Package 'sedproxy'

October 14, 2022

Title Simulation of Sediment Archived Climate Proxy Records

Version 0.7.3

Description Proxy forward modelling for sediment archived climate proxies such
as Mg/Ca, d18O or Alkenones. The user provides a hypothesised ``true'' past climate,
such as output from a climate model, and details of the sedimentation rate and
sampling scheme of a sediment core. Sedproxy returns simulated proxy records.
Implements the methods described in Dolman and Laepple (2018)
<doi:10.5194/cp-14-1851-2018>.

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Encoding UTF-8

Language en-gb

LazyData true

RoxygenNote 7.1.2

Depends R (>= 4.0.0)

Imports stats, mvtnorm, dplyr, tidyr, ggplot2, shiny, readr, rlang

Suggests testthat, knitr, rmarkdown, tidyverse

VignetteBuilder knitr

URL https://earthsystemdiagnostics.github.io/sedproxy/,

https://github.com/EarthSystemDiagnostics/sedproxy

NeedsCompilation no

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R topics documented:

BioturbationWeights *Bioturbation weights*

Description

For a given focal depth (or time), this function returns the probability that material collected from that depth was originally deposited at depth(s) z. In other words, that the material would have been found at depth z if there had been no bioturbation. It is the convolution of the depth solution from Berger and Heath (1968) with a uniform distribution to account for the width of the sediment layer from which samples were picked/extracted. It is a probability density function.

Usage

```
BioturbationWeights(
  z,
  focal.z,
  layer.width = 1,
  sed.acc.rate,
  bio.depth,
  scale = c("time", "depth")
)
```

Arguments

z	A vector of times or depths at which to evaluate the bioturbation weights
focal.z	The depth (or time) for which source dates are wanted
layer.width	the width of the sediment layer from which samples were taken, e.g. foraminifera were picked or alkenones were extracted, in cm. Defaults to 1 cm. If bio.depth and layer.width are both set to zero, each timepoint samples from a single year of the clim.signal, equivalent to sampling an annually laminated sediment core.
sed.acc.rate	Sediment accumulation rate in cm per 1000 years. Defaults to 50 cm per ka. Either a single value, or vector of same length as "timepoints"
bio.depth	Depth of the bioturbated layer in cm, defaults to 10 cm.
scale	Whether to scale depths by sediment accumulation rate to give positions in terms of time. Defaults to time.

Value

a numerical vector of weights.

References

Berger, W. H., & Heath, G. R. (1968). Vertical mixing in pelagic sediments. Journal of Marine Research, 26(2), 134–143.

Examples

```
z <- 0:10000
w <- BioturbationWeights(z, focal.z = 4000, layer.width = 1, sed.acc.rate = 5, bio.depth = 10)
plot(z, w, "l")
```

ClimToProxyClim	*Simulate sediment archived proxy records from an input climate signal.*

Description

`ClimToProxyClim` simulates the creation of a proxy climate record from a climate signal that is assumed to be true.

The following aspects of proxy creation are currently modelled.

1. Seasonal bias in the encoding of a proxy due to the interaction between climate seasonality and any seasonality in the life cycle of the organism encoding the climate signal (e.g. Foraminifera for Mg/Ca ratios, or phytoplankton for Alkenone unsaturation indices).

2. Bioturbation of the sediment archived proxy. For each requested timepoint, the simulated proxy consists of a weighted mean of the climate signal over a time window that is determined by the sediment accumulation rate *sed.acc.rate* and the bioturbation depth *bio.depth* which defaults to 10 cm. The weights are given by the depth solution to an impulse response function (Berger and Heath, 1968).

3. Aliasing of seasonal and inter-annual climate variation onto to bioturbated (smoothed) signal. For proxies measured on a small number of discrete particles both seasonal and inter-annual climate variation is aliased into the proxy record. For example, Foraminifera have a life-cycle of approximately 1 month, so they record something like the mean temperature from a single month. If Mg/Ca is measured on e.g. `n.samples = 30` individuals, the measured proxy signal is a mean of 30 distinct monthly mean temperatures and will thus be a stochastic sample of the true mean climate.

