The PROFOUND R-package: ProfoundData

Ramiro Silveyra Gonzalez, Christopher Reyer, Friedrich Bohn, Florian Hartig

For questions please contact reyer@pik-potsdam.de

This document is part of the following data publication and should be cited like:

Reyer CPO, Silveyra Gonzalez R, Dolos K, Hartig F, Hauf Y, Noack M, Lasch-Born P, Rötzer T, Pretzsch H, Meesenburg H, Fleck S, Wagner M, Bolte A, Sanders T, Kolari P, Mäkelä A, Vesala T, Mammarella I, Pumpanen J, Matteucci G, Collalti A, D'Andrea E, Foltýnová L, Krejza J, Ibrom A, Pilegaard K, Loustau D, Bonnefond J-M, Berbigier P, Picart D, Lafont S, Dietze M, Cameron D, Vieno M, Tian H, Palacios-Orueta A, Cicuendez V, Recuero L, Wiese K, Büchner M, Lange S, Volkholz J, Kim H, Weedon GP, Sheffield J, Babst F, Vega del Valle I, Suckow F, Horemans J, Martel S, Bohn F, Steinkamp J, Chikalanov A, Mahnken M, Gutsch M, Trotta C, Babst F, Frieler K (2020) The PROFOUND database for evaluating vegetation models and simulating climate impacts on European forests. V.0.3. GFZ Data Services. http://doi.org/10.5880/PIK.2020.006

This dataset (version 0.3) replaces an earlier version published (v0.1.12) as Reyer et al. (2019) by replacing tree and stand data for the site Soro and fixing a range of minor issues documented in the file changelog_Profound-DB_v03.pdf.

Reyer CPO, Silveyra Gonzalez R, Dolos K, Hartig F, Hauf Y, Noack M, Lasch-Born P, Rötzer T, Pretzsch H, Meesenburg H, Fleck S, Wagner M, Bolte A, Sanders T, Kolari P, Mäkelä A, Vesala T, Mammarella I, Pumpanen J, Matteucci G, Collalti A, D'Andrea E, Foltýnová L, Krejza J, Ibrom A, Pilegaard K, Loustau D, Bonnefond J-M, Berbigier P, Picart D, Lafont S, Dietze M, Cameron D, Vieno M, Tian H, Palacios-Orueta A, Cicuendez V, Recuero L, Wiese K, Büchner M, Lange S, Volkholz J, Kim H, Weedon GP, Sheffield J, Vega del Valle I, Suckow F, Horemans J, Martel S, Bohn F, Steinkamp J, Chikalanov A, Frieler K (2019) *The PROFOUND database for evaluating vegetation models and simulating climate impacts on forests*. V.0.1.12. GFZ Data Services. http://doi.org/10.5880/PIK.2019.008

A full description paper is also in preparation:

Reyer CPO, Silveyra Gonzalez R, Dolos K, Hartig F, Hauf Y, Noack M, Lasch-Born P, Rötzer T, Pretzsch H, Meesenburg H, Fleck S, Wagner M, Bolte A, Sanders T, Kolari P, Mäkelä A, Vesala T, Mammarella I, Pumpanen J, Matteucci G, Collalti A, Trotta C, D'Andrea E, Foltýnová L, Krejza J, Ibrom A, Pilegaard K, Loustau D, Bonnefond J-M, Berbigier P, Picart D, Lafont S, Dietze M, Cameron D, Vieno M, Tian H, Palacios A, Cicuendez V, Recuero L, Wiese K, Büchner M, Lange S, Volkholz J, Kim H, Weedon GP, Sheffield J, Babst F, Vega del Valle I, Suckow F, Horemans J, Martel S, Bohn F, Steinkamp J, Chikalanov A, Mahnken M, Gutsch M, Frieler K (2020) The PROFOUND database for evaluating vegetation models and simulating climate impacts on forests. Earth System Science Data Discussions. https://doi.org/10.5194/essd-2019-220, 2020

2020-04-28

Contents

ProfoundData R-package: using the PROFOUND database from R

The ProfoundData package serves as interface to access the PROFOUND database. Three main functions are included to achieve this goal: a browseData function for exploring the database, a getData function for downloading data from the database and a plotData function to quickly inspect any variable of the datasets.

Currently, the functions allow to download data from one site and one dataset at a time. For downloading data of more than one dataset or of more than one site, the function should be called as many times as the number of desired sites or datasets. Additionally, flags and other parameters can be passed to the functions.

The package also includes utilities functions to do tasks such as inspecting the data or writing NetCDF files.

First Steps

Package requirements

Before installing the package, you should have the following packages installed:

- sqldf
- RSQLite
- zoo
- RNetCDF
- settings

Database connection

After loading ProfoundData, the first step is to call the *setDB*.

```
library(ProfoundData)
```

This function will create a database object. It requires from you a **valid absolute path to the PROFOUND database**.

```
myDB <- path.expand("~/ownCloud/PROFOUND_Data/v0.3/ProfoundData.sqlite")
setDB(myDB)
```

To check the database connection you can use the use *getDB*, which returns the database path and also informs about the database version.

```
getDB()

## Database version is 0.3

## [1] "/home/ramiro/ownCloud/PROFOUND_Data/v0.3/ProfoundData.sqlite"
```

Exploring the database

The browseData function

The browseData function allows to see what data is included in the database and for what sites the data is available.

```
overview <- browseData()

knitr::kable(overview, align = "l")
```

site_id	site	SITES	TREE	STAND	SOIL	CLIMATE_LOCAL	CLIMATE_ISIMIP2B	CLIMATE_ISIMIP2BLBC	CLIMATE_ISIMIP2A	CLIMATE_ISIMIPFT	METEOROLOGICAL	FLUX	ATMOSPHERICHEATCONDUCTION	SOILTS	NDEPOSITION_EMEP	NDEPOSITION_ISIMIP2B	CO2_ISIMIP	MODIS_MOD09A1	MODIS_MOD15A2	MODIS_MOD11A2	MODIS_MOD13Q1	MODIS_MOD17A2	MODIS
3	bily_kriz	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	collelongo	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	hyytiala	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	kroof	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1
14	le_bray	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	peitz	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1
20	solling_beech	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1
21	soro	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	solling_spruce	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1

Hint: If you set *collapse* to FALSE, you will get the full version of the overview table.

```
overview <- browseData(collapse = F)
```

Besides returning the overview, browseData allows to check:

- available datasets

```
tables <- browseData(dataset = "DATASETS")
```

- available variables for a given dataset

```
variables <- browseData(dataset = "CLIMATE_LOCAL", variables = T)
```

- available sites for a given dataset

```
available <- browseData(dataset = "CLIMATE_LOCAL")
```

- available datasets for a given site

```
available <- browseData(site ="le_bray")
```

- whether a dataset is available for a specific site

```
available <- browseData(site ="le_bray", dataset = "CLIMATE_LOCAL")
```

- version history

```
version <- browseData(dataset = "VERSION")
```

- metadata

```
metadata <- browseData(dataset = "METADATA_CLIMATE_LOCAL")
```

Hint: You can also pass a site to check the metadata of a specific site.

```
metadata <- browseData(dataset = "METADATA_TREE", site = "solling_spruce")
```

- source

```
source <- browseData(dataset = "SOURCE")
```

Hint: You can also pass a site to check the source of a specific site.

```
source <- browseData(dataset = "SOURCE", site = "solling_spruce")
```

- policy

```
source <- browseData(dataset = "POLICY")
```

Hint: You can also pass a site to check the policy of a specific site.

```
policy <- browseData(dataset = "POLICY", site = "solling_spruce")
```

The summarizeData function

Data overviews of the available data

The *summarizeData* function allows to obtain data summaries and overviews of the data depending on **mode**. If you choose the mode overview, *summarizeData* will return a data frame with the years and number of observations, the first and last value, and the min and max value, as in the example below.

```
data <-summarizeData(dataset = "CLIMATE_LOCAL", site = "bily_kriz", mode = "overview")

kable(data, row.names = F)
```

site	site_id	variable	first	last	min	max	mean	year_first	year_last	obs
bily_kriz	3	tmax_degC	1.353014e+01	1.053710e+01	9.310364e+00	1.353014e+01	1.150140e+01	2000	2008	9
bily_kriz	3	tmean_degC	8.536865e+00	7.484678e+00	5.930202e+00	8.536865e+00	7.356880e+00	2000	2008	9
bily_kriz	3	tmin_degC	4.102271e+00	4.652052e+00	2.349707e+00	4.652052e+00	3.801032e+00	2000	2008	9
bily_kriz	3	p_mm	1.490324e+03	1.167563e+03	1.004007e+03	1.750245e+03	1.434560e+03	2000	2008	9
bily_kriz	3	relhum_percent	7.993809e+01	8.380125e+01	7.276064e+01	8.884459e+01	8.198789e+01	2000	2008	9
bily_kriz	3	airpress_hPa	9.127901e+02	9.131897e+02	9.117648e+02	9.144979e+02	9.131942e+02	2000	2008	9
bily_kriz	3	rad_Jcm2	3.706045e+05	3.871684e+05	3.418508e+05	4.053810e+05	3.787749e+05	2000	2008	9
bily_kriz	3	wind_ms	2.350770e+00	2.404200e+00	1.945468e+00	2.474911e+00	2.188664e+00	2000	2008	9

The overview tables for ISIMIP datasets contain more fields, namely forcing datasets and/or forcing conditions.

```
data <-summarizeData(dataset = "CLIMATE_ISIMIP2B", site = "bily_kriz", mode = "overview")

kable(data, row.names = F)
```

site	site_id	forcingDataset	forcingCondition	variable	first	last	min	max	mean	year_first	year_last	obs
bily_kriz	3	GFDLESM2M	historical	tmax_degC	1.006887e+01	1.147109e+01	8.685277e+00	1.525831e+01	1.154169e+01	1861	2005	145
bily_kriz	3	GFDLESM2M	historical	tmean_degC	5.878167e+00	6.749036e+00	4.454744e+00	9.924510e+00	6.930977e+00	1861	2005	145
bily_kriz	3	GFDLESM2M	historical	tmin_degC	1.692771e+00	1.964804e+00	1.069216e-01	4.430233e+00	2.223197e+00	1861	2005	145
bily_kriz	3	GFDLESM2M	historical	p_mm	9.766867e+02	1.125590e+03	6.073860e+02	1.311257e+03	9.683358e+02	1861	2005	145
bily_kriz	3	GFDLESM2M	historical	relhum_percent	7.694075e+01	7.747906e+01	6.644276e+01	7.905318e+01	7.428709e+01	1861	2005	145
bily_kriz	3	GFDLESM2M	historical	airpress_hPa	9.490722e+02	9.495864e+02	9.468872e+02	9.533306e+02	9.498743e+02	1861	2005	145
bily_kriz	3	GFDLESM2M	historical	rad_Jcm2	3.780155e+05	3.823430e+05	3.557333e+05	4.346502e+05	3.911453e+05	1861	2005	145
bily_kriz	3	GFDLESM2M	historical	wind_ms	2.800383e+00	3.286238e+00	2.800383e+00	3.490822e+00	3.217614e+00	1861	2005	145
bily_kriz	3	GFDLESM2M	piControl	tmax_degC	1.155938e+01	1.118532e+01	8.056727e+00	1.441375e+01	1.153763e+01	1661	2099	439
bily_kriz	3	GFDLESM2M	piControl	tmean_degC	6.591962e+00	6.797587e+00	3.551189e+00	9.195662e+00	6.811351e+00	1661	2099	439
bily_kriz	3	GFDLESM2M	piControl	tmin_degC	1.662844e+00	2.404546e+00	-9.935545e-01	4.178733e+00	2.079977e+00	1661	2099	439
bily_kriz	3	GFDLESM2M	piControl	p_mm	9.001616e+02	1.160674e+03	7.274699e+02	1.399731e+03	1.040637e+03	1661	2099	439
bily_kriz	3	GFDLESM2M	piControl	relhum_percent	7.657000e+01	7.932156e+01	6.822058e+01	8.215661e+01	7.708760e+01	1661	2099	439
bily_kriz	3	GFDLESM2M	piControl	airpress_hPa	9.504819e+02	9.497652e+02	9.468040e+02	9.525582e+02	9.497105e+02	1661	2099	439
bily_kriz	3	GFDLESM2M	piControl	rad_Jcm2	4.141776e+05	3.772647e+05	3.423868e+05	4.528545e+05	3.912886e+05	1661	2099	439
bily_kriz	3	GFDLESM2M	piControl	wind_ms	2.586498e+00	2.612632e+00	2.331867e+00	2.819268e+00	2.560670e+00	1661	2099	439
bily_kriz	3	GFDLESM2M	rcp2p6	tmax_degC	1.215476e+01	1.316143e+01	1.068443e+01	1.554527e+01	1.289789e+01	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp2p6	tmean_degC	7.546677e+00	8.467387e+00	6.442471e+00	1.045057e+01	8.310183e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp2p6	tmin_degC	2.838122e+00	3.674079e+00	1.616721e+00	5.559387e+00	3.577403e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp2p6	p_mm	1.273594e+03	1.008292e+03	6.054646e+02	1.273594e+03	1.016470e+03	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp2p6	relhum_percent	7.915016e+01	7.360668e+01	6.662971e+01	7.915016e+01	7.381166e+01	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp2p6	airpress_hPa	9.490538e+02	9.516424e+02	9.471578e+02	9.538344e+02	9.507912e+02	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp2p6	rad_Jcm2	3.780991e+05	3.964951e+05	3.529131e+05	4.402460e+05	3.976782e+05	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp2p6	wind_ms	3.209430e+00	3.354782e+00	3.160059e+00	3.826681e+00	3.444829e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp4p5	tmax_degC	1.288055e+01	1.406410e+01	1.086514e+01	1.547209e+01	1.341545e+01	2006	2099	94

