org/>)

"osm_stamen": Stamen (<https://maps.stamen.com/>) via Stadia Maps (<https://stadiamaps.
com/>), Open Street Map contributors (<https://www.openstreetmap.org/copyright>)

"osm_stadia": Stadia Maps (<https://stadiamaps.com/>), Open Street Map contributors (<https:
//www.openstreetmap.org/copyright>)

"osm_thunderforest": Thunderforest (<https://www.thunderforest.com/>), Open Street Map
contributors (<https://www.openstreetmap.org/copyright>)

"carto": Carto (<https://carto.com/>)

"mapbox": Mapbox (<https://www.mapbox.com>)

"esri": Esri (<https://www.esri.com/en-us/home>)

See Also

[basemap]()

Examples

```
# for all services
get_maptypes()

# for osm only
get_maptypes("osm")
# or
get_maptypes()$osm

# for mapbox only
get_maptypes("mapbox")
# or
get_maptypes()$mapbox

# same for all other map services
```

---

plot   *Plot raster objects using* ggplot

Description

This function plots objects of class SpatRaster, RasterLayer, RasterBrick or RasterStack as ggplot2. It is used internally by basemap* functions that return ggplot plots.

Usage

```
gg_raster(r, r_type = "RGB", gglayer = F, ...)
```

Arguments

r	raster of class SpatRaster, RasterLayer, RasterBrick or RasterStack.
r_type	character, either "gradient" or "discrete".
gglayer	logical, if FALSE (default), a ggplot2 plot is returned, if TRUE, a ggplot2 layer is returned.
...	additional arguments, including

- maxpixels, numeric, maximum number of pixels to be plotted (default: number of pixels in r). Use a value lower then ncell(r) to lower resolution for faster plotting.
- alpha, numeric between 0 and 1, alpha value of the plotted data (transparency).
- maxColorValue, numeric, the value to use as colour maximum.
- interpolate, logical, whether to smooth the plot (default is TRUE).

Value

A ggplot2 object

Examples

```
library(basemaps)

# example extent
data(ext)

## Not run:
# raster object: Brick
map <- basemap_raster(ext)

# plotting RasterBrick
gg_raster(map, r_type = "RGB")

## End(Not run)
```

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