

Package ‘climatekit’

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Title Unified Climate Indices for Temperature, Precipitation, and Drought

Version 0.1.0

Description Compute 35+ standard climate indices from daily weather observations. Includes temperature indices (frost days, ice days, growing degree days), precipitation indices (dry spells, heavy precipitation, intensity), drought indices (Standardized Precipitation Index, Standardized Precipitation-Evapotranspiration Index), agroclimatic indices (Huglin, Winkler, Branas), and comfort indices (wind chill, heat index, humidex, fire danger). All functions accept vectors of observations with dates and return tidy data frames with metadata. Implements the 'ET-SCI' Expert Team on Sector-specific Climate Indices definitions where applicable. No external API calls; pairs with data packages such as 'readnoaa' for acquisition.

Depends R (>= 4.1.0)

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Suggests testthat (>= 3.0.0)

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URL <https://github.com/charlescoverdale/climatekit>

BugReports <https://github.com/charlescoverdale/climatekit/issues>

NeedsCompilation no

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 ck_available

List All Available Climate Indices

Description

Returns a data frame listing every index that climatekit can compute, along with its category, unit, and a short description.

Usage

```
ck_available()
```

Value

A data frame with columns index, category, unit, and description.

Examples

```
ck_available()
```

ck_branas	<i>Branas Hydrothermal Index</i>
-----------	----------------------------------

Description

The Branas index combines temperature and precipitation during the growing season to estimate disease pressure (especially downy mildew) in vineyards. It is the sum of the product of monthly mean temperature and monthly precipitation for April-August.

Usage

```
ck_branas(precip, tavg, dates)
```

Arguments

precip	Numeric vector of daily precipitation (mm).
tavg	Numeric vector of daily mean temperatures (degrees C).
dates	Date vector of the same length as precip.

Value

A data frame with columns period, value, index, and unit.

References

Branas, J., Bernon, G., & Levadoux, L. (1946). Elements de viticulture generale.

Examples

```
dates <- seq(as.Date("2024-04-01"), as.Date("2024-08-31"), by = "day")
set.seed(42)
tavg <- rnorm(length(dates), mean = 12, sd = 3)
precip <- rgamma(length(dates), shape = 0.5, rate = 0.2)
ck_branas(precip, tavg, dates)
```

 ck_compute

Compute a Climate Index by Name

Description

A generic dispatcher that calls the appropriate ck_* function based on a string index name. Useful for programmatic workflows where the index is selected at runtime.

Usage

```
ck_compute(data, index, ...)
```

Arguments

data	A named list or data frame containing the required input vectors. Column names should match function argument names (e.g. tmin, tmax, precip, dates).
index	Character. Name of the index to compute (e.g. "frost_days"). Use ck_available() to see valid names.
...	Additional arguments passed to the underlying function (e.g. period, threshold, base).

Value

A data frame as returned by the underlying ck_* function.

Examples

```
d <- data.frame(
  dates = as.Date("2024-01-01") + 0:9,
  tmin = c(-2, 3, -1, 5, -3, 0, 2, -4, 1, -1)
)
ck_compute(d, "frost_days")
```

 ck_convert_temp

Convert Temperature Units

Description

Convert between Celsius, Fahrenheit, and Kelvin.

Usage

```
ck_convert_temp(x, from, to)
```

Arguments

x	Numeric vector of temperatures.
from	Character. Source unit: "C", "F", or "K".
to	Character. Target unit: "C", "F", or "K".

Value

Numeric vector of converted temperatures.

Examples

```
ck_convert_temp(c(0, 100), from = "C", to = "F")
ck_convert_temp(32, from = "F", to = "C")
```

ck_cooling_degree_days

Cooling Degree Days

Description

Sum of $(T_{avg} - base)$ for all days where daily average temperature is above the base temperature (default 18 degrees C).