bily_kriz	3	GFDLESM2M	rcp4p5	tmean_degC	8.189510e+00	9.282370e+00	6.527514e+00	1.018920e+01	8.748496e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp4p5	tmin_degC	3.500966e+00	4.324320e+00	1.943218e+00	5.135467e+00	3.953199e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp4p5	p_mm	1.125624e+03	9.592606e+02	6.383654e+02	1.255992e+03	9.899021e+02	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp4p5	relhum_percent	7.530757e+01	7.354885e+01	6.562762e+01	7.757270e+01	7.318045e+01	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp4p5	airpress_hPa	9.498213e+02	9.522953e+02	9.481768e+02	9.535832e+02	9.511007e+02	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp4p5	rad_Jcm2	4.187450e+05	3.932176e+05	3.658412e+05	4.397868e+05	4.012383e+05	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp4p5	wind_ms	3.400762e+00	3.346777e+00	3.056685e+00	3.704483e+00	3.384756e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp6p0	tmax_degC	1.208168e+01	1.311559e+01	9.968399e+00	1.602148e+01	1.326510e+01	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp6p0	tmean_degC	7.570482e+00	8.811900e+00	6.057520e+00	1.112778e+01	8.651463e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp6p0	tmin_degC	2.989240e+00	4.376124e+00	1.833080e+00	6.031763e+00	3.902593e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp6p0	p_mm	1.231269e+03	1.124040e+03	6.924375e+02	1.323759e+03	9.899244e+02	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp6p0	relhum_percent	7.804449e+01	7.551482e+01	6.533163e+01	7.829034e+01	7.330648e+01	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp6p0	airpress_hPa	9.485220e+02	9.479184e+02	9.479184e+02	9.543837e+02	9.510994e+02	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp6p0	rad_Jcm2	3.782895e+05	3.776877e+05	3.467031e+05	4.440431e+05	3.975791e+05	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp6p0	wind_ms	3.288611e+00	3.464434e+00	3.221312e+00	3.704554e+00	3.415027e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp8p5	tmax_degC	1.196326e+01	1.518987e+01	1.130086e+01	1.837590e+01	1.410468e+01	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp8p5	tmean_degC	7.587771e+00	1.013861e+01	6.961074e+00	1.266328e+01	9.202764e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp8p5	tmin_degC	3.015651e+00	4.842265e+00	1.922271e+00	6.747208e+00	4.231603e+00	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp8p5	p_mm	1.073079e+03	1.066355e+03	6.471813e+02	1.342434e+03	1.000770e+03	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp8p5	relhum_percent	7.824174e+01	7.510250e+01	6.322957e+01	7.912488e+01	7.327579e+01	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp8p5	airpress_hPa	9.515534e+02	9.518250e+02	9.482375e+02	9.547403e+02	9.513680e+02	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp8p5	rad_Jcm2	3.672316e+05	3.959328e+05	3.550359e+05	4.419723e+05	3.973588e+05	2006	2099	94
bily_kriz	3	GFDLESM2M	rcp8p5	wind_ms	3.231205e+00	3.267776e+00	2.994912e+00	3.386237e+00	3.196491e+00	2006	2099	94
bily_kriz	3	HadGEM2ES	historical	tmax_degC	1.240796e+01	1.298377e+01	8.781035e+00	1.430560e+01	1.153644e+01	1861	2005	145
bily_kriz	3	HadGEM2ES	historical	tmean_degC	7.456127e+00	8.608379e+00	4.407828e+00	9.180084e+00	6.750251e+00	1861	2005	145
bily_kriz	3	HadGEM2ES	historical	tmin_degC	2.329002e+00	4.058239e+00	-6.764856e-01	4.058239e+00	1.824607e+00	1861	2005	145
bily_kriz	3	HadGEM2ES	historical	p_mm	9.149067e+02	1.003253e+03	5.692869e+02	1.389685e+03	9.490047e+02	1861	2005	145
bily_kriz	3	HadGEM2ES	historical	relhum_percent	7.123042e+01	7.439501e+01	6.299857e+01	8.089450e+01	7.346432e+01	1861	2005	145

bily_kriz	3	HadGEM2ES	historical	airpress_hPa	9.486078e+02	9.494245e+02	9.473832e+02	9.533742e+02	9.502473e+02	1861	2005	145
bily_kriz	3	HadGEM2ES	historical	rad_Jcm2	4.270536e+05	3.921624e+05	3.381196e+05	4.537614e+05	4.014820e+05	1861	2005	145
bily_kriz	3	HadGEM2ES	historical	wind_ms	3.270745e+00	3.378617e+00	2.898211e+00	3.746602e+00	3.246359e+00	1861	2005	145
bily_kriz	3	HadGEM2ES	piControl	tmax_degC	1.239539e+01	1.216643e+01	9.627133e+00	1.542569e+01	1.234029e+01	1661	2299	639
bily_kriz	3	HadGEM2ES	piControl	tmean_degC	7.430585e+00	7.716153e+00	4.674864e+00	1.035509e+01	7.400779e+00	1661	2299	639
bily_kriz	3	HadGEM2ES	piControl	tmin_degC	2.339270e+00	3.021990e+00	-2.853242e-01	5.138582e+00	2.314961e+00	1661	2299	639
bily_kriz	3	HadGEM2ES	piControl	p_mm	8.711580e+02	1.588627e+03	5.898036e+02	1.599551e+03	9.695199e+02	1661	2299	639
bily_kriz	3	HadGEM2ES	piControl	relhum_percent	7.169393e+01	7.592076e+01	6.377954e+01	8.019184e+01	7.205009e+01	1661	2299	639
bily_kriz	3	HadGEM2ES	piControl	airpress_hPa	9.509282e+02	9.491502e+02	9.467626e+02	9.529376e+02	9.500176e+02	1661	2299	639
bily_kriz	3	HadGEM2ES	piControl	rad_Jcm2	4.408675e+05	3.919564e+05	3.673516e+05	4.890285e+05	4.280856e+05	1661	2299	639
bily_kriz	3	HadGEM2ES	piControl	wind_ms	3.201148e+00	3.271918e+00	2.818410e+00	3.792542e+00	3.231371e+00	1661	2299	639
bily_kriz	3	HadGEM2ES	rcp2p6	tmax_degC	1.336879e+01	1.433306e+01	1.066634e+01	1.725215e+01	1.417385e+01	2006	2299	294
bily_kriz	3	HadGEM2ES	rcp2p6	tmean_degC	8.954505e+00	9.362698e+00	6.536817e+00	1.173888e+01	9.440236e+00	2006	2299	294
bily_kriz	3	HadGEM2ES	rcp2p6	tmin_degC	4.427333e+00	4.298052e+00	1.926148e+00	6.702829e+00	4.635533e+00	2006	2299	294
bily_kriz	3	HadGEM2ES	rcp2p6	p_mm	1.040633e+03	1.060025e+03	5.331777e+02	1.705248e+03	1.086752e+03	2006	2299	294
bily_kriz	3	HadGEM2ES	rcp2p6	relhum_percent	7.220592e+01	6.955574e+01	6.225784e+01	8.013845e+01	7.240671e+01	2006	2299	294
bily_kriz	3	HadGEM2ES	rcp2p6	airpress_hPa	9.488484e+02	9.493447e+02	9.467316e+02	9.529557e+02	9.500760e+02	2006	2299	294
bily_kriz	3	HadGEM2ES	rcp2p6	rad_Jcm2	3.877499e+05	4.497789e+05	3.776577e+05	4.886075e+05	4.264955e+05	2006	2299	294
bily_kriz	3	HadGEM2ES	rcp2p6	wind_ms	3.643074e+00	3.444059e+00	2.758286e+00	3.873323e+00	3.226201e+00	2006	2299	294
bily_kriz	3	HadGEM2ES	rcp4p5	tmax_degC	1.407407e+01	1.486035e+01	1.233871e+01	1.893476e+01	1.518882e+01	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp4p5	tmean_degC	9.252982e+00	1.023809e+01	7.807531e+00	1.343729e+01	1.035594e+01	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp4p5	tmin_degC	4.306459e+00	5.660579e+00	2.954550e+00	7.816934e+00	5.447787e+00	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp4p5	p_mm	8.424510e+02	1.241633e+03	5.241117e+02	1.705915e+03	1.013117e+03	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp4p5	relhum_percent	6.952648e+01	7.277929e+01	6.028664e+01	7.748811e+01	6.991351e+01	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp4p5	airpress_hPa	9.498508e+02	9.501007e+02	9.474724e+02	9.530760e+02	9.504404e+02	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp4p5	rad_Jcm2	4.036507e+05	4.304601e+05	3.571120e+05	4.840511e+05	4.283607e+05	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp4p5	wind_ms	3.346421e+00	3.008326e+00	2.778189e+00	3.610636e+00	3.228131e+00	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp6p0	tmax_degC	1.377976e+01	1.689714e+01	1.133283e+01	1.833320e+01	1.514908e+01	2006	2099	94

bily_kriz	3	HadGEM2ES	rcp6p0	tmean_degC	8.184624e+00	1.220952e+01	6.780259e+00	1.316056e+01	1.034288e+01	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp6p0	tmin_degC	2.653739e+00	7.376551e+00	2.069489e+00	7.961926e+00	5.469182e+00	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp6p0	p_mm	7.380091e+02	1.006461e+03	5.830797e+02	1.562262e+03	1.020103e+03	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp6p0	relhum_percent	6.758564e+01	6.895909e+01	6.078655e+01	7.712791e+01	7.003207e+01	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp6p0	airpress_hPa	9.503455e+02	9.500506e+02	9.483097e+02	9.532589e+02	9.504964e+02	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp6p0	rad_Jcm2	4.420520e+05	4.397051e+05	3.743635e+05	4.841025e+05	4.277062e+05	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp6p0	wind_ms	3.075746e+00	3.038154e+00	2.956440e+00	3.636227e+00	3.250932e+00	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp8p5	tmax_degC	1.344648e+01	1.972161e+01	1.228382e+01	2.119298e+01	1.651697e+01	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp8p5	tmean_degC	8.656728e+00	1.482784e+01	7.683308e+00	1.584537e+01	1.159772e+01	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp8p5	tmin_degC	3.836115e+00	9.819416e+00	2.772772e+00	1.050681e+01	6.635632e+00	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp8p5	p_mm	1.044783e+03	1.013541e+03	5.578729e+02	1.504246e+03	9.901365e+02	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp8p5	relhum_percent	7.262943e+01	6.610779e+01	5.935513e+01	7.549967e+01	6.808624e+01	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp8p5	airpress_hPa	9.504481e+02	9.501788e+02	9.482010e+02	9.530406e+02	9.507368e+02	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp8p5	rad_Jcm2	4.058588e+05	4.509622e+05	3.958738e+05	4.980015e+05	4.389597e+05	2006	2099	94
bily_kriz	3	HadGEM2ES	rcp8p5	wind_ms	3.036766e+00	3.152602e+00	2.935808e+00	3.650375e+00	3.271677e+00	2006	2099	94
bily_kriz	3	IPSLCM5ALR	historical	tmax_degC	1.199800e+01	1.233205e+01	7.929561e+00	1.326267e+01	1.098010e+01	1861	2005	145
bily_kriz	3	IPSLCM5ALR	historical	tmean_degC	7.181227e+00	7.945040e+00	3.505916e+00	8.572173e+00	6.358021e+00	1861	2005	145
bily_kriz	3	IPSLCM5ALR	historical	tmin_degC	2.151261e+00	3.452792e+00	-1.236086e+00	3.784220e+00	1.601908e+00	1861	2005	145
bily_kriz	3	IPSLCM5ALR	historical	p_mm	1.042106e+03	1.267612e+03	7.187445e+02	1.356358e+03	1.026966e+03	1861	2005	145
bily_kriz	3	IPSLCM5ALR	historical	relhum_percent	7.513935e+01	7.493006e+01	7.023702e+01	8.112070e+01	7.585932e+01	1861	2005	145
bily_kriz	3	IPSLCM5ALR	historical	airpress_hPa	9.497655e+02	9.472133e+02	9.462076e+02	9.523612e+02	9.495280e+02	1861	2005	145
bily_kriz	3	IPSLCM5ALR	historical	rad_Jcm2	4.301708e+05	3.964781e+05	3.530505e+05	4.510969e+05	3.977368e+05	1861	2005	145
bily_kriz	3	IPSLCM5ALR	historical	wind_ms	2.915605e+00	3.217643e+00	2.915605e+00	3.593020e+00	3.260216e+00	1861	2005	145
bily_kriz	3	IPSLCM5ALR	piControl	tmax_degC	9.414541e+00	9.659026e+00	7.981816e+00	1.283197e+01	1.043142e+01	1661	2299	639
bily_kriz	3	IPSLCM5ALR	piControl	tmean_degC	4.799536e+00	4.813293e+00	3.086220e+00	8.020728e+00	5.751357e+00	1661	2299	639
bily_kriz	3	IPSLCM5ALR	piControl	tmin_degC	-2.675180e-02	-3.598362e-01	-2.418813e+00	3.198123e+00	8.944435e-01	1661	2299	639
bily_kriz	3	IPSLCM5ALR	piControl	p_mm	1.060398e+03	1.002191e+03	7.333915e+02	1.467790e+03	1.055779e+03	1661	2299	639
bily_kriz	3	IPSLCM5ALR	piControl	relhum_percent	7.907758e+01	7.742399e+01	7.172206e+01	8.153754e+01	7.661966e+01	1661	2299	639