4. Measurement noise/error is added as a pure Gaussian white noise process with mean = 0, standard deviation = `sqrt(sigma.meas^2 + sigma.ind^2/n.samples)`.

5. Additionally, a random *bias* can be added to each realisation of a proxy record. Bias is simulated as a Gaussian random variable with mean = 0, standard deviation = `meas.bias`. The same randomly generated bias value is applied to all timepoints in a simulated proxy record, when multiple replicate proxies are generated (*n.replicates* > 1) each replicate has a different bias applied.

`ClimToProxyClim` returns one or more replicates of the final simulated proxy as well as several intermediate stages (see section **Value** below).

Usage

```
ClimToProxyClim(
  clim.signal,
  timepoints,
  calibration.type = c("identity", "Uk37", "MgCa"),
  calibration = switch(calibration.type, identity = NA, Uk37 = "Mueller global", MgCa =
    "Ten planktonic species_350-500"),
  slp.int.means = NULL,
  slp.int.vcov = NULL,
  noise.type = switch(calibration.type, identity = "additive", Uk37 = "additive", MgCa
    = "multiplicative"),
  plot.sig.res = 100,
  habitat.weights = rep(1/ncol(clim.signal), ncol(clim.signal)),
  habitat.wt.args = NULL,
  bio.depth = 10,
  sed.acc.rate = 50,
  layer.width = 1,
  sigma.meas = 0,
  sigma.ind = 0,
  meas.bias = 0,
  scale.noise = switch(calibration.type, identity = FALSE, Uk37 = TRUE, MgCa = TRUE),
  n.samples = Inf,
  n.replicates = 1,
  top.of.core = NULL,
  n.bd = 3
)
```

Arguments

clim.signal	The "assumed true" climate signal, e.g. climate model output or instrumental record. A `ts` object consisting of a years x 12 (months) x n habitats (e.g. depths) matrix of temperatures. The time series should be at annual resolution and in reverse, i.e. "most recent timepoint first" order.
timepoints	The timepoints for which the proxy record is to be modelled
calibration.type	Type of proxy, e.g. Uk'37 or MgCa, to which the clim.signal is converted before the archiving and measurement of the proxy is simulated. Defaults to "identity" which means no conversion takes place.
calibration	The name of a specific calibration for which calibration parameters are provided by sedproxy. Currently applies only to calibration.type MgCa.
slp.int.means	Optional user supplied vector of values for the slope and intercept of the calibration function. Overides the defaults.
slp.int.vcov	Optional user supplied variance covariance matrix calibration parameters. Overides the defaults.
noise.type	Determines whether additive or multiplicative measurement noise is added. The appropriate type depends on the units of the proxy. Defaults to multiplicative for MgCa, additive for Uk'37 and identity (none) calibration types. Can be overidden with a string, "additive" or "multiplicative" in the case that pre-converted climate signal and measurement noise values are used in combination with an "identity" calibration type.
plot.sig.res	The resolution, in years, of the smoothed (block averaged) version of the input climate signal returned for plotting. This does not affect what the proxy model uses as input. If set to NA, no smoothed climate output is generated, this can speed up some simulations.
habitat.weights	Production weights for the proxy / proxy-carrier either as a vector of values with length = ncol(clim.signal), i.e. 1 weight for each month x habitat combination, a matrix of the same dimensions as the input climate signal matrix, or a function that produces an index of productivity as a function of temperature. Defaults to a vector of length = ncol(clim.signal) of equal weights.
habitat.wt.args	A named list of parameter values to be passed to a function named in habitat.weights.
bio.depth	Depth of the bioturbated layer in cm, defaults to 10 cm.
sed.acc.rate	Sediment accumulation rate in cm per 1000 years. Defaults to 50 cm per ka. Either a single value, or vector of same length as "timepoints"
layer.width	the width of the sediment layer from which samples were taken, e.g. foraminifera were picked or alkenones were extracted, in cm. Defaults to 1 cm. If bio.depth and layer.width are both set to zero, each timepoint samples from a single year of the clim.signal, equivalent to sampling an annually laminated sediment core.
sigma.meas	The standard deviation of the measurement error added to each simulated proxy value.

