

Package ‘daRt’

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Type Package

Title Read DART Model Outputs

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Description For reading outputs from the Discrete Anisotropic Radiative Transfer (DART) model, formatted in a ``long" dplyr-ready format suitable for efficient analysis.

Github <https://github.com/willmorrison1/daRt>

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Encoding UTF-8

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accessors

Access object information

Description

Generic functions to access information from the objects with classes defined in this package

Usage

```
product(x)

simname(x)

files(x)

bands(x)

iters(x)

variables(x)

variablesRB3D(x)

typeNums(x)

imageTypes(x)

imageNos(x)
```

Arguments

x [SimulationFilter](#) or [SimulationFiles](#) class

Examples

```
sF <- simulationFilter(product = "directions")
bands(sF)

## Not run:
#access information within SimulationFiles object
#define the simulation directory
simDir <- "C:/Users/<Username>/DART/user_data/simulations/cesbio/"
simFiles <- getFiles(simDir)
#show bands that are selected
bands(simFiles)
#show 'type numbers' that have been selected
typeNums(simFiles)

## End(Not run)
```

```
as.data.frame,SimulationData-method  
as.data.frame
```

Description

as.data.frame

Usage

```
## S4 method for signature 'SimulationData'  
as.data.frame(x, as.tibble = TRUE)
```

Arguments

x	SimulationData.
as.tibble	Return as a tibble-type data frame?

Value

data.frame or tibble

```
deleteFiles
```

deleteFiles

Description

DART input files can be very large. This function deletes those large files that are not required for post-processing of data in this package.

Usage

```
deleteFiles(x = "SimulationFiles", ...)
```

Arguments

x	SimulationFiles-class type object.
...	trianglesInput remove "triangles" input files? (bool)
...	maketOutput remove "maket.txt" output file? (bool)

Details

Delete potentially large input files

Directions-class	<i>Directions data class</i>
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Description

Directions data class that extends [SimulationData-class](#) class.

getData	<i>Main function: get DART data</i>
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Description

Main function to get data from DART simulation outputs in a friendly 'long' data format that is part of an object that extends a [SimulationData-class](#) type object

Usage

```
getData(x, sF, ...)
```

Arguments

x	simulation directory or directories (character) or SimulationFiles-class object
sF	SimulationFilter-class if x = character

getFiles	<i>Get DART output filenames</i>
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Description

Function for getting [SimulationFiles-class](#) type object. Useful to perform a 'dry run' of [getData](#) by exploring the files that will vary based on the contents of x and the configuration of sF.

Usage

```
getFiles(x = "character", sF = "SimulationFilter")
```

Arguments

x	simulation directory or directories (character)
sF	SimulationFilter-class object
...	Optional arguments of: nCores: number of cores to use when loading data.

Images-class	<i>Images data class</i>
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Description

Image data class extends [SimulationData-class](#) class.

imagesToDirectionsDF	<i>imagesToDirectionsDF</i>
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Description

Convert an [Images-class](#) object to a Directions-class object

Usage

```
imagesToDirectionsDF(x, fun)
```

Arguments

- x [Images-class](#) object
- fun Function to apply across each image.

Details

Aggregate images to single values

Value

```
data.frame()
```

plotDirections	<i>plotDirections</i>
----------------	-----------------------

Description

Plot directions data as polar plot.

Usage

```
plotDirections(azimuth, zenith, value, azimuthOffsetVal = 0,
  outerRadius = max(zenith) + max(zenith) * 0.01, zenithLabPch = 20,
  zenithLabCol = "darkgrey", zenithLabCex = 1, brks = seq(min(value),
  max(value), length.out = 10), cols = c("dark grey",
  colorRampPalette(c("purple", "blue3", "yellow", "red"))(length(brks) -
  3), "firebrick4"), ...)
```

Arguments

azimuth	Numeric. Azimuth angle with DART conventions
zenith	Numeric. Zenith angle with DART conventions
value	Numeric. Values associated with the given azimuth and zenith angles
azimuthOffsetVal	Numeric. Scene offset (degrees) as shown in the DART GUI.
outerRadius	Numeric. Maximum radius (degrees) of polar plot
zenithLabPch	Numeric. Pch for zenith label.
zenithLabCol	Character. Colour for zenith label.
zenithLabCex	Numeric. Cex for zenith label.
brks	Numeric. Breaks for colour palette e.g. seq(0, 1, by = 0.1). Optional.
cols	Character. Colours for given breaks. Optional.
...	Additional options passed to points() when drawing directions points.