bily_kriz	3	IPSLCM5ALR	piControl	airpress_hPa	9.499279e+02	9.508284e+02	9.462248e+02	9.531473e+02	9.493137e+02	1661	2299	639
bily_kriz	3	IPSLCM5ALR	piControl	rad_Jcm2	4.056774e+05	4.117241e+05	3.646121e+05	4.807791e+05	4.146426e+05	1661	2299	639
bily_kriz	3	IPSLCM5ALR	piControl	wind_ms	2.958875e+00	3.131536e+00	2.779596e+00	3.537544e+00	3.111507e+00	1661	2299	639
bily_kriz	3	IPSLCM5ALR	rcp2p6	tmax_degC	1.271243e+01	1.206834e+01	1.111059e+01	1.606638e+01	1.335131e+01	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp2p6	tmean_degC	8.245935e+00	7.651714e+00	6.436547e+00	1.085479e+01	8.822487e+00	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp2p6	tmin_degC	3.622934e+00	3.006334e+00	1.604008e+00	6.001023e+00	4.221685e+00	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp2p6	p_mm	1.059338e+03	1.157982e+03	7.838197e+02	1.579415e+03	1.097729e+03	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp2p6	relhum_percent	7.348688e+01	7.610261e+01	6.965373e+01	7.806824e+01	7.385492e+01	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp2p6	airpress_hPa	9.502836e+02	9.483053e+02	9.467434e+02	9.540936e+02	9.497823e+02	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp2p6	rad_Jcm2	4.192525e+05	4.093297e+05	3.755701e+05	4.724685e+05	4.214701e+05	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp2p6	wind_ms	3.107687e+00	3.209825e+00	2.860877e+00	3.502095e+00	3.215132e+00	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp4p5	tmax_degC	1.191375e+01	1.669228e+01	1.113558e+01	1.761033e+01	1.495644e+01	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp4p5	tmean_degC	7.378555e+00	1.222542e+01	6.156196e+00	1.248705e+01	1.031143e+01	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp4p5	tmin_degC	2.894090e+00	7.676787e+00	1.049118e+00	7.676787e+00	5.649276e+00	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp4p5	p_mm	1.010627e+03	1.117893e+03	7.525715e+02	1.454753e+03	1.047160e+03	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp4p5	relhum_percent	7.352016e+01	7.069703e+01	6.809642e+01	7.708260e+01	7.204049e+01	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp4p5	airpress_hPa	9.497573e+02	9.513709e+02	9.475247e+02	9.545087e+02	9.505808e+02	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp4p5	rad_Jcm2	4.138551e+05	4.213282e+05	3.825715e+05	4.689618e+05	4.269643e+05	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp4p5	wind_ms	3.210255e+00	3.095609e+00	2.753695e+00	3.495707e+00	3.062641e+00	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp6p0	tmax_degC	1.331781e+01	1.619413e+01	1.164372e+01	1.730295e+01	1.396568e+01	2006	2099	94
bily_kriz	3	IPSLCM5ALR	rcp6p0	tmean_degC	8.302739e+00	1.159692e+01	7.272854e+00	1.223028e+01	9.406104e+00	2006	2099	94
bily_kriz	3	IPSLCM5ALR	rcp6p0	tmin_degC	3.396871e+00	6.990521e+00	2.516000e+00	7.173803e+00	4.783379e+00	2006	2099	94
bily_kriz	3	IPSLCM5ALR	rcp6p0	p_mm	9.563375e+02	9.788523e+02	6.843208e+02	1.350419e+03	1.044151e+03	2006	2099	94
bily_kriz	3	IPSLCM5ALR	rcp6p0	relhum_percent	7.157938e+01	6.888948e+01	6.765031e+01	7.785576e+01	7.255214e+01	2006	2099	94
bily_kriz	3	IPSLCM5ALR	rcp6p0	airpress_hPa	9.524426e+02	9.497988e+02	9.476348e+02	9.537398e+02	9.501633e+02	2006	2099	94
bily_kriz	3	IPSLCM5ALR	rcp6p0	rad_Jcm2	4.427263e+05	4.408261e+05	3.666051e+05	4.862628e+05	4.200933e+05	2006	2099	94
bily_kriz	3	IPSLCM5ALR	rcp6p0	wind_ms	2.966485e+00	3.388938e+00	2.836045e+00	3.419347e+00	3.147624e+00	2006	2099	94
bily_kriz	3	IPSLCM5ALR	rcp8p5	tmax_degC	1.129110e+01	2.661842e+01	1.129110e+01	2.872586e+01	2.089522e+01	2006	2299	294

bily_kriz	3	IPSLCM5ALR	rcp8p5	tmean_degC	6.929035e+00	2.188515e+01	6.838658e+00	2.355456e+01	1.609645e+01	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp8p5	tmin_degC	2.401975e+00	1.716133e+01	1.754659e+00	1.870146e+01	1.129307e+01	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp8p5	p_mm	1.192158e+03	9.140424e+02	5.043313e+02	1.394962e+03	9.394859e+02	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp8p5	relhum_percent	7.559265e+01	6.053796e+01	5.734636e+01	7.780171e+01	6.613040e+01	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp8p5	airpress_hPa	9.491727e+02	9.506043e+02	9.480315e+02	9.545785e+02	9.510250e+02	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp8p5	rad_Jcm2	3.585790e+05	4.184550e+05	3.585790e+05	4.754847e+05	4.354537e+05	2006	2299	294
bily_kriz	3	IPSLCM5ALR	rcp8p5	wind_ms	3.369205e+00	3.138238e+00	2.565214e+00	3.382828e+00	3.019524e+00	2006	2299	294
bily_kriz	3	MIROC5	historical	tmax_degC	1.209526e+01	1.288251e+01	8.793722e+00	1.418052e+01	1.153099e+01	1861	2005	145
bily_kriz	3	MIROC5	historical	tmean_degC	7.028521e+00	7.674554e+00	4.236689e+00	9.000305e+00	6.838927e+00	1861	2005	145
bily_kriz	3	MIROC5	historical	tmin_degC	1.912003e+00	2.383862e+00	-7.711300e-01	3.886889e+00	1.974051e+00	1861	2005	145
bily_kriz	3	MIROC5	historical	p_mm	9.499720e+02	9.374091e+02	6.634450e+02	1.334588e+03	9.666290e+02	1861	2005	145
bily_kriz	3	MIROC5	historical	relhum_percent	7.073858e+01	7.427323e+01	6.771783e+01	7.820979e+01	7.372307e+01	1861	2005	145
bily_kriz	3	MIROC5	historical	airpress_hPa	9.501901e+02	9.498800e+02	9.481898e+02	9.520636e+02	9.501136e+02	1861	2005	145
bily_kriz	3	MIROC5	historical	rad_Jcm2	4.319353e+05	4.356081e+05	3.327256e+05	4.578575e+05	3.980370e+05	1861	2005	145
bily_kriz	3	MIROC5	historical	wind_ms	3.247369e+00	2.892433e+00	2.892433e+00	3.593764e+00	3.298318e+00	1861	2005	145
bily_kriz	3	MIROC5	piControl	tmax_degC	1.224752e+01	1.394277e+01	1.055379e+01	1.565283e+01	1.297621e+01	1661	2299	639
bily_kriz	3	MIROC5	piControl	tmean_degC	7.581752e+00	8.707366e+00	5.260067e+00	1.002929e+01	7.789709e+00	1661	2299	639
bily_kriz	3	MIROC5	piControl	tmin_degC	2.671488e+00	3.474802e+00	-1.236649e-01	4.573351e+00	2.546084e+00	1661	2299	639
bily_kriz	3	MIROC5	piControl	p_mm	1.100524e+03	9.223519e+02	5.981956e+02	1.450320e+03	1.000430e+03	1661	2299	639
bily_kriz	3	MIROC5	piControl	relhum_percent	7.169501e+01	7.160043e+01	6.573467e+01	7.643777e+01	7.112007e+01	1661	2299	639
bily_kriz	3	MIROC5	piControl	airpress_hPa	9.490148e+02	9.503783e+02	9.477455e+02	9.520115e+02	9.497192e+02	1661	2299	639
bily_kriz	3	MIROC5	piControl	rad_Jcm2	4.340896e+05	4.622626e+05	4.122271e+05	4.968523e+05	4.536182e+05	1661	2299	639
bily_kriz	3	MIROC5	piControl	wind_ms	3.165871e+00	3.088682e+00	2.779904e+00	3.421336e+00	3.090434e+00	1661	2299	639
bily_kriz	3	MIROC5	rcp2p6	tmax_degC	1.267762e+01	1.464753e+01	1.130763e+01	1.766991e+01	1.438910e+01	2006	2299	294
bily_kriz	3	MIROC5	rcp2p6	tmean_degC	7.869374e+00	9.637533e+00	6.665525e+00	1.172847e+01	9.211597e+00	2006	2299	294
bily_kriz	3	MIROC5	rcp2p6	tmin_degC	3.107871e+00	4.501144e+00	1.495701e+00	5.931406e+00	3.954928e+00	2006	2299	294
bily_kriz	3	MIROC5	rcp2p6	p_mm	9.649997e+02	1.232772e+03	6.138350e+02	1.505568e+03	1.032402e+03	2006	2299	294
bily_kriz	3	MIROC5	rcp2p6	relhum_percent	7.326803e+01	6.998136e+01	6.496672e+01	7.411541e+01	6.966650e+01	2006	2299	294