sigma.ind	The standard deviation of error between individuals (e.g. Forams) not otherwise modelled. This could included "vital effects" or aliasing of depth habitat variation not modelled via a depth resolved input climate signal and habitat weights. sigma.ind is scaled by n.samples before being combined with sigma.meas.
meas.bias	The amount of bias to add to each simulated proxy time-series. Each replicate proxy time-series has a constant bias added, drawn from a normal distribution with mean = 0, sd = meas.bias. Bias defaults to zero.
scale.noise	Scale noise to proxy units. Defaults to TRUE if calibration.type is not "identity"
n.samples	Number of e.g. Foraminifera sampled per timepoint, this can be either a single number, or a vector of length = timepoints. Can be set to Inf for non-discrete proxies, e.g. for Uk'37.
n.replicates	Number of replicate proxy time-series to simulate from the climate signal
top.of.core	The theoretical minimum age at the top of the core, ie. the year the core was sampled, defaults to the start of clim.in
n.bd	Number of multiples of the bioturbation width at which to truncate the bioturbation filter

Value

ClimToProxyClim returns an object of class "sedproxy.pfm", a list with three elements:

1. a dataframe simulated.proxy
2. a dataframe smoothed.signal
3. a dataframe everything

The dataframe simulated.proxy contains a single realisation of the final forward modelled proxy, as well as the intermediate stages and the original climate signal at the requested timepoints.

The dataframe smoothed.signal contains a block averaged version the input climate signal, defaults to 100 year means but this is set by the parameter plot.sig.res. This is useful for plotting against the resulting simulated proxy.

The dataframe everything contains all of the above but with multiple replicates of the pseudo-proxy records if requested. The data are in "long form", with the column "stage" inidcating the proxy stage or input climate resolution and column "value" giving the values.

Named elements of the returned proxy record:

timepoints Requested timepoints

clim.signal.ann Input climate signal at requested timepoints at annual resolution

clim.signal.smoothed Input climate signal at regular time intervals and resolution = plot.sig.res

clim.timepoints.ssr Input climate signal at requested timepoints, smoothed to resolution = plot.sig.res

proxy.bt Climate signal after bioturbation

proxy.bt.sb Climate signal after bioturbation and habitat bias

proxy.bt.sb.inf.b Climate signal after bioturbation, habitat bias, and calibration bias

proxy.bt.sb.inf.b.n Climate signal after bioturbation, habitat bias, and measurement error

proxy.bt.sb.sampY Climate signal after bioturbation, habitat bias, and aliasing of inter-annual variation

proxy.bt.sb.sampYM Climate signal after bioturbation, habitat bias, and aliasing of inter-annual and intra-annual variation such as monthly temperatures or depth habitats

proxy.bt.sb.sampYM.b Climate signal after bioturbation, habitat bias, and aliasing of inter-annual and intra-annual variation such as monthly temperatures or depth habitats, and calibration bias

proxy.bt.sb.sampYM.b.n Climate signal after bioturbation, habitat bias, aliasing, and measurement error

simulated.proxy Final simulated pseudo-proxy, this will be same as proxy.bt.sb.inf.b.n when n.samples = Inf, and proxy.bt.sb.sampYM.b.n when n.samples is finite

observed.proxy True observed proxy (when supplied)

Examples

```
library(ggplot2)
set.seed(26052017)
clim.in <- ts(N41.t21k.climate[nrow(N41.t21k.climate):1,] - 273.15, start = -39)

PFM <- ClimToProxyClim(clim.signal = clim.in,
                       timepoints = round(N41.proxy$Published.age),
                       calibration.type = "identity",
                       habitat.weights = N41.G.ruber.seasonality,
                       sed.acc.rate = N41.proxy$Sed.acc.rate.cm.ka,
                       layer.width = 1,
                       sigma.meas = 0.46,
                       sigma.ind = 0, n.samples = Inf,
                       plot.sig.res = 10, meas.bias = 1,
                       n.replicates = 10)

PlotPFMs(PFM$everything, max.replicates = 1, stage.order = "seq") +
  facet_wrap(~stage)

PlotPFMs(PFM$everything, max.replicates = 1, stage.order = "var")

PlotPFMs(PFM$everything, stage.order = "var", plot.stages = "all")
```

