

Package ‘AgroMetIndices’

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Title Agrometeorological Indices for Daily, Monthly, and Seasonal Time Scales

Version 0.1.0

Description Provides methods for calculating agrometeorological indices from daily weather data at daily, monthly, and user-defined seasonal time scales. The package includes temperature, rainfall, growing degree days, heat and cold stress, wet and dry spells, extreme rainfall, and seasonal completeness indices, along with functions for meteorological data quality assessment and crop-season definition. For method details see [doi:10.1002/wcc.147](https://doi.org/10.1002/wcc.147) and [doi:10.1038/s41598-026-55293-3](https://doi.org/10.1038/s41598-026-55293-3).

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agromet_indices	<i>Calculate agrometeorological indices</i>
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Description

Main user-facing function for calculating daily, monthly, or user-defined seasonal agrometeorological indices.

Usage

```
agromet_indices(  
  data,  
  frequency = "daily",  
  seasons = NULL,  
  date = "Date",  
  location = "Location",  
  rain = "Rain",  
  tmax = "Tmax",  
  tmin = "Tmin",  
  tbase,  
  heat_threshold = 35,  
  cold_threshold = 15  
)
```

Arguments

data	A daily meteorological data frame.
frequency	Calculation frequency: "daily", "monthly", or "seasonal".
seasons	A season-definition data frame created using create_seasons(). Required when frequency = "seasonal".
date	Name of the date column.
location	Name of the location column.
rain	Name of the rainfall column.

tmax	Name of the maximum temperature column.
tmin	Name of the minimum temperature column.
tbase	Base temperature for GDD calculation.
heat_threshold	Heat-stress threshold.
cold_threshold	Cold-stress threshold.

Value

Calculated agrometeorological indices.

Examples

```
data(weather_daily)

# Daily indices
daily <- agromet_indices(
  weather_daily,
  frequency = "daily",
  tbase = 10
)

head(daily)

# Monthly indices
monthly <- agromet_indices(
  weather_daily,
  frequency = "monthly",
  tbase = 10
)

head(monthly)

# Seasonal indices
seasons <- rbind(
  create_seasons("Kharif", "01-06", "31-10"),
  create_seasons("Rabi", "01-11", "31-03")
)

seasonal <- agromet_indices(
  weather_daily,
  frequency = "seasonal",
  seasons = seasons,
  tbase = 10
)

head(seasonal$indices)
```

assign_season	<i>Assign season and season year</i>
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Description

Assigns each daily observation to a user-defined crop season and determines the corresponding SeasonYear.

Usage

```
assign_season(data, seasons, date = "Date")
```

Arguments

data	A data frame containing a date column.
seasons	A data frame created using create_seasons().
date	Name of the date column.

Value

The input data frame with Season and SeasonYear columns.

Examples

```
data(weather_daily)

seasons <- create_seasons(
  season_name = c("Kharif", "Rabi"),
  start = c("01-06", "01-11"),
  end = c("31-10", "31-03")
)

seasonal_data <- assign_season(
  weather_daily,
  seasons = seasons
)

head(seasonal_data)

table(seasonal_data$Season)
```

check_meteo_data	<i>Check daily meteorological data</i>
------------------	--

Description

Checks the structure and completeness of daily meteorological data.

Usage

```
check_meteo_data(  
  data,  
  date = "Date",  
  location = "Location",  
  rain = "Rain",  
  tmax = "Tmax",  
  tmin = "Tmin"  
)
```

Arguments

data	A data frame containing Date, Location, Rain, Tmax and Tmin.
date	Name of the date column.
location	Name of the location column.
rain	Name of the rainfall column.
tmax	Name of the maximum temperature column.
tmin	Name of the minimum temperature column.

Value

A list containing data summary and data-quality information.

Examples

```
data(weather_daily)  
  
qc <- check_meteo_data(weather_daily)  
  
qc$summary
```

`check_season_completeness`*Check completeness of crop seasons*

Description

Calculates seasonal completeness while distinguishing dates that fall outside a location's available observation period from dates missing within that period.

Usage

```
check_season_completeness(data, seasons, date = "Date")
```

Arguments

<code>data</code>	A data frame containing Date, Season and SeasonYear.
<code>seasons</code>	A data frame created using <code>create_seasons()</code> .
<code>date</code>	Name of the date column.

Value

A data frame containing seasonal completeness information.