bily_kriz	3	MIROC5	rcp2p6	airpress_hPa	9.506265e+02	9.496163e+02	9.486850e+02	9.527078e+02	9.506783e+02	2006	2299	294
bily_kriz	3	MIROC5	rcp2p6	rad_Jcm2	4.015045e+05	4.496680e+05	3.932749e+05	4.920393e+05	4.595528e+05	2006	2299	294
bily_kriz	3	MIROC5	rcp2p6	wind_ms	3.050639e+00	3.514055e+00	2.933608e+00	3.758578e+00	3.365197e+00	2006	2299	294
bily_kriz	3	MIROC5	rcp4p5	tmax_degC	1.300568e+01	1.510026e+01	1.151963e+01	1.755379e+01	1.475842e+01	2006	2099	94
bily_kriz	3	MIROC5	rcp4p5	tmean_degC	8.434508e+00	9.775845e+00	6.952403e+00	1.184436e+01	9.597190e+00	2006	2099	94
bily_kriz	3	MIROC5	rcp4p5	tmin_degC	3.869308e+00	4.562683e+00	2.184686e+00	6.364980e+00	4.439743e+00	2006	2099	94
bily_kriz	3	MIROC5	rcp4p5	p_mm	1.249482e+03	9.238703e+02	6.806175e+02	1.525409e+03	1.072190e+03	2006	2099	94
bily_kriz	3	MIROC5	rcp4p5	relhum_percent	7.511250e+01	6.839224e+01	6.537780e+01	7.608938e+01	7.074752e+01	2006	2099	94
bily_kriz	3	MIROC5	rcp4p5	airpress_hPa	9.495245e+02	9.520004e+02	9.486400e+02	9.531066e+02	9.507222e+02	2006	2099	94
bily_kriz	3	MIROC5	rcp4p5	rad_Jcm2	3.864426e+05	4.578805e+05	3.864426e+05	4.767179e+05	4.429179e+05	2006	2099	94
bily_kriz	3	MIROC5	rcp4p5	wind_ms	3.206825e+00	3.053288e+00	2.738664e+00	3.424915e+00	3.084660e+00	2006	2099	94
bily_kriz	3	MIROC5	rcp6p0	tmax_degC	1.284927e+01	1.712913e+01	1.117872e+01	1.765651e+01	1.454981e+01	2006	2099	94
bily_kriz	3	MIROC5	rcp6p0	tmean_degC	8.199558e+00	1.155381e+01	6.376874e+00	1.202585e+01	9.412531e+00	2006	2099	94
bily_kriz	3	MIROC5	rcp6p0	tmin_degC	3.445637e+00	5.986129e+00	1.129950e+00	6.514371e+00	4.238116e+00	2006	2099	94
bily_kriz	3	MIROC5	rcp6p0	p_mm	1.062149e+03	9.548170e+02	6.743912e+02	1.767767e+03	1.069415e+03	2006	2099	94
bily_kriz	3	MIROC5	rcp6p0	relhum_percent	7.314449e+01	6.843324e+01	6.497104e+01	7.580435e+01	7.059043e+01	2006	2099	94
bily_kriz	3	MIROC5	rcp6p0	airpress_hPa	9.500106e+02	9.510659e+02	9.484295e+02	9.536767e+02	9.505556e+02	2006	2099	94
bily_kriz	3	MIROC5	rcp6p0	rad_Jcm2	4.104626e+05	4.678674e+05	4.053620e+05	4.883105e+05	4.456123e+05	2006	2099	94
bily_kriz	3	MIROC5	rcp6p0	wind_ms	3.203270e+00	3.285214e+00	2.915114e+00	3.476665e+00	3.168073e+00	2006	2099	94
bily_kriz	3	MIROC5	rcp8p5	tmax_degC	1.370752e+01	2.039066e+01	1.143856e+01	2.039066e+01	1.582312e+01	2006	2099	94
bily_kriz	3	MIROC5	rcp8p5	tmean_degC	8.660868e+00	1.438092e+01	6.973280e+00	1.438092e+01	1.056073e+01	2006	2099	94
bily_kriz	3	MIROC5	rcp8p5	tmin_degC	3.541571e+00	8.389683e+00	2.456856e+00	8.751239e+00	5.286968e+00	2006	2099	94
bily_kriz	3	MIROC5	rcp8p5	p_mm	1.066102e+03	7.791861e+02	7.472848e+02	1.588807e+03	1.067657e+03	2006	2099	94
bily_kriz	3	MIROC5	rcp8p5	relhum_percent	7.126742e+01	6.665186e+01	6.485983e+01	7.568164e+01	6.955227e+01	2006	2099	94
bily_kriz	3	MIROC5	rcp8p5	airpress_hPa	9.500284e+02	9.527342e+02	9.484535e+02	9.530866e+02	9.510911e+02	2006	2099	94
bily_kriz	3	MIROC5	rcp8p5	rad_Jcm2	4.216762e+05	4.793708e+05	3.965346e+05	4.900858e+05	4.542928e+05	2006	2099	94
bily_kriz	3	MIROC5	rcp8p5	wind_ms	3.052468e+00	3.074464e+00	2.911949e+00	3.389135e+00	3.135116e+00	2006	2099	94

This option is also availabe for TREE and STAND datasets.

```
data <-summarizeData(dataset = "TREE", site = "solling_beech", mode = "overview")

kable(data, row.names = F)
```

site	site_id	species	species_id	variable	first	last	min	max	mean	year_first	year_last	obs
solling_beech	20	Fagus sylvatica	fasy	size_m2	10000.00000	10000.00000	10000.00000	10000.00000	10000.00000	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	density_treeha	245.00000	130.00000	130.00000	245.00000	214.18750	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	dbhDQ_cm	37.44884	49.99646	37.44884	49.99646	42.59802	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	dbhArith_cm	36.48286	48.84923	36.48286	48.84923	41.52105	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	dbhBA_cm	40.19266	53.39641	40.19266	53.39641	45.67458	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	heightArith_m	24.63196	30.22754	24.63196	30.22754	27.48854	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	heightBA_m	25.44974	30.77684	25.44974	30.77684	28.17222	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	ba_m2ha	26.98564	25.52182	25.52182	35.40038	29.88959	1967	2014	16

Please note that the TREE overview table is first summarized by years, pulling all trees together as a stand. Thus, you might find coincidences between the STAND and the TREE overviews.

```
data <-summarizeData(dataset = "STAND", site = "solling_beech", mode = "overview")

kable(data, row.names = F)
```

site	site_id	species	species_id	variable	first	last	min	max	mean	year_first	year_last	obs
solling_beech	20	Fagus sylvatica	fasy	age	120.00000	168.00000	120.00000	168.00000	137.37500	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	dbhArith_cm	36.48286	48.84923	36.48286	48.84923	41.52105	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	dbhBA_cm	40.19266	53.39641	40.19266	53.39641	45.67458	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	dbhDQ_cm	37.44884	49.99646	37.44884	49.99646	42.59802	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	heightArith_m	24.63196	30.22754	24.63196	30.22754	27.48854	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	heightBA_m	25.44974	30.77684	25.44974	30.77684	28.17222	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	ba_m2ha	26.98564	25.52182	25.52182	35.40038	29.88959	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	density_treeha	245.00000	130.00000	130.00000	245.00000	214.18750	1967	2014	16
solling_beech	20	Fagus sylvatica	fasy	foliageBiomass_kgha	2631.00000	2509.00000	2509.00000	3035.00000	2734.60000	1996	2014	5

Data summaries of the available data

The other value of mode is **data**. It sets the behaviour of *summarizeData* to produce result summaries.

TREE

```
data <-summarizeData(dataset = "TREE", site = "bily_kriz")

kable(data, row.names = F)
```

site	site_id	year	species	species_id	size_m2	density_treeha	dbhDQ_cm	dbhArith_cm	dbhBA_cm	heightArith_m	heightBA_m	ba_m2ha
bily_kriz	3	1997	Picea abies	piab	2500	2408	7.391285	7.112625	8.160837	5.631395	6.263354	10.33204
bily_kriz	3	1998	Picea abies	piab	2500	2396	8.106565	7.834391	8.863961	6.339399	6.957685	12.36660
bily_kriz	3	1999	Picea abies	piab	2500	2392	8.786736	8.504013	9.574108	6.880936	7.499656	14.50461
bily_kriz	3	2000	Picea abies	piab	2500	2388	9.415671	9.115075	10.253861	7.497990	8.129110	16.62749
bily_kriz	3	2001	Picea abies	piab	2500	1848	10.506718	10.232468	11.265544	8.426840	8.988191	16.02234
bily_kriz	3	2002	Picea abies	piab	2500	1836	11.264091	10.981264	12.048025	9.134423	9.692305	18.29594
bily_kriz	3	2003	Picea abies	piab	2500	1836	11.955024	11.661656	12.766838	9.801089	10.367013	20.60931
bily_kriz	3	2004	Picea abies	piab	2500	1668	12.869809	12.603837	13.621369	10.495923	10.976840	21.69852
bily_kriz	3	2005	Picea abies	piab	2500	1664	13.581622	13.299760	14.377679	11.198077	11.690715	24.10718
bily_kriz	3	2006	Picea abies	piab	2500	1580	14.278164	13.988861	15.087051	11.515190	12.049585	25.29832
bily_kriz	3	2007	Picea abies	piab	2500	1508	14.851371	14.574801	15.631127	11.997878	12.487173	26.12307
bily_kriz	3	2008	Picea abies	piab	2500	1500	15.585562	15.301067	16.384768	12.359733	12.868074	28.61713
bily_kriz	3	2009	Picea abies	piab	2500	1492	16.186739	15.885791	17.033125	12.892992	13.426940	30.70276
bily_kriz	3	2010	Picea abies	piab	2500	1488	16.688517	16.372850	17.570925	13.436828	13.994286	32.54830
bily_kriz	3	2011	Picea abies	piab	2500	1488	17.270525	16.935753	18.203030	14.131183	14.721789	34.85812
bily_kriz	3	2012	Picea abies	piab	2500	1268	18.269222	17.926183	19.217967	13.517350	14.435891	33.23910
bily_kriz	3	2013	Picea abies	piab	2500	1256	18.601908	18.249363	19.574279	13.769745	14.699054	34.13458
bily_kriz	3	2014	Picea abies	piab	2500	1256	19.090841	18.723248	20.104355	14.059873	15.011682	35.95255
bily_kriz	3	2015	Picea abies	piab	2500	1252	19.387417	18.991693	20.465280	14.233227	15.263984	36.96018

CLIMATE

CLIMATE_LOCAL

```
data <-summarizeData(dataset = "CLIMATE_LOCAL", site = "bily_kriz")

kable(data, row.names = F)
```

site	site_id	year	tmax_degC	tmean_degC	tmin_degC	p_mm	relhum_percent	airpress_hPa	rad_Jcm2	wind_ms
bily_kriz	3	2000	13.530145	8.536865	4.102271	1490.324	79.93809	912.7901	370604.5	2.350770
bily_kriz	3	2001	12.416737	7.674437	3.716715	1567.342	82.74661	912.3483	341850.8	2.474911
bily_kriz	3	2002	12.978551	8.296474	4.418110	1378.978	86.42986	913.0215	375278.4	2.198978
bily_kriz	3	2003	11.091126	6.161538	2.349707	1004.007	72.76064	914.4979	405381.0	1.980277
bily_kriz	3	2004	12.281959	7.683303	3.645454	1651.989	88.84459	912.8626	367439.9	2.254436
bily_kriz	3	2005	9.310364	5.930202	3.031704	1505.717	80.06642	913.9712	387422.4	1.945468
bily_kriz	3	2006	10.399436	6.877683	3.871940	1394.874	81.55814	914.3021	394615.9	2.022121
bily_kriz	3	2007	10.967189	7.566738	4.421340	1750.245	81.74537	911.7648	379212.4	2.066813
bily_kriz	3	2008	10.537101	7.484678	4.652052	1167.563	83.80125	913.1897	387168.4	2.404200

CLIMATE_ISIMIP

For several forcing datasets and/or forcing conditions

```
data <-summarizeData(dataset = "CLIMATE_ISIMIP2B", site = "bily_kriz")

kable(data, row.names = F)
```

forcingDataset	forcingCondition	year	tmax_degC	tmean_degC	tmin_degC	p_mm	relhum_percent	airpress_hPa	rad_Jcm2	wind_ms
GFDLESM2M	historical	1861-2005	11.54169	6.930977	2.2231966	968.3358	74.28709	949.8743	391145.3	3.217614
GFDLESM2M	piControl	1661-2099	11.53763	6.811351	2.0799773	1040.6370	77.08760	949.7105	391288.6	2.560670
GFDLESM2M	rcp2p6	2006-2099	12.89789	8.310183	3.5774033	1016.4696	73.81166	950.7912	397678.2	3.444829
GFDLESM2M	rcp4p5	2006-2099	13.41545	8.748496	3.9531990	989.9021	73.18045	951.1007	401238.3	3.384756
GFDLESM2M	rcp6p0	2006-2099	13.26510	8.651463	3.9025928	989.9244	73.30648	951.0994	397579.1	3.415027
GFDLESM2M	rcp8p5	2006-2099	14.10468	9.202764	4.2316025	1000.7700	73.27579	951.3680	397358.8	3.196491
HadGEM2ES	historical	1861-2005	11.53644	6.750251	1.8246069	949.0047	73.46432	950.2473	401482.0	3.246359
HadGEM2ES	piControl	1661-2299	12.34029	7.400779	2.3149606	969.5199	72.05009	950.0176	428085.6	3.231371
HadGEM2ES	rcp2p6	2006-2299	14.17385	9.440236	4.6355333	1086.7517	72.40671	950.0760	426495.5	3.226201
HadGEM2ES	rcp4p5	2006-2099	15.18882	10.355945	5.4477872	1013.1172	69.91351	950.4404	428360.7	3.228131
HadGEM2ES	rcp6p0	2006-2099	15.14908	10.342883	5.4691821	1020.1033	70.03207	950.4964	427706.2	3.250932
HadGEM2ES	rcp8p5	2006-2099	16.51697	11.597719	6.6356322	990.1365	68.08624	950.7368	438959.7	3.271677
IPSLCM5ALR	historical	1861-2005	10.98010	6.358021	1.6019083	1026.9663	75.85932	949.5280	397736.8	3.260216
IPSLCM5ALR	piControl	1661-2299	10.43142	5.751357	0.8944435	1055.7788	76.61966	949.3137	414642.6	3.111507
IPSLCM5ALR	rcp2p6	2006-2299	13.35131	8.822487	4.2216854	1097.7286	73.85492	949.7823	421470.1	3.215132
IPSLCM5ALR	rcp4p5	2006-2299	14.95644	10.311434	5.6492760	1047.1603	72.04049	950.5808	426964.3	3.062641
IPSLCM5ALR	rcp6p0	2006-2099	13.96568	9.406104	4.7833788	1044.1505	72.55214	950.1633	420093.3	3.147624
IPSLCM5ALR	rcp8p5	2006-2299	20.89522	16.096453	11.2930703	939.4859	66.13040	951.0250	435453.7	3.019524
MIROC5	historical	1861-2005	11.53099	6.838927	1.9740510	966.6290	73.72307	950.1136	398037.0	3.298318
MIROC5	piControl	1661-2299	12.97621	7.789709	2.5460838	1000.4297	71.12007	949.7192	453618.2	3.090434
MIROC5	rcp2p6	2006-2299	14.38910	9.211597	3.9549275	1032.4024	69.66650	950.6783	459552.8	3.365197
MIROC5	rcp4p5	2006-2099	14.75842	9.597190	4.4397434	1072.1900	70.74752	950.7222	442917.9	3.084660
MIROC5	rcp6p0	2006-2099	14.54981	9.412531	4.2381155	1069.4153	70.59043	950.5556	445612.3	3.168073
MIROC5	rcp8p5	2006-2099	15.82312	10.560728	5.2869677	1067.6575	69.55227	951.0911	454292.8	3.135116