Usage

```
ck_cooling_degree_days(tavg, dates, base = 18, period = "annual")
```

Arguments

tavg	Numeric vector of daily average temperatures (degrees C).
dates	Date vector of the same length as tavg.
base	Numeric. Base temperature in degrees C (default 18).
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-07-01") + 0:9
tavg <- c(25, 30, 22, 20, 28, 19, 32, 17, 35, 27)
ck_cooling_degree_days(tavg, dates)
```

ck_diurnal_range	<i>Diurnal Temperature Range</i>
------------------	----------------------------------

Description

Mean daily temperature range (Tmax - Tmin) per period.

Usage

```
ck_diurnal_range(tmin, tmax, dates, period = "annual")
```

Arguments

tmin	Numeric vector of daily minimum temperatures (degrees C).
tmax	Numeric vector of daily maximum temperatures (degrees C).
dates	Date vector of the same length as tmin and tmax.
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
tmin <- c(-2, 3, -1, 5, -3, 0, 2, -4, 1, -1)
tmax <- c(5, 10, 6, 12, 4, 8, 9, 3, 7, 6)
ck_diurnal_range(tmin, tmax, dates)
```

ck_dry_days	<i>Maximum Consecutive Dry Days</i>
-------------	-------------------------------------

Description

Maximum number of consecutive days with precipitation below a threshold.

Usage

```
ck_dry_days(precip, dates, threshold = 1, period = "annual")
```

Arguments

precip	Numeric vector of daily precipitation (mm).
dates	Date vector of the same length as precip.
threshold	Numeric. Dry day threshold in mm (default 1).
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
precip <- c(0, 0, 5, 0, 0, 0, 2, 0, 0, 0)
ck_dry_days(precip, dates)
```

ck_fire_danger	<i>Fire Danger Index (Simplified)</i>
----------------	---------------------------------------

Description

A simplified fire danger proxy based on temperature, humidity, wind speed, and recent precipitation. This is NOT the Canadian Forest Fire Weather Index (Van Wagner 1987); for the full FWI system, use the cffdrs package.

Usage

```
ck_fire_danger(tavg, humidity, wind_speed, precip)
```

Arguments

tavg	Numeric vector of temperatures (degrees C).
humidity	Numeric vector of relative humidity (percent, 0-100).
wind_speed	Numeric vector of wind speeds (km/h).
precip	Numeric vector of daily precipitation (mm).

Value

A data frame with columns value, index, and unit.

Examples

```
ck_fire_danger(
  tavg = c(30, 25, 35),
  humidity = c(20, 40, 15),
  wind_speed = c(25, 10, 30),
  precip = c(0, 5, 0)
)
```

ck_first_frost	<i>First Frost Date</i>
----------------	-------------------------

Description

Date of the first autumn frost ($T_{min} < 0$ degrees C) after July 1 in each year.

Usage

```
ck_first_frost(tmin, dates)
```

Arguments

tmin	Numeric vector of daily minimum temperatures (degrees C).
dates	Date vector of the same length as tmin.

Value

A data frame with columns period, value (day of year), date (the frost date), index, and unit.

Examples

```
dates <- seq(as.Date("2024-07-01"), as.Date("2024-12-31"), by = "day")
set.seed(42)
tmin <- 15 - seq_along(dates) * 0.15 + rnorm(length(dates), sd = 3)
ck_first_frost(tmin, dates)
```

ck_frost_days	<i>Frost Days</i>
---------------	-------------------

Description

Count the number of days where minimum temperature is below 0 degrees C.

Usage

```
ck_frost_days(tmin, dates, period = "annual")
```

Arguments

tmin	Numeric vector of daily minimum temperatures (degrees C).
dates	Date vector of the same length as tmin.
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
tmin <- c(-2, 3, -1, 5, -3, 0, 2, -4, 1, -1)
ck_frost_days(tmin, dates)
```

ck_growing_degree_days

Growing Degree Days

Description

Sum of (Tavg - base) for all days where daily average temperature is above the base temperature (default 10 degrees C).