---

example.data	*Data for running the examples in package* sedproxy

---

Description

A set of data objects for running the examples in sedproxy

N41.proxy

N41.proxy.details

N41.G.ruber.seasonality

N41.t21k.climate

Details

Example data

ForamGrowthfT	*Foraminifer Growth Rate Function from Lombard et al. (2009)*

Description

Implements the function for foraminifer growth rate as a function of temperature from Lombard et al. (2009) with parametrization from FAME 1.0 (Roche et al, 2018).

Usage

```
ForamGrowthfT(
  foram = c("sacculifer", "bulloides", "pachy_d", "siphonifera", "universa", "pachy_s",
    "dutertrei", "ruber"),
  temperature_K,
  norm = FALSE,
  min.growth.thresh = 0
)
```

Arguments

foram	Name of foram.
temperature_K	Temperature in Kelvin
norm	Optional normalizing factor
min.growth.thresh	
	Sets a lower cutoff for growth as a proportion of the maximum growth rate for that taxon. For example in Roche et al (2018) a cutoff of 0.1 was used, meaning all growth rates less than 0.1*max were set to zero.

Value

A numerical vector or matrix with the same dimensions as the object passed to temperature_K. Units are daily growth rate, unless norm == TRUE.

References

Lombard, F., Labeyrie, L., Michel, E., Spero, H. J., and Lea, D. W.: Modelling the temperature dependent growth rates of planktic foraminifera, Marine Micropaleontology, 70, 1–7, https://doi.org/10.1016/j.marmicro.2008.0 2009.

Roche, D. M., Waelbroeck, C., Metcalfe, B. and Caley, T.: FAME (v1.0): a simple module to simulate the effect of planktonic foraminifer species-specific habitat on their oxygen isotopic content, Geosci. Model Dev. Discuss., 2017, 1–22, doi:10.5194/gmd-2017-251, 2017.

Examples

```
ForamGrowthfT(foram = 'ruber', temperature_K = (c(280, 290)), norm = 1)
```

---

gisp2.ann   *gisp2 ice core data at annual resolution*

Description

gisp2 ice core data interpolated to annual resolution

Usage

```
gisp2.ann
```

Format

A data frame with 49885 rows and 3 variables:

age.yr.bp Age in years BP

temperature temperature in deg C

temperature.rescaled temperature rescaled to resemble a d18O record as in Löwemark et al 2008

Details

GISP2 data from Alley, R.B.. 2004. GISP2 Ice Core Temperature and Accumulation Data. IGBP PAGES/World Data Center for Paleoclimatology Data Contribution Series 2004-013. NOAA/NGDC Paleoclimatology Program, Boulder CO, USA. Interpolated to annual resolution and additionally rescaled to resemble a d18O record. As in Fig.2 of Löwemark, L., Konstantinou, K. I. and Steinke, S.: Bias in foraminiferal multispecies reconstructions of paleohydrographic conditions caused by foraminiferal abundance variations and bioturbational mixing: A model approach, Marine Geology, 256(1–4), 101–106, doi:10.1016/j.margeo.2008.10.005, 2008.

N41.G.ruber.seasonality

Seasonality of Globigerinoides ruber at core MD97-2141

Description

Seasonality of Globigerinoides ruber at core MD97-2141 predicted by the PLAFOM model (Fraile et al. 2008).

Usage

```
N41.G.ruber.seasonality
```

Format

A vector of 12 values

Source

Fraile, I., Schulz, M., Mulitza, S., & Kucera, M. (2008). Predicting the global distribution of planktonic foraminifera using a dynamic ecosystem model. Biogeosciences, 5(3), 891–911.

N41.proxy   *Mg/Ca proxy based temperature reconstruction for core MD97-2141*

Description

Mg/Ca proxy based temperature reconstruction for core MD97-2141, originally published in Rosenthal et al. (2003), extracted from Shakun et al. (2012).