For only one forcing dataset and forcing conditions

```
data <-summarizeData(dataset = "CLIMATE_ISIMIP2B_IPSLCM5ALR_historical", site = "bily_kriz")

kable(head(data), row.names = F)
```

site	site_id	year	tmax_degC	tmean_degC	tmin_degC	p_mm	relhum_percent	airpress_hPa	rad_Jcm2	wind_ms
bily_kriz	3	1861	11.998002	7.181227	2.1512612	1042.1062	75.13935	949.7655	430170.8	2.915605
bily_kriz	3	1862	8.601109	4.253349	-0.2935495	992.2576	77.44364	948.6095	380275.5	3.273053
bily_kriz	3	1863	10.811001	6.334792	1.6841171	1075.9658	77.80697	948.7587	396601.6	3.161322
bily_kriz	3	1864	9.958074	4.968835	-0.2399347	969.7612	76.24269	949.5919	438632.8	3.278511
bily_kriz	3	1865	11.024017	6.382603	1.6215635	1017.4756	75.40079	948.5346	422913.8	2.987183
bily_kriz	3	1866	12.541975	7.771579	2.9999504	1015.3766	73.85415	950.6490	421603.8	3.134281

FLUX

```
data <-summarizeData(dataset = "FLUX", site = "bily_kriz")

kable(data, row.names = F)
```

site	bily_kriz	bily_kriz	bily_kriz	bily_kriz	bily_kriz	bily_kriz	bily_kriz	bily_kriz	bily_kriz
site_id	3	3	3	3	3	3	3	3	3
year	2000	2001	2002	2003	2004	2005	2006	2007	2008
neeCutRef_tCha1	-3.878.573	-3.277.164	-3.658.319	-9.117.122	-8.457.856	-7.908.237	-6.437.540	-7.593.613	-8.349.085
neeVutRef_tCha1	-3.959.809	-3.629.736	-3.797.092	-9.071.734	-8.356.907	-8.249.708	-6.507.293	-7.422.389	-8.275.882
neeCutRefJointunc_tCha1	15.209.695	11.523.480	9.151.159	11.427.876	27.092.536	8.661.794	24.926.481	31.515.550	36.022.763
neeVutRefJointunc_tCha1	1.586.517	1.177.295	1.109.704	1.215.067	3.938.024	1.204.517	2.789.668	2.752.587	2.902.647
recoNtVutRef_tCha1	9.783.216	5.197.413	6.396.572	11.399.077	6.333.830	5.272.831	7.865.130	11.094.775	10.060.264
recoNtVutSe_tCha1	2.408.624	2.064.628	1.678.422	2.434.624	1.440.231	2.710.158	2.017.064	3.409.521	1.775.322
recoNtCutRef_tCha1	10.209.309	5.490.414	5.906.654	11.301.510	6.331.870	5.954.222	7.905.678	9.503.352	9.338.333
recoNtCutSe_tCha1	2.440.183	2.072.944	2.507.639	2.925.302	1.718.276	2.576.154	1.689.278	3.798.527	1.995.026
gppNtVutRef_tCha1	13.866.666	8.648.057	10.328.778	20.516.419	14.677.583	13.415.438	14.479.195	18.480.026	18.180.827
gppNtVutSe_tCha1	3.967.526	3.049.352	2.665.789	4.039.363	3.967.510	5.274.783	4.331.742	4.826.859	3.722.435
gppNtCutRef_tCha1	14.519.560	9.901.904	9.869.803	20.370.148	15.077.614	14.276.343	14.642.456	18.154.589	18.159.439
gppNtCutSe_tCha1	4.126.893	3.346.192	3.657.584	5.157.969	5.129.495	5.185.471	3.842.385	5.190.658	3.912.224
recoDtVutRef_tCha1	5.823.775	7.740.778	7.320.840	8.556.300	10.302.871	6.053.836	8.037.568	9.469.553	10.422.396
recoDtVutSe_tCha1	7.234.624	3.178.191	3.276.043	3.735.950	4.847.279	6.489.167	5.130.079	7.085.845	8.265.871
recoDtCutRef_tCha1	6.781.385	7.830.948	5.478.220	9.386.853	9.367.065	6.858.801	8.352.022	6.907.559	10.295.398
recoDtCutSe_tCha1	7.632.900	4.676.769	3.948.784	5.552.283	5.601.932	8.837.533	4.773.277	7.696.311	6.246.577
gppDtVutRef_tCha1	1.079.271	1.161.664	1.149.007	1.770.804	1.742.867	1.827.498	1.914.361	1.931.778	2.025.231
gppDtVutSe_tCha1	4.083.021	2.044.694	2.011.733	2.699.202	4.021.578	5.116.223	3.560.452	3.219.596	4.299.510
gppDtCutRef_tCha1	1.107.110	1.120.838	1.210.953	1.864.835	1.829.802	1.988.996	1.878.914	1.869.977	2.047.656
gppDtCutSe_tCha1	4.281.572	2.611.838	2.635.683	4.224.106	4.963.656	5.399.609	3.345.761	4.493.286	3.643.597

The getData function

The getData allows to download data from the PROFOUND database. The returned object will be a data frame or a list of data frames, depending on the data that has been requested.

SITES

To obtain the site information use getData and download the table SITES.

```
data <-getData(dataset = "SITES")

names(data)

##  [1] "site_id"               "site"
##  [3] "lat"                   "lon"
##  [5] "epsg"                  "country"
##  [7] "aspect_deg"            "elevation_masl"
##  [9] "slope_percent"         "natVegetation_code1"
## [11] "natVegetation_code2"   "natVegetation_description"
```

Optionally, you can specify a site.

```
data <-getData(dataset = "SITES", site = "soro")

knitr::kable(data, row.names = F)
```

site_id	21
site	soro
lat	5.548.584
lon	1.164.462
epsg	4326
country	Denmark
aspect_deg	NA
elevation_masl	40
slope_percent	0
natVegetation_code1	F.5.2.1
natVegetation_code2	F108
natVegetation_description	South Scandinavian-north Central European Galium odoratum- and Milium effusum-beech forests (Fagus sylvatica), partly with Fraxinus excelsior, partly with Stellaria nemorum subsp. Montana, Luzula sylvatica, Polygonatum verticillatum, Ranunculus lanuginosus, Cardamine bulbifera

A text description can be obtained from **SITEDESCRIPTION**

```
soro <-getData(dataset = "SITEDESCRIPTION", site = "soro")

soro$description

## [1] The ICOS site Sorø (DK-Sor in the FLUXNET and ICOS data bases) is located in Denmark at an elevation of 40 m.a.s.l.. The climate is warm temperate and fully humid with a mean annual temperature of 9°C and annual precipitation sum of 774 mm during the period 1996-2010. The soil has been classified as an Alfisols/Molisols. Potential natural vegetation is deciduous broad-leaved forest dominated by Fagus sylvatica. Other species occurring in the area are Fraxinus excelsior, Larix decidua, Picea abies, Quercus spp., Acer spp. However, the region is mostly used as cropland. Data on tree DBH are reconstructed from tree ring measurement (Babst et al. 2014) and historical management information for the time period from 1994 to 2017. The mean DBH of this Fagus sylvatica stand was 41 cm in the year 2017. More information about the site can be found in Ladekarl (2001), Pilegaard et al. (2003, 2011), and Wu et al. (2013)."
```

DATASETS

To download any dataset, you have to provide a dataset name and a site

```
data <-getData( dataset = "CLIMATE_LOCAL", site = "soro")
```

collapse

This option specifies whether the returned data should be a data frame or a list of data frames. This argument is relevant when downloading data from SOIL or ISIMIP datasets.

For ISIMIP datasets, by setting collapse to FALSE you will obtain a list with data frames named after the forcing datasets and conditions. Otherwise, the data will return in a unique data frame.

```
data <- getData(dataset ="CLIMATE_ISIMIP2A", site = "soro", collapse = FALSE)

names(data)

## [1] "GSWP3"     "PRINCETON" "WATCH"     "WFDEI"

names(data[[1]])

##  [1] "record_id"       "site"            "site_id"         "date"
##  [5] "forcingDataset"  "day"             "mo"              "year"
##  [9] "tmax_degC"       "tmean_degC"      "tmin_degC"       "p_mm"
## [13] "relhum_percent" "airpress_hPa"   "rad_Jcm2"    "wind_ms"
```

We recommend to unset collapse when downloading SOIL data because in many cases SOIL is a collection of tables.

```
data <- getData(dataset ="SOIL", site = "soro", collapse = FALSE)

str(data, 1)
```

```
## List of 5
## $ :'data.frame': 1 obs. of 8 variables:
## $ :'data.frame': 5 obs. of 16 variables:
## $ :'data.frame': 3 obs. of 12 variables:
## $ :'data.frame': 1 obs. of 14 variables:
## $ :'data.frame': 5 obs. of 12 variables:
```

```
names(data[[1]])
```

```
## [1] "record_id" "site" "site_id" "table_id"
## [5] "layer_id" "upperDepth_cm" "lowerDepth_cm" "type_fao"
```

forcingDataset, forcingCondition

With the function arguments *forcingDataset* and *forcingCondition* it is possible to select specific forcing datasets and conditions, respectively. These arguments are relevant for ISIMIP datasets.

```
data <- getData( dataset ="CLIMATE_ISIMIP2B", site ="soro", forcingDataset="GFDLESM2M", forcingCondition ="rcp2p6")

knitr::kable(head(data), align = "l")
```

record_id	2194374	2194375	2194376	2194377	2194378	2194379
site	soro	soro	soro	soro	soro	soro
site_id	21	21	21	21	21	21
date	01.01.2006	02.01.2006	03.01.2006	04.01.2006	05.01.2006	06.01.2006
forcingDataset	GFDLESM2M	GFDLESM2M	GFDLESM2M	GFDLESM2M	GFDLESM2M	GFDLESM2M
forcingCondition	rcp2p6	rcp2p6	rcp2p6	rcp2p6	rcp2p6	rcp2p6
day	1	2	3	4	5	6
mo	1	1	1	1	1	1
year	2006	2006	2006	2006	2006	2006
tmax_degC	4.795.770	2.531.210	-1.635.780	0.781488	0.856897	2.576.410
tmean_degC	3.271.880	-1.260.170	-2.116.130	-0.917487	0.441339	0.935022
tmin_degC	-0.661963	-3.237.280	-2.662.660	-2.497.320	-0.221411	0.253656
p_mm	35.799.900	0.0000000	0.0000000	0.0000000	0.0725665	0.5808390
relhum_percent	836.211	806.147	715.942	733.637	836.679	860.278
airpress_hPa	984.678	1.000.790	1.001.730	1.001.090	998.288	1.006.040
rad_Jcm2	213.688	170.412	253.197	239.468	169.763	148.146
wind_ms	891.397	649.315	298.789	416.723	615.931	608.605

The previous getData call is actually equivalent to

```
data <- getData(dataset ="CLIMATE_ISIMIP2B_GFDLESM2M_rcp2p6", site ="soro")

knitr::kable(head(data), align = "l")
```

record_id	2194374	2194375	2194376	2194377	2194378	2194379
site	soro	soro	soro	soro	soro	soro
site_id	21	21	21	21	21	21
date	01.01.2006	02.01.2006	03.01.2006	04.01.2006	05.01.2006	06.01.2006
forcingDataset	GFDLESM2M	GFDLESM2M	GFDLESM2M	GFDLESM2M	GFDLESM2M	GFDLESM2M
forcingCondition	rcp2p6	rcp2p6	rcp2p6	rcp2p6	rcp2p6	rcp2p6
day	1	2	3	4	5	6
mo	1	1	1	1	1	1
year	2006	2006	2006	2006	2006	2006
tmax_degC	4.795.770	2.531.210	-1.635.780	0.781488	0.856897	2.576.410
tmean_degC	3.271.880	-1.260.170	-2.116.130	-0.917487	0.441339	0.935022
tmin_degC	-0.661963	-3.237.280	-2.662.660	-2.497.320	-0.221411	0.253656
p_mm	35.799.900	0.0000000	0.0000000	0.0000000	0.0725665	0.5808390
relhum_percent	836.211	806.147	715.942	733.637	836.679	860.278
airpress_hPa	984.678	1.000.790	1.001.730	1.001.090	998.288	1.006.040
rad_Jcm2	213.688	170.412	253.197	239.468	169.763	148.146
wind_ms	891.397	649.315	298.789	416.723	615.931	608.605

variables

For any dataset it is possible to define the variable or variables to be downloaded

```
data <- getData(dataset ="CLIMATE_ISIMIP2B", site ="soro",
    forcingDataset="GFDLESM2M", forcingCondition ="rcp2p6",
    variables = "p_mm")

knitr::kable(head(data),  align = "l")
```

record_id	site	site_id	date	year	day	mo	forcingDataset	forcingCondition	p_mm
2194374	soro	21	2006-01-01	2006	1	1	GFDLESM2M	rcp2p6	3.5799900
2194375	soro	21	2006-01-02	2006	2	1	GFDLESM2M	rcp2p6	0.0000000
2194376	soro	21	2006-01-03	2006	3	1	GFDLESM2M	rcp2p6	0.0000000
2194377	soro	21	2006-01-04	2006	4	1	GFDLESM2M	rcp2p6	0.0000000
2194378	soro	21	2006-01-05	2006	5	1	GFDLESM2M	rcp2p6	0.0725665
2194379	soro	21	2006-01-06	2006	6	1	GFDLESM2M	rcp2p6	0.5808390

species

When downloading TREE or STAND data, you can select species with the argument *species*. It takes both full species name or the species id.

```
data <- getData(dataset ="TREE", site ="hyytiala",
    species = "Pinus sylvestris")

data <- getData(dataset ="TREE", site ="hyytiala",
    species = "pisy")
```

period

For time series data it is possible to subset the data to a specific period.

```
data <- getData(dataset ="CLIMATE_ISIMIP2B", site ="soro",
    forcingDataset="GFDLESM2M", forcingCondition ="rcp2p6",
    period = c("2006-01-01","2006-12-31"))

range(data$date)

## [1] "2006-01-01" "2006-12-31"
```

quality

Some datasets, such as CLIMATE_LOCAL or FLUX, have quality flags to indicate how the data was obtained. Please be aware of the values of quality flags before using this option. The definition of the flags is available in the metadata.

