# Package 'geslaR'

July 3, 2026

**Title** Get and Manipulate the GESLA Dataset

**Version** 1.0-3

**Description** Promote access to the GESLA <https://gesla787883612.wordpress.com> (Global Extreme Sea Level Analysis) dataset, a higher-frequency sea-level record data from all over the world. It provides functions to download it entirely, or query subsets directly into R, without the need of downloading the full dataset. Also, it provides a built-in web-application, so that users can apply basic filters to select the data of interest, generating informative plots, and showing the selected sites.

**License** GPL (>= 3)

**Encoding** UTF-8

**RoxygenNote** 7.2.3

**URL** https://github.com/EireExtremes/geslaR, https://eireextremes.github.io/geslaR/

**BugReports** https://github.com/EireExtremes/geslaR/issues

**Depends** arrow, dplyr, R (>= 4.1.0)

**Imports** cli

**Suggests** bslib, DT, knitr, leaflet, leafpop, lubridate, patchwork, plotly, rmarkdown, shiny, shinyalert, shinycssloaders, shinyWidgets, testthat (>= 3.0.0), tidyverse

**SystemRequirements** arrow

**Config/testthat/edition** 3

**VignetteBuilder** knitr

**NeedsCompilation** no

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**Date/Publication** 2026-07-03 08:40:13 UTC

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`download_gesla` *Download the GESLA dataset*

---

## Description

This function will download the entire GESLA dataset to the specified folder. Note that the full dataset is about 7GB in size, so the total download time may take a few minutes, as it will depend on internet connection. If you don't need the whole dataset, you can use the `query_gesla()` function, to directly import a subset of it.

## Usage

```
download_gesla(
  dest = "./gesla_dataset",
  ask = TRUE,
  messages = TRUE,
  overwrite = FALSE
)
```

## Arguments

| | |
|---|---|
| `dest` | The directory to download the files to. If the directory doesn't exist, it will be created. Defaults to a folder called `gesla_dataset` in the current working directory. |
| `ask` | Ask for confirmation before downloading? Defaults to `TRUE`. |
| `messages` | Show informative messages? Defaults to `TRUE`. |
| `overwrite` | Overwrite the whole dataset (i.e. download again)? Defaults to `FALSE`. Note that, if `TRUE`, it will only overwrite if the function is called in the same directory where `dest` is. |

## Details

This function should only be useful if you want to deal with all the files from the GESLA dataset. If you need only a subset, you can use the `query_gesla()` function, or the GESLA Shiny app interface, from the `run_gesla_app()` function.

## Value

The whole GESLA dataset, consisting of 5119 files (with `.parquet` extension). It should have approximately 7GB in size.

## Author(s)

Fernando Mayer <fernando.mayer@ufpr.br>

## Examples

```
if(interactive()) {
    ## Create a temporary directory for downloaded files
    dest <- paste0(tempdir(), "/gesla_dataset")
    ## Download to 'gesla_dataset' folder in the temporary directory
    download_gesla(dest = dest)
    ## To overwrite (download again) on the same location
    download_gesla(dest = dest, overwrite = TRUE)
    ## Don't ask for confirmation before download
    download_gesla(dest = dest, overwrite = TRUE, ask = FALSE)
    ## Don't show informative messages
    download_gesla(dest = dest, overwrite = TRUE, messages = FALSE)
    ## Don't ask for confirmation neither show messages
    download_gesla(dest = dest, overwrite = TRUE,
        ask = FALSE, messages = FALSE)
    ## Remove temporary directory
    unlink(dest, recursive = TRUE)
}
```

---

# query_gesla *Query the GESLA dataset*

---

## Description

This function will make a query to fetch a subset of the GESLA dataset. At least a country code and one year must be specified. Site names can also be specified, but are optional. By default, the resulting subset will contain only data that were revised and recommended for analysis, by the GESLA group of researchers.