Usage

```
N41.proxy
```

Format

A data frame with 216 rows and 4 variables:

Published.age	Age in yr BP
Published.temperature	Reconstructed temperature in degrees C
Sed.acc.rate.cm.ka	Sediment accumulation rate in cm per kyr

Details

Published age and published temperature were extracted from Shakun, J. D., Clark, P. U., He, F., Marcott, S. A., Mix, A. C., Liu, Z., . . . Bard, E. (2012). Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation. Nature, 484(7392), 49–54. doi: 10.1038/ nature10915.

Sediment accumulation rates were estimated by fitting splines to the published age and depth estimates.

Source

Original reference: Rosenthal, Y., Oppo, D. W., & Linsley, B. K. (2003). The amplitude and phasing of climate change during the last deglaciation in the Sulu Sea, western equatorial Pacific. Geophysical Research Letters, 30(8), 1428. doi: 10.1029/2002GL016612.

N41.proxy.details   *Metadata for datset* N41.proxy

Description

Metadata for core MD97-2141 taken from Shakun et al. (2012)

Usage

```
N41.proxy.details
```

Format

A data frame with 1 rows and 17 variables:

Number	Proxy ID number from Shakun et al. (2012)
ID.no	Proxy ID number from Shakun et al. (2012) with prefix "N"
Core	ID code of sediment core
Location	Location of core
Proxy	Proxy type
Lat	Latutide of core
Lon	Longitude of core
Elevation	Depth of core-top below sea level in metres
Reference	Original reference for the proxy record
Resolution	Average time resolution in years
Calibration.ref	Reference for Mg/Ca calibration
Calibration	Mg/Ca calibration formula
Foram.sp	Foram species analyses for proxy
Ref.14C	Reference for carbon dating
Notes	
Geo.cluster	Coarse geographic location
Archive.type	Type of proxy archive

Source

Shakun, J. D., Clark, P. U., He, F., Marcott, S. A., Mix, A. C., Liu, Z., . . . Bard, E. (2012). Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation. Nature, 484(7392), 49–54. doi: 10.1038/nature10915

N41.t21k.climate	*Climate (surface temperature) at core MD97-2141 from TraCE-21ka*

Description

Modelled surface temperature at core MD97-2141. Model output from TraCE-21ka simulations.

Usage

```
N41.t21k.climate
```

Format

A matrix with 22040 rows and 12 columns

Source

Liu, Z., Otto-Bliesner, B. L., He, F., Brady, E. C., Tomas, R., Clark, P. U., . . . Cheng, J. (2009). Transient Simulation of Last Deglaciation with a New Mechanism for Bølling-Allerød Warming. Science, 325(5938), 310–314. https://doi.org/10.1126/science.1171041

---

param.tab   *sedproxy parameters*

Description

Parameters and variables required to generate a pseudo-proxy with `ClimToProxyClim`

Usage

```
param.tab
```

Format

A data frame with 12 rows and 4 variables:

`Function argument` character Argument name in `ClimToProxyClim`

`Description` character Description of argument and corresponding variable/parameter

`Possible sources` character Source or possible sources of values for arguments

`Default` character Default values for arguments

PlotPFMs   *Plot forward modelled sedimentary proxies*

Description

Plot forward modelled sedimentary proxies

Usage

```
PlotPFMs(
  PFMs,
  stage.order = c("var", "seq"),
  plot.stages = c("default"),
  max.replicates = 5,
  colr.palette = "default",
  alpha.palette = "default",
  levl.labels = "default"
)
```

Arguments

`PFMs`	A dataframe of forward modelled proxies
`stage.order`	Controls the order in which proxy stages are plotted, either sequentially, "seq", or in order of variance, "var". Defaults to var.
`plot.stages`	Proxy stages to be plotted, "default", "all", or a custom character vector
`max.replicates`	Maximum number of replicates to plot at once
`colr.palette`	Colours for the proxy stages
`alpha.palette`	Alpha levels for the proxy stages
`levl.labels`	Labels for the proxy stages

Value

a ggplot object of class "gg" "ggplot"