When passing a quality flag value, you should also define how the threshold should be applied. Values out of the selected range will be dropped from the data based on your query.

```
data <- getData(dataset = "CLIMATE_LOCAL", site = "soro",
    period = c("2011-01-01","2012-12-31"),
    quality = 1, decreasing = FALSE)

data <- getData(dataset = "FLUX", site = "soro",
    period = c("2011-01-01","2012-12-31"),
    quality = 0, decreasing = TRUE)
```

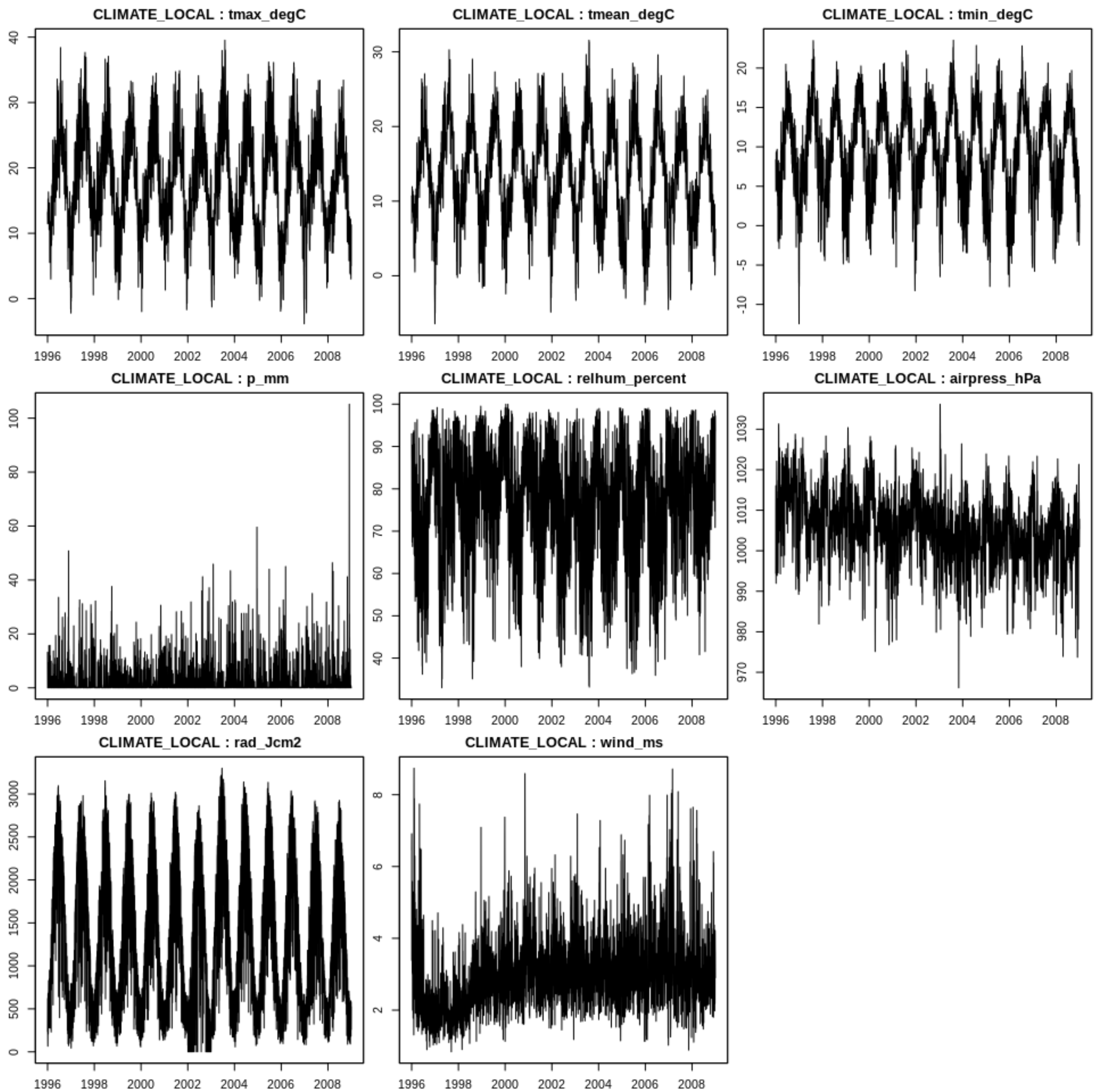
The plotData function

The plotData function performs a query to the database, downloads the data, applies the desired options (time period, quality flag, etc.) and shapes the final data into a time series for plotting. It requires a dataset name and a site. Check the help files to see what datasets are supported.

Normal plotting

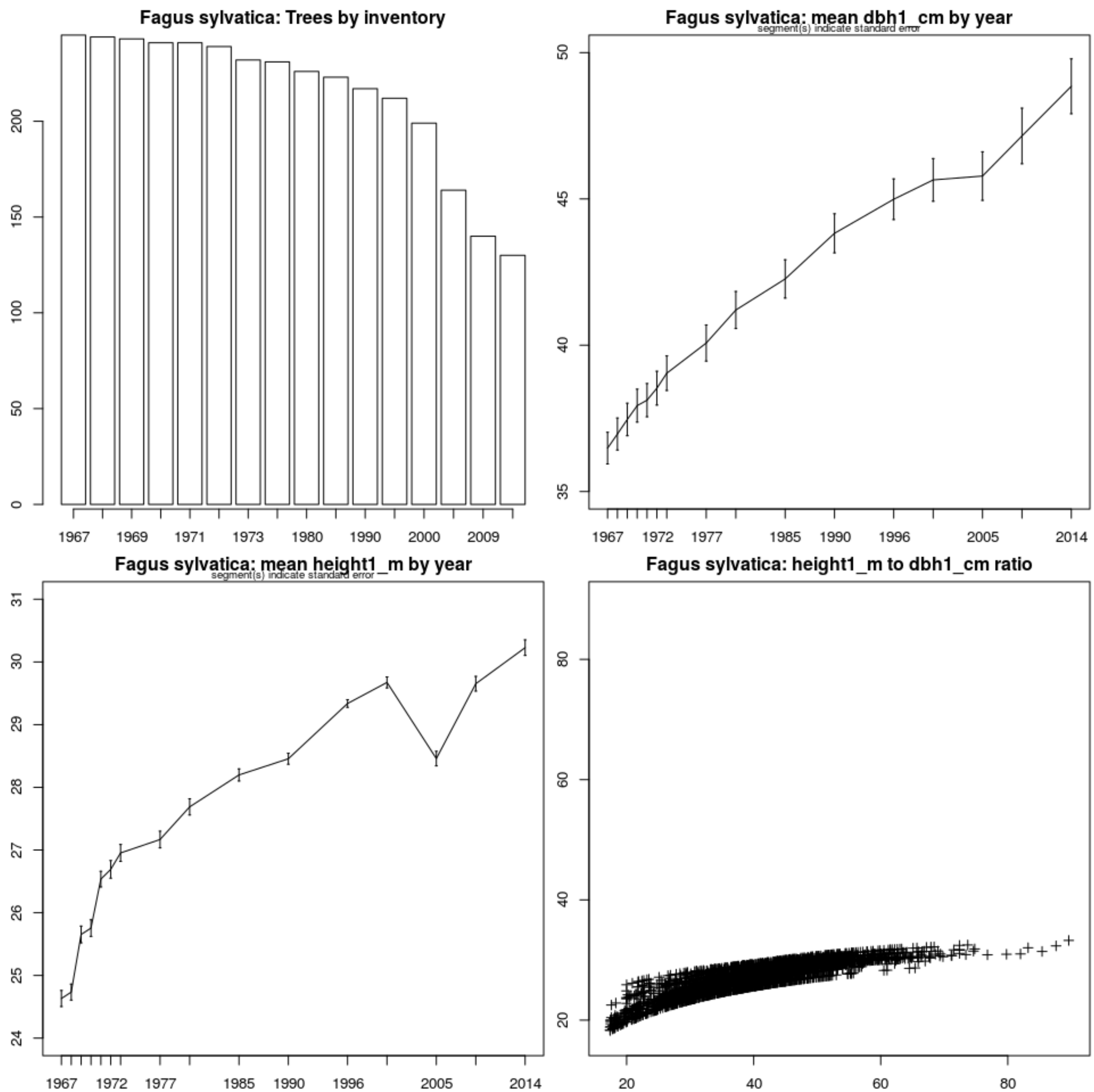
A simple plot call looks like

```
plotData(dataset = "CLIMATE_LOCAL", site = "le_bray", automaticPanels = TRUE)
```



Or for TREE data

```
plotData(dataset = "TREE", site = "solling_beech", automaticPanels = TRUE)
```



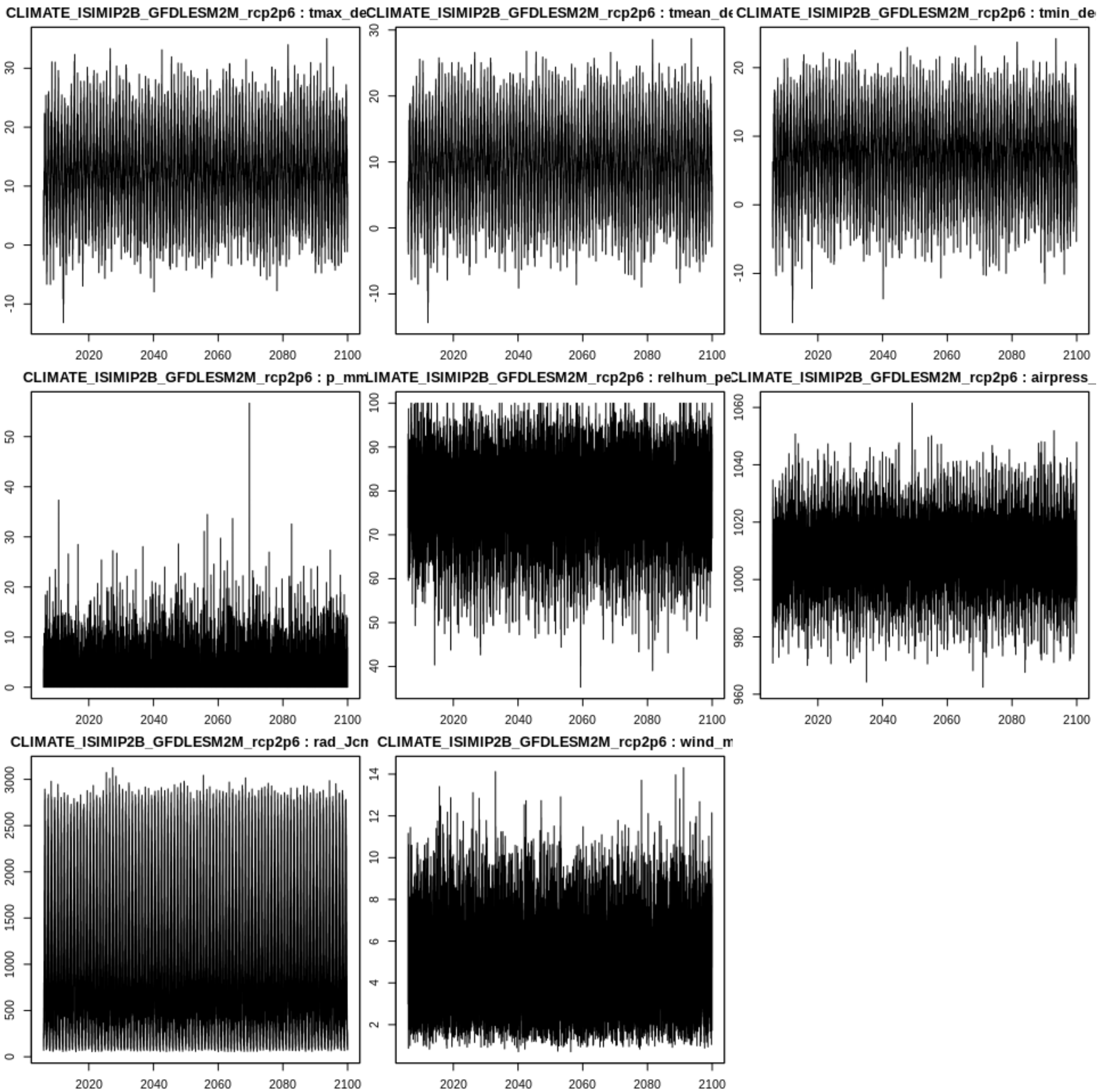
Note that the argument *automaticPanels* defines whether the plot in a panel.