Usage

```
ck_growing_degree_days(tavg, dates, base = 10, period = "annual")
```

Arguments

tavg	Numeric vector of daily average temperatures (degrees C).
dates	Date vector of the same length as tavg.
base	Numeric. Base temperature in degrees C (default 10).
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-07-01") + 0:9
tavg <- c(15, 20, 8, 12, 25, 9, 30, 11, 22, 18)
ck_growing_degree_days(tavg, dates)
```

ck_growing_season	<i>Growing Season Length</i>
-------------------	------------------------------

Description

Compute the growing season length following the ETCCDI definition: the number of days between the first occurrence of at least 6 consecutive days with daily mean temperature above 5 degrees C and the first span of 6 consecutive days with Tmean below 5 degrees C after July 1 (Northern Hemisphere) or January 1 (Southern Hemisphere). Calculated per year.

Usage

```
ck_growing_season(tavg, dates, lat = 50)
```

Arguments

tavg	Numeric vector of daily mean temperatures (degrees C).
dates	Date vector of the same length as tavg.
lat	Numeric. Latitude in decimal degrees (used to determine hemisphere for end-of-season rule). Default 50 (Northern Hemisphere).

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:364
set.seed(42)
tavg <- sin(seq(0, 2 * pi, length.out = 365)) * 15 + 5
ck_growing_season(tavg, dates)
```

ck_heating_degree_days	<i>Heating Degree Days</i>
------------------------	----------------------------

Description

Sum of (base - Tavg) for all days where daily average temperature is below the base temperature (default 18 degrees C).

Usage

```
ck_heating_degree_days(tavg, dates, base = 18, period = "annual")
```

Arguments

tavg	Numeric vector of daily average temperatures (degrees C).
dates	Date vector of the same length as tavg.
base	Numeric. Base temperature in degrees C (default 18).
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
tavg <- c(5, 10, 15, 20, 8, 12, 18, 3, 25, 7)
ck_heating_degree_days(tavg, dates)
```

ck_heat_index	<i>Heat Index</i>
---------------	-------------------

Description

Compute the heat index (apparent temperature) using the Rothfusz regression equation used by the US National Weather Service.

Usage

```
ck_heat_index(tavg, humidity)
```

Arguments

tavg	Numeric vector of temperatures (degrees C).
humidity	Numeric vector of relative humidity (percent, 0-100).

Value

A data frame with columns value, index, and unit.

References

Rothfusz, L. P. (1990). The heat index equation. NWS Technical Attachment SR 90-23.

Examples

```
ck_heat_index(tavg = c(30, 35, 40), humidity = c(60, 70, 50))
```

ck_heavy_precip *Heavy Precipitation Days*

Description

Count of days with precipitation at or above a threshold (default 10 mm).

Usage

```
ck_heavy_precip(precip, dates, threshold = 10, period = "annual")
```

Arguments

precip	Numeric vector of daily precipitation (mm).
dates	Date vector of the same length as precip.
threshold	Numeric. Threshold in mm (default 10).
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
precip <- c(0, 5, 12, 0, 15, 2, 0, 11, 4, 0)
ck_heavy_precip(precip, dates)
```

ck_huglin *Huglin Heliothermal Index*

Description

The Huglin index is used in viticulture to characterise the thermal potential of a region for grape growing. It is computed over the growing season (April 1 to September 30 in the Northern Hemisphere; October 1 to March 31 in the Southern Hemisphere).

Usage

```
ck_huglin(tmin, tmax, dates, lat)
```

Arguments

tmin	Numeric vector of daily minimum temperatures (degrees C).
tmax	Numeric vector of daily maximum temperatures (degrees C).
dates	Date vector of the same length as tmin.
lat	Numeric. Latitude in decimal degrees (used to determine hemisphere and day-length coefficient).

Value

A data frame with columns period, value, index, and unit.

References

Huglin, P. (1978). Nouveau mode d'évaluation des possibilites heliothermiques d'un milieu viticole. *Comptes Rendus de l'Academie d'Agriculture de France*, 64, 1117-1126.

Examples

```
dates <- seq(as.Date("2024-04-01"), as.Date("2024-09-30"), by = "day")
set.seed(42)
tmin <- rnorm(length(dates), mean = 12, sd = 3)
tmax <- tmin + runif(length(dates), 8, 15)
ck_huglin(tmin, tmax, dates, lat = 45)
```

ck_humidex	<i>Humidex</i>
------------	----------------

Description

Compute the Canadian humidex from temperature and dewpoint.