## Usage

```
query_gesla(
  country,
  year = NULL,
  site_name = NULL,
  use_flag = 1,
  as_data_frame = FALSE
)
```

## Arguments

| | |
|---|---|
| country | A character vector specifying the selected countries, using the three-letter ISO 3166-1 alpha-3 code. See Details. |
| year | A numeric vector specifying the selected years. If NULL (the default), all available years will be selected. |
| site_name | Optional character vector of site names. |
| use_flag | The default is 1, which means to use only the data that was revised and usefull for analysis. Can be 0, to fetch only revised and not recommend for analysis, or c(0, 1) to fetch all the data. See Details. |
| as_data_frame | If FALSE (default), the data will be imported as an arrow_dplyr_query object. Otherwise, the data will be in a tbl_df (data.frame) format. See Details. |

## Details

The country codes must follow the three-letter ISO 3166-1 alpha-3 code. However, note that not all countries are available at the GESLA dataset. If in doubt, use the run_gesla_app() function to check the GESLA Shiny app interface (geslaR-app) locally.

The use_flag argument must be 1 or 0, or c(0, 1). The use_flag is a column at the GESLA dataset that indicates whether the data should be used for analysis or not. The 1 (default) indicates it should, and 0 the otherwise. In a data analysis scenario, the user must only be interested in using the recommended data, so this argument shouldn't be changed. However, in same cases, one must be interested in the non-recommended data, therefore this option is available. Also, you can specify c(0, 1) to fetch all the data (usable and not usable). In any case, the use_flag column will always be present, and it can be used for any post-processing. Please, see the GESLA format documentation for more details.

The default argument as_data_frame = FALSE will result in an object of the arrow_dplyr_query class. The advantage is that, regardless of the size of the resulting dataset, the object will be small in (memory) size. Also, as it happens with the Arrow Table class, it can be manipulated with dplyr verbs. Please, see the documentation at the Arrow website.

Note that, if the as_data_frame argument is set to TRUE, the imported R object will vary in size, according to the size of the subset. In many situations, this can take a long time an may even be infeasible, since the object can result in a "larger-than-memory" size, and possibly will make R operations slow or even a session crash. Therefore, we always recommend to start with as_data_frame = FALSE, and work with the dataset from there.

Please, see vignette("intro-to-geslaR") for a detailed example.

## Value

An object of class arrow_dplyr_query or a tbl_df (data.frame).

## Author(s)

Fernando Mayer <fernando.mayer@ufpr.br>

## Examples

```
if(interactive()) {
    ## Simple query
    da <- query_gesla(country = "IRL")

    ## Select one specific year
    da <- query_gesla(country = "IRL", year = 2015)

    ## Multiple years
    da <- query_gesla(country = "IRL", year = c(2015, 2017))
    da <- query_gesla(country = "IRL", year = 2010:2017)
    da <- query_gesla(country = "IRL", year = c(2010, 2012, 2015))
    da |>
        count(year) |>
        collect()

    ## Multiple countries
    da <- query_gesla(country = c("IRL", "ATA"), year = 2015)
    da <- query_gesla(country = c("IRL", "ATA"), year = 2010:2017)
    da |>
        count(country, year) |>
        collect()

    ## Specifying a site name
    da <- query_gesla(country = "IRL", year = c(2015, 2017),
        site_name = "Dublin_Port")
    da |>
        count(year) |>
        collect()
}
```

---

# read_gesla *Read a GESLA dataset*

---

## Description

Read a CSV or Parquet file, as exported from the GESLA Shiny app interface (geslaR-app). A "GESLA dataset file" is a subset of the GESLA dataset, fetched from the geslaR-app. When using that app, you can choose to download the selected subset in CSV or Parquet file formats. Whichever option is chosen this function will automatically identify the file type and use the appropriate functions to import the dataset to R.

This function can be used for exported files from the geslaR-app interface, run locally with the `run_gesla_app()` function.

## Usage

```
read_gesla(file, as_data_frame = FALSE, ...)
```

## Arguments

| | |
|---|---|
| file | The file name (must end in .csv or .parquet only) |
| as_data_frame | If FALSE (default), the data will be imported as an Arrow Table format. Otherwise, the data will be in a tbl_df (data.frame) format. See Details. |
| ... | Other arguments from arrow::read_csv_arrow(), and arrow::read_parquet(), from the arrow package. |

## Details

We highly recommend to export subsets of the GESLA dataset from the geslaR-app in the Parquet file format. This format has a much smaller file size when compared to the CSV format.