Additional options

Besides, plotData supports the same options as getData.

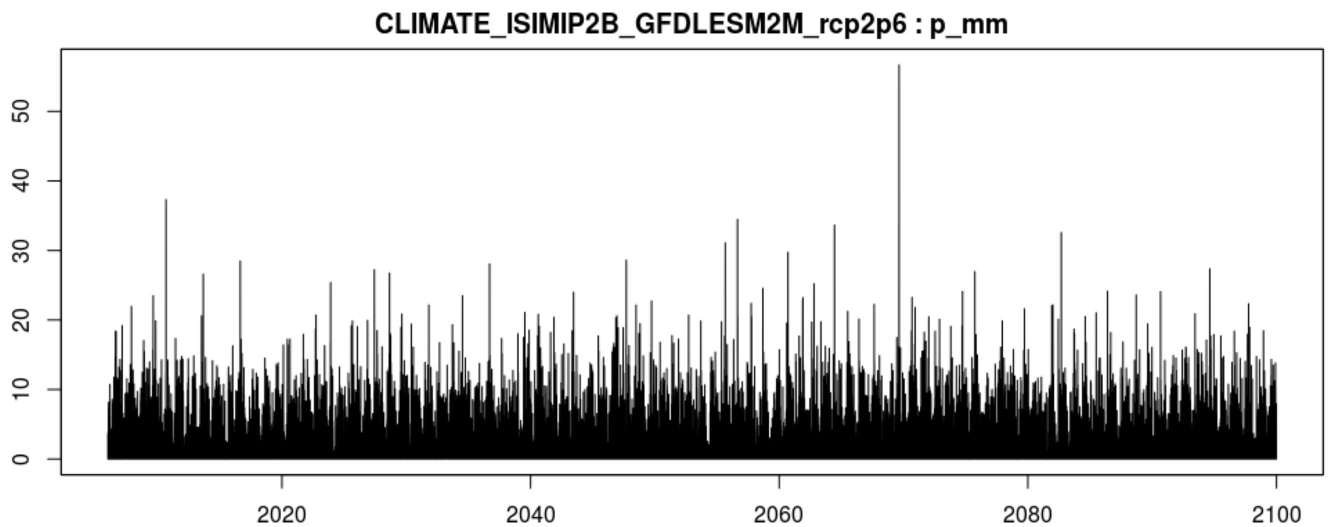
forcingDataset, forcingCondition

```
plotData(dataset          ="CLIMATE_ISIMIP2B",          site          ="soro",
    forcingDataset="GFDLESM2M",          forcingCondition          ="rcp2p6",
    automaticPanels = TRUE)
```



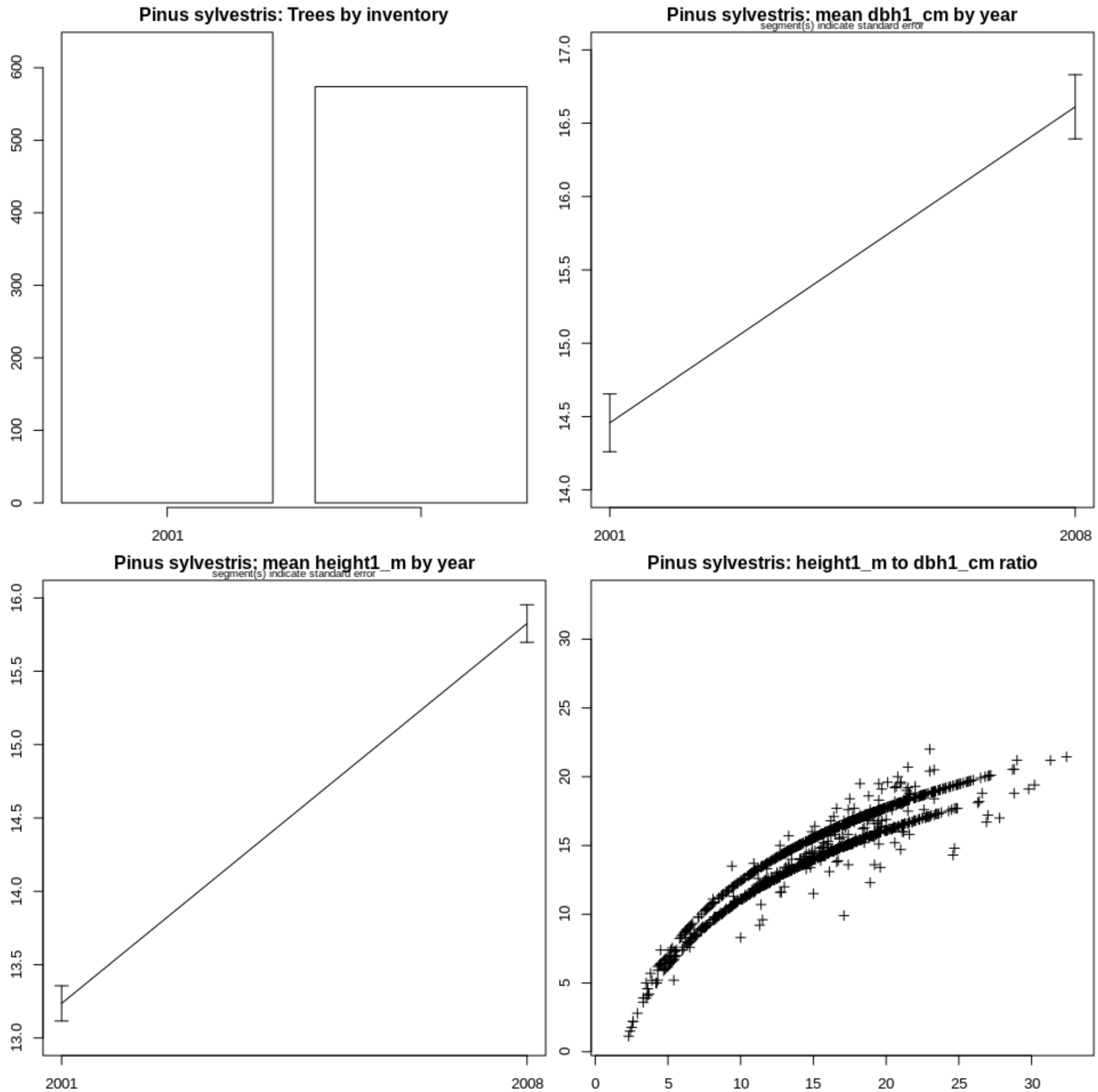
variables

```
plotData(dataset ="CLIMATE_ISIMIP2B",site ="soro",
    forcingDataset="GFDLESM2M", forcingCondition ="rcp2p6",
    variables = "p_mm")
```



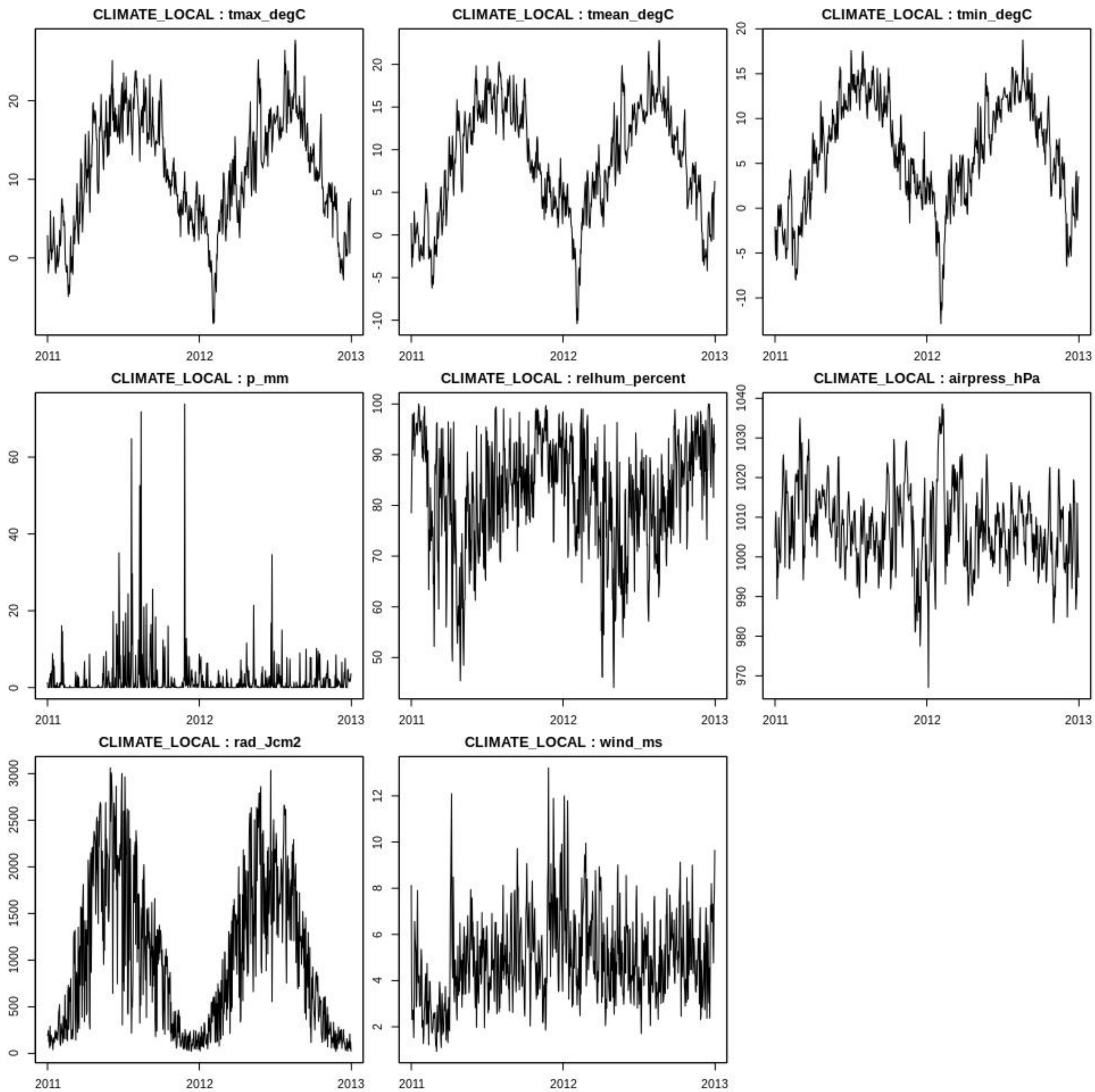
species

```
plotData(dataset ="TREE", site ="hyytiala", species = "Pinus sylvestris",
    automaticPanels = TRUE)
```