Usage

```
ck_humidex(tavg, dewpoint)
```

Arguments

tavg	Numeric vector of temperatures (degrees C).
dewpoint	Numeric vector of dewpoint temperatures (degrees C).

Value

A data frame with columns value, index, and unit.

References

Masterson, J., & Richardson, F. A. (1979). Humidex: A method of quantifying human discomfort due to excessive heat and humidity. Environment Canada.

Examples

```
ck_humidex(tavg = c(30, 35), dewpoint = c(20, 25))
```

ck_ice_days	<i>Ice Days</i>
-------------	-----------------

Description

Count the number of days where maximum temperature is below 0 degrees C.

Usage

```
ck_ice_days(tmax, dates, period = "annual")
```

Arguments

tmax	Numeric vector of daily maximum temperatures (degrees C).
dates	Date vector of the same length as tmax.
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
tmax <- c(-2, 3, -1, 5, -3, 0, 2, -4, 1, -1)
ck_ice_days(tmax, dates)
```

ck_last_frost	<i>Last Frost Date</i>
---------------	------------------------

Description

Date of the last spring frost ($T_{min} < 0$ degrees C) before July 1 in each year.

Usage

```
ck_last_frost(tmin, dates)
```

Arguments

tmin	Numeric vector of daily minimum temperatures (degrees C).
dates	Date vector of the same length as tmin.

Value

A data frame with columns period, value (day of year), date (the frost date), index, and unit.

Examples

```
dates <- seq(as.Date("2024-01-01"), as.Date("2024-06-30"), by = "day")
set.seed(42)
tmin <- -10 + seq_along(dates) * 0.12 + rnorm(length(dates), sd = 3)
ck_last_frost(tmin, dates)
```

ck_max_1day_precip	<i>Maximum 1-Day Precipitation</i>
--------------------	------------------------------------

Description

Maximum precipitation recorded in a single day per period.

Usage

```
ck_max_1day_precip(precip, dates, period = "annual")
```

Arguments

precip	Numeric vector of daily precipitation (mm).
dates	Date vector of the same length as precip.
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
precip <- c(0, 5, 22, 0, 15, 25, 0, 11, 4, 30)
ck_max_1day_precip(precip, dates)
```

ck_max_5day_precip *Maximum 5-Day Precipitation*

Description

Maximum precipitation total over any 5 consecutive days per period.

Usage

```
ck_max_5day_precip(precip, dates, period = "annual")
```

Arguments

precip Numeric vector of daily precipitation (mm).
 dates Date vector of the same length as precip.
 period Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
precip <- c(0, 5, 22, 0, 15, 25, 0, 11, 4, 30)
ck_max_5day_precip(precip, dates)
```

ck_metadata *Get Metadata for a Climate Index*

Description

Returns metadata (unit, category, description, reference) for a named climate index.

Usage

```
ck_metadata(index)
```

Arguments

index Character string. The index name (e.g. "frost_days"). Use [ck_available\(\)](#) to see valid names.

Value

A list with elements index, category, unit, description, and reference.

Examples

```
ck_metadata("frost_days")
```

ck_pet

Potential Evapotranspiration (Hargreaves Method)

Description

Estimate daily PET using the Hargreaves-Samani equation, which requires only daily temperature extremes and latitude.

Usage

```
ck_pet(tmin, tmax, lat, dates)
```

Arguments

tmin	Numeric vector of daily minimum temperatures (degrees C).
tmax	Numeric vector of daily maximum temperatures (degrees C).
lat	Numeric. Latitude in decimal degrees.
dates	Date vector of the same length as tmin.

Value

A data frame with columns date, value, index, and unit.

References

Hargreaves, G. H., & Samani, Z. A. (1985). Reference crop evapotranspiration from temperature. *Applied Engineering in Agriculture*, 1(2), 96-99.

Examples