Examples

```
data(weather_daily)

seasons <- create_seasons(
  season_name = c("Kharif", "Rabi"),
  start = c("01-06", "01-11"),
  end = c("31-10", "31-03")
)

seasonal_data <- assign_season(
  weather_daily,
  seasons = seasons
)

season_qc <- check_season_completeness(
  seasonal_data,
  seasons = seasons
)

season_qc
```

create_seasons	Create crop-season definitions
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Description

Creates a standardized table of user-defined crop seasons.

Usage

```
create_seasons(season_name, start, end)
```

Arguments

season_name	Character vector of season names.
start	Character vector of season start dates in "DD-MM" format.
end	Character vector of season end dates in "DD-MM" format.

Value

A data frame containing season definitions.

Examples

```
seasons <- create_seasons(  
  season_name = c("Kharif", "Rabi"),  
  start = c("01-06", "01-11"),  
  end = c("31-10", "31-03")  
)  
  
seasons
```

daily_agromet	Calculate daily agrometeorological indices
---------------	--

Description

Calculates daily mean temperature, diurnal temperature range, growing degree days, temperature-stress indicators, and precipitation-related indices.

Usage

```
daily_agromet(  
  data,  
  date = "Date",  
  location = "Location",  
  tmax = "Tmax",  
  tmin = "Tmin",  
  tbase,  
  heat_threshold = 35,  
  cold_threshold = 15  
)
```

Arguments

data	A data frame containing Date, Location, Rain, Tmax and Tmin.
date	Name of the date column.
location	Name of the location column.
tmax	Name of the maximum temperature column.
tmin	Name of the minimum temperature column.
tbase	Base temperature for GDD calculation.
heat_threshold	Temperature above which a heat-stress day is recorded.
cold_threshold	Temperature below which a cold-stress day is recorded.

Value

A data frame containing the original data and calculated indices.

Examples

```
data(weather_daily)  
  
daily <- daily_agromet(  
  weather_daily,  
  tbase = 10  
)  
  
head(daily)
```

monthly_agromet	<i>Calculate monthly agrometeorological indices</i>
-----------------	---

Description

Aggregates daily agrometeorological indices to monthly values. The function calculates monthly temperature, rainfall, growing degree days, precipitation extremes, consecutive dry and wet days, heat and cold stress indicators, and monthly data-quality information.

Usage

```
monthly_agromet(  
  data,  
  date = "Date",  
  location = "Location",  
  tmax = "Tmax",  
  tmin = "Tmin"  
)
```

Arguments

data	A data frame containing daily agrometeorological indices, typically produced by [daily_agromet()].
date	Name of the date column.
location	Name of the location column.
tmax	Name of the maximum temperature column.
tmin	Name of the minimum temperature column.

Value

A data frame containing monthly agrometeorological indices and monthly data-quality information.

Examples

```
data(weather_daily)  
  
daily <- daily_agromet(  
  weather_daily,  
  tbase = 10  
)  
  
monthly <- monthly_agromet(  
  daily  
)  
  
head(monthly)
```

seasonal_agromet	<i>Calculate seasonal agrometeorological indices</i>
------------------	--

Description

Calculates seasonal agrometeorological indices for user-defined crop seasons. Only complete seasons are used for calculation.

Usage

```
seasonal_agromet(data, seasons, date = "Date", location = "Location")
```

Arguments

data	A data frame containing daily agrometeorological indices, typically produced by [daily_agromet()].
seasons	A data frame created using [create_seasons()].
date	Name of the date column.
location	Name of the location column.

Value

A list containing two elements: indices, a data frame containing seasonal agrometeorological indices, and qc, a data frame containing seasonal completeness information.

Examples

```
data(weather_daily)

daily <- daily_agromet(
  weather_daily,
  tbase = 10
)

seasons <- create_seasons(
  season_name = c("Kharif", "Rabi"),
  start = c("01-06", "01-11"),
  end = c("31-10", "31-03")
)

seasonal <- seasonal_agromet(
  daily,
  seasons = seasons
)

head(seasonal$indices)

head(seasonal$qc)
```

weather_daily	<i>Daily weather example dataset</i>
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Description

A two-year daily weather dataset for Kashi, India, containing daily rainfall, maximum temperature, and minimum temperature.

Usage

weather_daily

Format

A data frame with 731 rows and 5 variables:

- Date** Date of observation.
- Location** Location name.
- Rain** Daily rainfall (mm).
- Tmax** Daily maximum air temperature (°C).
- Tmin** Daily minimum air temperature (°C).

Details

The dataset covers 1 January 2023 to 31 December 2024, with 731 daily observations, including the leap day in 2024.

Source

Local daily weather dataset used for demonstration of the **AgroMeteoIndices** package.

Examples

```
data(weather_daily)
head(weather_daily)
```

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