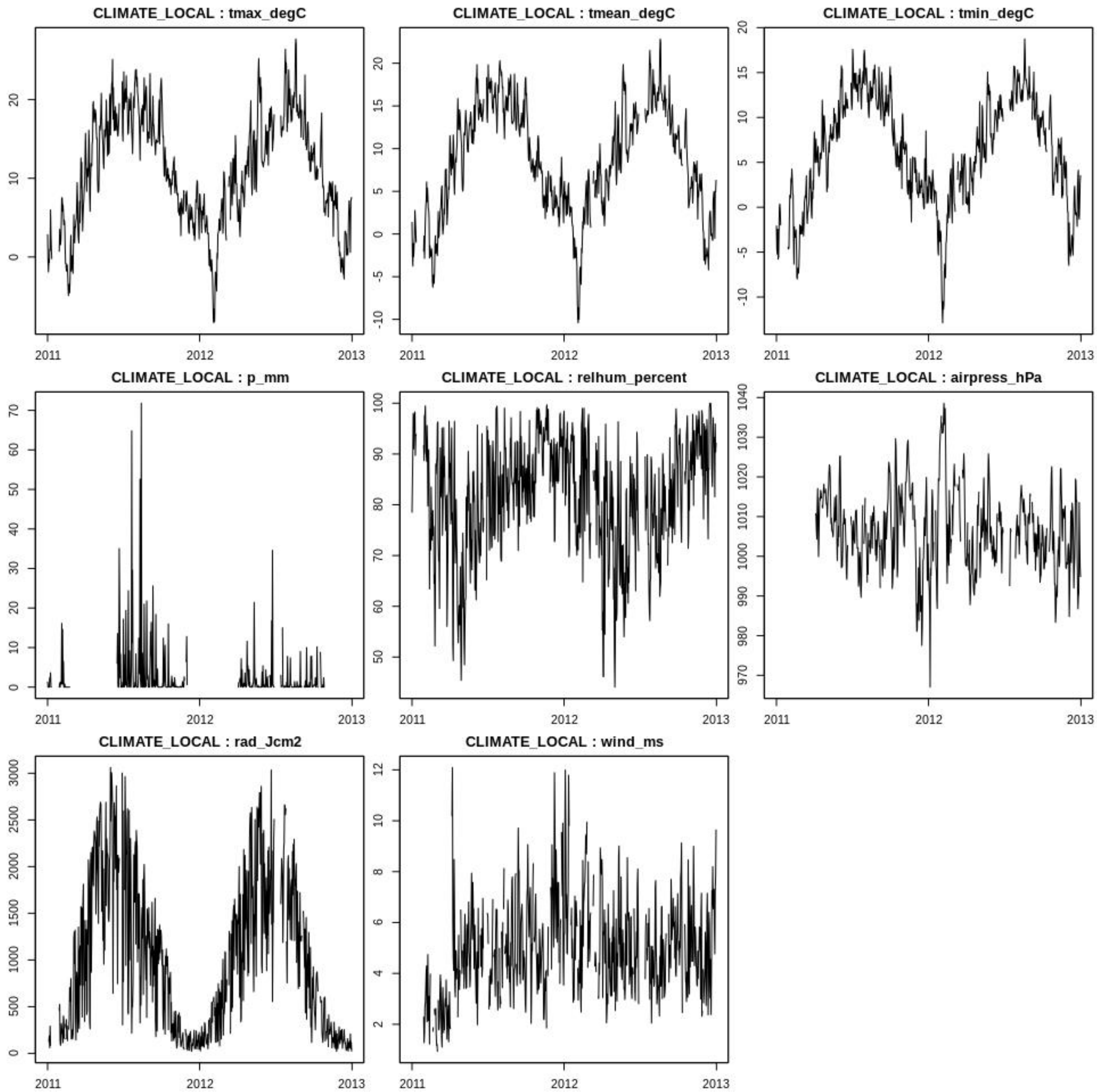
period

```
plotData("CLIMATE_LOCAL", "soro", period = c("2011-01-01","2012-12-31"))
```

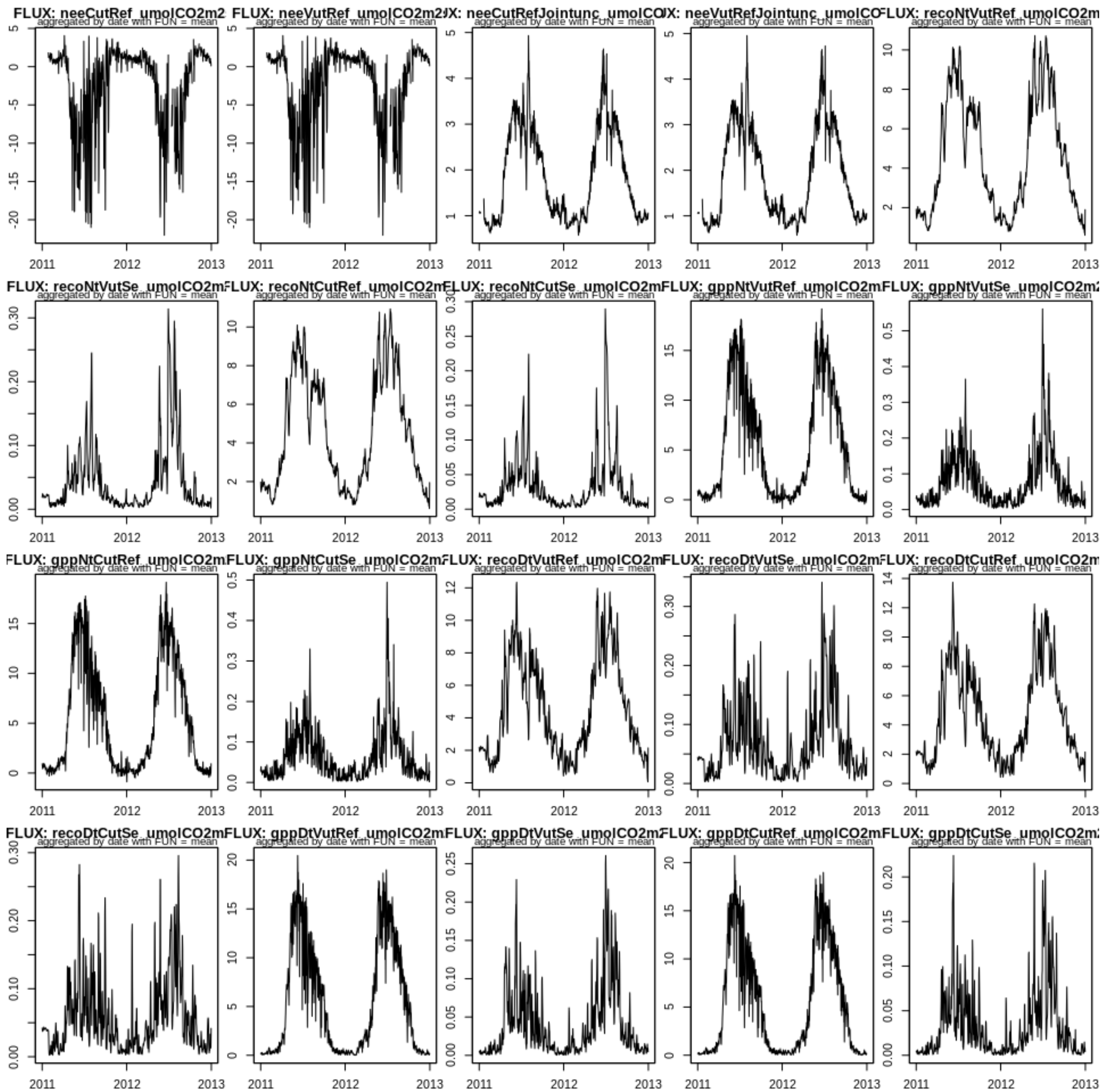


quality

```
plotData("CLIMATE_LOCAL", "soro", period = c("2011-01-01","2012-12-31"),
    quality = 1, decreasing = FALSE)
```



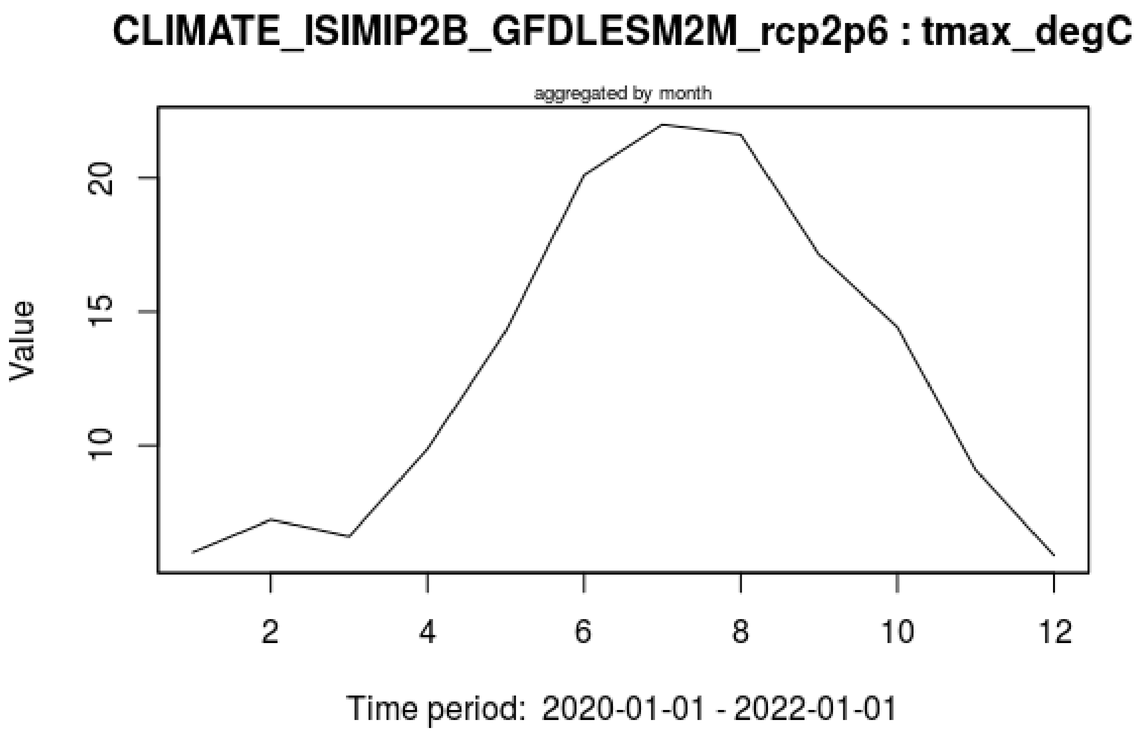

```
plotData("FLUX", "soro", period = c("2011-01-01","2012-12-31"),
    quality = 0, decreasing = TRUE)
```


FLUX: neeCutRef_umolCO2m2
FLUX: neeVutRef_umolCO2m2
FLUX: neeCutRefJointunc_umolCO
FLUX: neeVutRefJointunc_umolCO
FLUX: recoNtVutRef_umolCO2m
FLUX: recoNtVutSe_umolCO2m
FLUX: recoNtCutRef_umolCO2m
FLUX: recoNtCutSe_umolCO2m
FLUX: gppNtVutRef_umolCO2m
FLUX: gppNtVutSe_umolCO2m
FLUX: gppNtCutRef_umolCO2m
FLUX: gppNtCutSe_umolCO2m
FLUX: recoDtVutRef_umolCO2m
FLUX: recoDtVutSe_umolCO2m
FLUX: recoDtCutRef_umolCO2m
FLUX: recoDtCutSe_umolCO2m
FLUX: gppDtVutRef_umolCO2m
FLUX: gppDtVutSe_umolCO2m
FLUX: gppDtCutRef_umolCO2m
FLUX: gppDtCutSe_umolCO2m
aggregated by date with FUN = mean
2011
2012
2013

aggregate

You can also aggregate data by defining *aggregate* and *FUN*. The data can be aggregated by day, month, year or date, and any statistic is supported, e.g. median.

```
plotData(dataset = "CLIMATE_ISIMIP2B", site ="soro",
    forcingDataset= "GFDLESM2M", forcingCondition="rcp2p6",
    variables = "tmax_degC", period = c("2020-01-01", "2022-01-01"),
    aggregate = "month", FUN =median, automaticPanels = FALSE)
```



The queryDB function: parsing your own queries

The package functions are designed to ease the access to the PROFOUND database by providing an R interface. However, if you feel confident with SQL syntax's, you could perform more advanced queries. The function *queryDB* allows to perform self-defined queries.

A basic query is *SELECT* FROM TABLE*, which will return all variables in the table.

```
overview <- queryDB("SELECT * FROM OVERVIEW")
tree <- queryDB("SELECT * FROM TREE")
```

More advanced queries include defining variables and conditions as the example below

```
myQuery <- queryDB("SELECT date, tmax_degC FROM CLIMATE_LOCAL
        WHERE tmax_degC > 20 AND site == 'hyytiala' AND year == 2010")
```

Besides, the database contains several views with ready-made queries (check *browseData("DATASETS")*), so that the two statements below are equivalent

```
myQuery <- queryDB("SELECT date, tmax_degC FROM CLIMATE_LOCAL
        WHERE site == 'hyytiala'")
myQuery <- queryDB("SELECT date, tmax_degC FROM CLIMATE_LOCAL_12")
```

This also works with tree species

```
myQuery <- queryDB("SELECT * FROM TREE
        WHERE species == 'Picea abies'")
myQuery <- queryDB("SELECT * FROM TREE_piab")
```

Hint: Check the last section for further information about SQL syntax's.

The reportDB function

This function makes possible to create reates a site-by-site report of all avalaible data in the PROFOUND database. The summary is created with a rmarkdown document, which is rendered and saved as a html document. The report provdes an exhaustive description and visualization of the PROFOUND database.

The function requires a path where to save the html document. If no path is specified, the working directory will be used as output directory.

```
reportDB(outDir = "/home/database/")
```

Please note that creating the report it might take several minutes.

Using the databse via sql

To access the database you can use an SQLite database explorer such as SQLiteStudio. Such software allows to visualize and download data through an interface, as well as writing SQL statements. Further information on SQLite characteristics can be found on the SQLite website. Besides, there are plenty of resources about using SQL like this oneX