```
dates <- as.Date("2024-07-01") + 0:9
tmin <- c(15, 16, 14, 17, 15, 13, 16, 14, 15, 16)
tmax <- c(30, 32, 28, 33, 31, 27, 34, 29, 30, 32)
ck_pet(tmin, tmax, lat = 45, dates = dates)
```

ck_precip_intensity *Precipitation Intensity (SDII)*

Description

Mean precipitation on wet days (days with precipitation ≥ 1 mm). Also known as the Simple Daily Intensity Index.

Usage

```
ck_precip_intensity(precip, dates, period = "annual")
```

Arguments

precip	Numeric vector of daily precipitation (mm).
dates	Date vector of the same length as precip.
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
precip <- c(0, 5, 12, 0, 15, 2, 0, 11, 4, 0)
ck_precip_intensity(precip, dates)
```

ck_spei *Standardized Precipitation-Evapotranspiration Index (SPEI)*

Description

Compute the SPEI by fitting a log-logistic distribution to the monthly climatic water balance (precipitation minus potential evapotranspiration) accumulated over a rolling window.

Usage

```
ck_spei(precip, pet, dates, scale = 3)
```

Arguments

precip	Numeric vector of daily precipitation (mm).
pet	Numeric vector of daily potential evapotranspiration (mm).
dates	Date vector of the same length as precip and pet.
scale	Integer. Accumulation period in months (default 3).

Value

A data frame with columns period, value, index, and unit.

References

Vicente-Serrano, S. M., Begueria, S., & Lopez-Moreno, J. I. (2010). A multiscalar drought index sensitive to global warming: the Standardized Precipitation Evapotranspiration Index. *Journal of Climate*, 23(7), 1696-1718.

Examples

```
dates <- seq(as.Date("2020-01-01"), as.Date("2023-12-31"), by = "day")
set.seed(42)
precip <- rgamma(length(dates), shape = 0.5, rate = 0.1)
pet <- rep(3, length(dates))
ck_spei(precip, pet, dates, scale = 3)
```

ck_spi	<i>Standardized Precipitation Index (SPI)</i>
--------	-----------------------------------------------

Description

Compute the SPI by fitting a gamma distribution to monthly precipitation totals accumulated over a rolling window, then transforming to standard normal deviates.

Usage

```
ck_spi(precip, dates, scale = 3)
```

Arguments

precip	Numeric vector of daily precipitation (mm).
dates	Date vector of the same length as precip.
scale	Integer. Accumulation period in months (default 3).

Value

A data frame with columns period, value, index, and unit.

References

McKee, T. B., Doesken, N. J., & Kleist, J. (1993). The relationship of drought frequency and duration to time scales.

Examples

```

dates <- seq(as.Date("2020-01-01"), as.Date("2023-12-31"), by = "day")
set.seed(42)
precip <- rgamma(length(dates), shape = 0.5, rate = 0.1)
ck_spi(precip, dates, scale = 3)

```

ck_summer_days	<i>Summer Days</i>
----------------	--------------------

Description

Count the number of days where maximum temperature exceeds 25 degrees C.

Usage

```
ck_summer_days(tmax, dates, period = "annual")
```

Arguments

tmax	Numeric vector of daily maximum temperatures (degrees C).
dates	Date vector of the same length as tmax.
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```

dates <- as.Date("2024-07-01") + 0:9
tmax <- c(22, 26, 28, 24, 30, 25, 27, 23, 31, 29)
ck_summer_days(tmax, dates)

```

ck_total_precip	<i>Total Precipitation</i>
-----------------	----------------------------

Description

Total precipitation sum by period.

Usage

```
ck_total_precip(precip, dates, period = "annual")
```

Arguments

precip	Numeric vector of daily precipitation (mm).
dates	Date vector of the same length as precip.
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
precip <- c(0, 5, 3, 0, 8, 2, 0, 1, 4, 0)
ck_total_precip(precip, dates)
```

ck_tropical_nights	<i>Tropical Nights</i>
--------------------	------------------------

Description

Count the number of days where minimum temperature exceeds 20 degrees C.