In any case, the only difference between CSV and Parquet files will be the file size. However, when importing these data to R, both file types have the option to be imported as an Arrow Table format, which is the default (argument as_data_frame = FALSE). This way, the object created in R will have a very small size, independent of how big the file size is. To deal with this type of object, you can use dplyr verbs, in the same way as a normal data.frame (or tbl_df). Some examples can be found in the Arrow documentation.

If the as_data_frame argument is set to TRUE, the imported R object will vary in size, according to the size of the dataset, and regardless of the file type. In many situations, this can be infeasible, since the object can result in a "larger-than-memory" size, and possibly will make R operations slow or even a session crash. Therefore, we always recommend to start with as_data_frame = FALSE, and work with the dataset from there.

See **Examples** below.

## Value

An Arrow Table object, or a tbl_df (data.frame)

## Author(s)

Fernando Mayer <fernando.mayer@ufpr.br>

## Examples

```
##-------------------------------------------------------------------
## Import an internal example Parquet file
tmp <- tempdir()
file.copy(system.file(
    "extdata", "ireland.parquet", package = "geslaR"), tmp)
da <- read_gesla(paste0(tmp, "/ireland.parquet"))
## Check size in memory
object.size(da)

##-------------------------------------------------------------------
## Import an internal example CSV file
tmp <- tempdir()
file.copy(system.file(
    "extdata", "ireland.csv", package = "geslaR"), tmp)
```

```
da <- read_gesla(paste0(tmp, "/ireland.csv"))
## Check size in memory
object.size(da)

##----------------------------------------------------------------
## Import an internal example Parquet file as data.frame
tmp <- tempdir()
file.copy(system.file(
    "extdata", "ireland.parquet", package = "geslaR"), tmp)
da <- read_gesla(paste0(tmp, "/ireland.parquet"),
    as_data_frame = TRUE)
## Check size in memory
object.size(da)

##----------------------------------------------------------------
## Import an internal example CSV file as data.frame
tmp <- tempdir()
file.copy(system.file(
    "extdata", "ireland.csv", package = "geslaR"), tmp)
da <- read_gesla(paste0(tmp, "/ireland.csv"),
    as_data_frame = TRUE)
## Check size in memory
object.size(da)

## Remove files from temporary directory
unlink(paste0(tmp, "/ireland.parquet"))
unlink(paste0(tmp, "/ireland.csv"))
```

---

`run_gesla_app` *Run the GESLA Shiny app*

---

## Description

Run the GESLA Shiny app (geslaR-app) locally. The first time this function is called, it will check if the GESLA dataset is present. If not, it will prompt to download it or not. Please note that the entire GESLA dataset is about 7GB in size, so make sure there is enough space for it. The Shiny app will only work with the entire dataset downloaded locally.

Note, however, that the dataset needs to be downloaded only once, so the next time this function is called, the app will open instantly.

## Usage

```
run_gesla_app(
  app_dest = "./gesla_app",
  dest = paste0(app_dest, "/gesla_dataset"),
  overwrite = FALSE,
  open = TRUE
)
```

## Arguments

| | |
|---|---|
| app_dest | The destination directory that will host the app and the database. It will be created if it doesn't exist. By default, it will create a directory called gesla_app in the current working directory. |
| dest | The destination directory that will host the GESLA dataset files. By default, it will create a subdirectory under the directory defined in app_dest. It's not recommended to change this argument. If needed, change only the app_dest argument. |
| overwrite | Overwrite the current dataset? If TRUE and called on the same directory as the app, it will overwrite (i.e. download again) the whole dataset. This is usually not necessary, unless the dataset has really changed. |
| open | Should the app open in the default browser? Defaults to TRUE. |

## Details

The geslaR-app Shiny interface relies on a set of packages, defined in the Suggests fields of the package DESCRIPTION file. When called for the first time, the function will check if all the packages are available. If one or more are not installed, a message will show which one of them should be installed. Alternatively, you can install all of them at once by reinstalling the geslaR package with devtools::install_github("EireExtremes/geslaR", dependencies = TRUE). In this case, you will need to restart your R session.