Examples

```
#Inputs are DART oriented directions (as seen in the DART files and \link{Directions-class})
plotDirections(azimuth = rep(225, 10),
               zenith = seq(0, 90, length.out = 10),
               value = 1:10)
#Output plot uses 'upward' directions from ground, where e.g.:
0deg (270deg) azimuth faces north (west)
0deg (90deg) zenith faces upward (horizon)
```

RB3D-class	<i>RB3D class</i>
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Description

RB3D (Radiative Budget 3D) class that extends [SimulationData-class](#) class.

rb3DtoNc	<i>rb3DtoNc</i>
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Description

DART radiative budget .bin files can be very large. This function replaces all .bin files with .nc files, which can be compressed and are faster to read.

Usage

```
rb3DtoNc(x = "SimulationFiles", ...)
```

Arguments

x	SimulationFiles-class type object.
ncCompressionFactor	Compression factor (0 - 9) for writing ncdf files (see ncdf4 package)

Details

Convert radiative budget .bin to .nc

Value

[SimulationFiles-class](#) type object.

removeRelief	<i>removeRelief</i>
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Description

Remove underlying orography from a [RB3D-class](#) dataset using a digital elevation model (DEM) of class RasterLayer that is georeferenced to [RB3D-class](#).

Usage

```
removeRelief(x = "RB3D", DEM = "RasterLayer")
```

Arguments

x	RB3D-class type object.
DSM	RasterLayer type object with height above ground level (m) and - preferably - a finer horizontal resolution than that of the radiative budget cells in x. The center of the DSM must be georeferenced to the center of the radiative budget data in x. The DSM can have a larger extent than x.

Details

Remove underlying orography

resourceUse	<i>ResourceUse</i>
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Description

Return a data frame with information on the resource use for a [SimulationFiles-class](#) type object

Usage

```
resourceUse(x = "SimulationFiles")
```

Arguments

x	SimulationFiles-class type object
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Details

Return resource use

sequenceParameters	<i>sequenceParameters</i>
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Description

Return a data frame where rows describe a parameter (parametre*) for a simulation (simName).

Usage

sequenceParameters(x)

Arguments

[SimulationFiles-class](#)
or [SimulationData-class](#) class object

Details

Get data frame of all sequence parameters

Value

data.frame()

SimulationData-class	<i>Generic SimulationData class</i>
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Description

Generic SimulationData class that extends to data classes for specific DART products

Slots

data data.frame.

See Also

[Images-class](#) [Directions-class](#) [RB3D-class](#)

SimulationFiles-class *SimulationFiles class*

Description

An S4 class to represent the files within a simulation or simulations. Created using the [getFiles](#) method. Specific files within the class are modified by the object with class [SimulationFilter-class](#)

Usage

```
baseDir(x)

simulationFilter(x) <- value

subDir(x)
```

Slots

`simulationFilter` contains [SimulationFilter-class](#) object
`files` a data.frame, with each row describing the file
`sequenceInfoList` a list, with each list element showing the variable permutation(s) within this specific simulation sequence.
`wavelengths` a data frame containing spectral information on each band for each simulation

simulationFilter *Create [SimulationFilter](#) class*

Description

Function for creating the [SimulationFilter](#) class. Define a product, then Optional arguments of: 'bands', 'variables', 'iterations', 'variablesRB3D', 'typeNums', 'imageTypes', 'imageNos'. See [SimulationFilter-class](#) for full description.

Usage

```
simulationFilter(product = "character", x, ...)
```

Arguments

product	One of: 'directions', 'rb3D', 'images'.
x	SimulationFiles-class object if product is missing.

Value

[SimulationFilter](#) type object

See Also

[SimulationFilter-class](#)

Examples

```
sF <- daRt::simulationFilter(product = "images",
                             bands = as.integer(0:2),
                             iters = c("ITER1", "ITER2"),
                             variables = "BRF",
                             imageNos = as.integer(c(5, 7)),
                             imageTypes = c("ima", "ima_transmittance"))
```

SimulationFilter-class

SimulationFilter class.

Description

SimulationFilter class.

Usage

```
product(x) <- value
iters(x) <- value
bands(x) <- value
variablesRB3D(x) <- value
variables(x) <- value
typeNums(x) <- value
imageTypes(x) <- value
imageNos(x) <- value
```

Slots

```
bands integer e.g. 0 for "BAND0"
variables character e.g. "BRF".
iters character e.g. "ITERX".
variablesRB3D character e.g. "Irradiance".
typeNums character e.g. "2_Ground".
imageTypes character e.g. "ima".
imageNos integer
product character e.g. "directions".
```

See Also

[simulationFilter](#)

versionInfo	<i>versionInfo</i>
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Description

Get the version used for the given simulation data

Usage

versionInfo(x)

Arguments

x [SimulationFiles-class](#) object

Details

Simulation version info

wavelengths	<i>wavelengths</i>
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Description

get full information on wavelengths for each band

Usage

wavelengths(x = "SimulationFiles")

Arguments

x sF [SimulationFiles-class](#)

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