Usage

```
ck_tropical_nights(tmin, dates, period = "annual")
```

Arguments

tmin	Numeric vector of daily minimum temperatures (degrees C).
dates	Date vector of the same length as tmin.
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-07-01") + 0:9
tmin <- c(18, 21, 22, 19, 25, 20, 23, 17, 24, 21)
ck_tropical_nights(tmin, dates)
```

ck_very_heavy_precip *Very Heavy Precipitation Days*

Description

Count of days with precipitation at or above a threshold (default 20 mm).

Usage

```
ck_very_heavy_precip(precip, dates, threshold = 20, period = "annual")
```

Arguments

precip	Numeric vector of daily precipitation (mm).
dates	Date vector of the same length as precip.
threshold	Numeric. Threshold in mm (default 20).
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
precip <- c(0, 5, 22, 0, 15, 25, 0, 11, 4, 30)
ck_very_heavy_precip(precip, dates)
```

ck_warm_spell *Warm Spell Days*

Description

Count the number of days in warm spells, where a warm spell is defined as at least 6 consecutive days with Tmax above the threshold quantile of the full series. This computes warm spell days using a quantile threshold from the input series. It does not implement the ETCCDI WSDI, which requires calendar-day percentiles from a 1961-1990 reference period.

Usage

```
ck_warm_spell(tmax, dates, threshold = 0.9, period = "annual")
```

Arguments

tmax	Numeric vector of daily maximum temperatures (degrees C).
dates	Date vector of the same length as tmax.
threshold	Numeric. Quantile threshold (default 0.9, i.e. 90th percentile).
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:364
set.seed(42)
tmax <- rnorm(365, mean = 20, sd = 5)
ck_warm_spell(tmax, dates)
```

ck_wet_days	<i>Maximum Consecutive Wet Days</i>
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Description

Maximum number of consecutive days with precipitation at or above a threshold.

Usage

```
ck_wet_days(precip, dates, threshold = 1, period = "annual")
```

Arguments

precip	Numeric vector of daily precipitation (mm).
dates	Date vector of the same length as precip.
threshold	Numeric. Wet day threshold in mm (default 1).
period	Character. Aggregation period: "annual" (default) or "monthly".

Value

A data frame with columns period, value, index, and unit.

Examples

```
dates <- as.Date("2024-01-01") + 0:9
precip <- c(5, 3, 0, 2, 8, 1, 0, 0, 4, 6)
ck_wet_days(precip, dates)
```

ck_wind_chill	<i>Wind Chill Temperature</i>
---------------	-------------------------------

Description

Compute wind chill using the North American Wind Chill Index formula (Environment Canada / US NWS). Valid for temperatures at or below 10 degrees C and wind speeds above 4.8 km/h.

Usage

```
ck_wind_chill(tavg, wind_speed)
```

Arguments

tavg	Numeric vector of temperatures (degrees C).
wind_speed	Numeric vector of wind speeds (km/h).

Value

A data frame with columns value, index, and unit.

Examples

```
ck_wind_chill(tavg = c(-5, -10, 0), wind_speed = c(20, 30, 15))
```

ck_winkler	<i>Winkler Index</i>
------------	----------------------

Description

The Winkler index (also called growing degree days for viticulture) accumulates daily mean temperature above 10 degrees C during the growing season (April-October in NH, October-April in SH).

Usage

```
ck_winkler(tavg, dates)
```

Arguments

tavg	Numeric vector of daily average temperatures (degrees C).
dates	Date vector of the same length as tavg.

Value

A data frame with columns period, value, index, and unit.

References

Amerine, M. A., & Winkler, A. J. (1944). Composition and quality of musts and wines of California grapes.

Examples

```
dates <- seq(as.Date("2024-04-01"), as.Date("2024-10-31"), by = "day")
set.seed(42)
tavg <- rnorm(length(dates), mean = 18, sd = 4)
ck_winkler(tavg, dates)
```

`clear_cache`*Clear Cache*

Description

Removes any cached reference data stored by climatekit.

Usage

```
clear_cache()
```

Value

Invisibly returns TRUE if cache was cleared, FALSE if no cache existed.

Examples

```
op <- options(climatekit.cache_dir = tempdir())
clear_cache()
options(op)
```

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