When downloading the GESLA dataset for the first time, it may take a few minutes, since it depends on your internet connection and on the traffic on an Amazon AWS server. Don't stop the process before it ends completely. Note that this will be needed only the first time. Once the dataset is downloaded, the other time this function is called on the same directory, the interface should open in your browser instantly.

## Value

The geslaR-app Shiny interface will open in your default browser.

## Author(s)

Fernando Mayer <fernando.mayer@ufpr.br>

## Examples

```
if(interactive()) {
    ##------------------------------------------------------------------
    ## This will create a directory called `geslaR_app` on the current
    ## working directory and import the necessary files for the app.
    ## Also, it will create a subdirectory `gesla_app/gesla_dataset`,
    ## where the dataset will be downloaded.
    tmp <- paste0(tempdir(), "/gesla_app")
    run_gesla_app(app_dest = tmp)

    ##------------------------------------------------------------------
    ## This function call on the same directory where the app is hosted,
    ## will overwrite the whole dataset (i.e. it will be downloaded
```

```
    ## again). A prompt for confirmation will be issued.
    run_gesla_app(app_dest = tmp, overwrite = TRUE)

    ## Remove files from temporary directory
    unlink(tmp, recursive = TRUE)
}
```

---

`write_gesla` *Write a GESLA dataset*

---

## Description

Write a CSV or Parquet file. Given an object `x`, this function will write a file in the appropriate format to store this object in the hard drive, facilitating it's reading in any other session.

The only accepted classes of `x` are `ArrowObject` or `data.frame`. If `x` is an `ArrowObject`, then the resulting file will have the `.parquet` extension, in the Apache Parquet file format. If `x` is a `data.frame`, the file will have a standard `.csv` extension.

This function is useful to save objects created by the `query_gesla()` function, for example. However, it may be used in any case where saving a (possible subset) of the GESLA dataset may be needed.

## Usage

```
write_gesla(x, file_name = "gesla-data", ...)
```

## Arguments

| | |
|---|---|
| `x` | An object of class `ArrowObject` or `data.frame` |
| `file_name` | The name of the file to be created. Must be provided without extension, as this will be determined by the class of `x`. |
| `...` | Other arguments from `arrow::write_csv_arrow()`, and `arrow::write_parquet()`, from the arrow package. |

## Details

We highly recommend to always use the `ArrowObject` class, as it will be much more efficient for dealing with it in R. Also, the resulting file (with `.parquet` extension) from objects of this type will be much smaller than CSV files created from `data.frame` objects.

## Value

A file with extension `.csv`, if `x` is a `data.frame`, or a file with extension `.parquet`, if `x` is an `ArrowObject`

## Author(s)

Fernando Mayer <fernando.mayer@ufpr.br>

## Examples

```
##------------------------------------------------------------------
## Import an internal example Parquet file
## Reading file
tmp <- tempdir()
file.copy(system.file(
    "extdata", "ireland.parquet", package = "geslaR"), tmp)
da <- read_gesla(paste0(tmp, "/ireland.parquet"))
## Generates a subset by filtering
db <- da |>
    filter(day == 1) |>
    collect()
## Save filtered data as file
write_gesla(db, file_name = paste0(tmp, "/gesla-data"))

##------------------------------------------------------------------
## Querying some data
## Make the query
if(interactive()) {
    da <- query_gesla(country = "IRL", year = 2019,
        site_name = "Dublin_Port")
    ## Save the resulting query to file
    write_gesla(da, file_name = paste0(tmp, "/gesla-data"))
}

## Remove files from temporary directory
unlink(paste0(tmp, "/gesla-data.csv"))
unlink(paste0(tmp, "/gesla-data.parquet"))
unlink(paste0(tmp, "/ireland.parquet"))
```

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