Examples

```
library(ggplot2)
set.seed(26052017)
clim.in <- ts(N41.t21k.climate[nrow(N41.t21k.climate):1,] - 273.15)

PFM <- ClimToProxyClim(clim.signal = clim.in,
                       timepoints = round(N41.proxy$Published.age),
                       calibration.type = "identity",
                       habitat.weights = N41.G.ruber.seasonality,
                       sed.acc.rate = N41.proxy$Sed.acc.rate.cm.ka,
                       sigma.meas = 0.45,
                       sigma.ind = 0,
                       n.samples = Inf,
                       plot.sig.res = 10, meas.bias = 1,
                       n.replicates = 10)

PlotPFMs(PFM$everything, max.replicates = 1, stage.order = "seq") +
  facet_wrap(~stage)

PlotPFMs(PFM$everything, max.replicates = 1, stage.order = "var")

PlotPFMs(PFM$everything, stage.order = "var", plot.stages = "all")
```

ProxyConversion	*Convert between Temperature in Degrees C and Proxy Units*

Description

A wrapper function for accessing proxy - temperature conversion functions

Usage

```
ProxyConversion(
  temperature = NULL,
  proxy.value = NULL,
  calibration.type = "identity",
  slp.int.means = NULL,
  slp.int.vcov = NULL,
 calibration = switch(calibration.type, identity = NA, Uk37 = "Mueller global", MgCa =
    "Ten planktonic species_350-500"),
  point.or.sample = c("point", "sample"),
  n = 1
)
```

Arguments

temperature	Temperature in degrees C
proxy.value	Temperature in proxy units
calibration.type	
	Type of proxy, e.g. Uk37 or MgCa
slp.int.means	Optional user supplied vector of values for the slope and intercept of the calibration function. Overides the defaults.
slp.int.vcov	Optional user supplied variance covariance matrix calibration parameters. Overides the defaults.
calibration	The name of a specific calibration for which calibration parameters are provided by sedproxy. Currently applies only to calibration.type MgCa.
point.or.sample	
	Use the "best estimate" calibration parameters, or parameters sampled from the fitted calibration model
n	the number of replicate conversions to make in the case of sampled calibration parameters

Details

Valid entries for calibration are: "Ten planktonic species_350-500", "G. aequilateralis_350-500", "G. aequilateralis_500-1000", "G. conglobatus_350-500", "G. hirsuta_350-500", "G. inflata_350-500", "G. ruber pink_250-350", "G. ruber pink_350-500", "G. ruber white_250-350", "G. ruber white_350-500", "G. sacculifer with sac_350-500", "G. sacculifer without sac_350-500", "G. truncatulinoides_350-500", "G. truncatulinoides_500-1000", "N. dutertrei_350-500", "O. univesa_350-500", "P. obliquiloculata_350-500"

Value

a vector of temperatures or proxy values

Examples

```
# From temperature to UK'37
## With fixed calibration
ProxyConversion(temperature = c(10, 20), point.or.sample = "point",
                calibration.type = "Uk37")

## With random calibration, 5 replicates
ProxyConversion(temperature = c(1, 2), n = 5, point.or.sample = "sample",
                calibration.type = "Uk37")


## Back-transformation with same calibration
ProxyConversion(
  proxy.value = as.vector(
    ProxyConversion(
      temperature = c(21, 22),
      calibration.type = "Uk37",
      point.or.sample = "point"
    )
  ),
  point.or.sample = "point",
  calibration.type = "Uk37"
)

## Back-transformation with random calibration
ProxyConversion(
  proxy.value = as.vector(
    ProxyConversion(
      temperature = c(21, 22),
      calibration.type = "Uk37",
     point.or.sample = "point"
    )
  )
  ,
  n = 5,
  point.or.sample = "sample",
  calibration.type = "Uk37"
)

## Incompatible arguments
## Not run:
ProxyConversion(temperature = 1, proxy.value = 1)

## End(Not run)
```

---

scussolini.tab1   *Scussolini et al. (2013) Table 1*

Description

Data from table 1 in Scussolini et al. (2013)

Usage

```
scussolini.tab1
```

Format

A dataframe with 22 rows and 6 columns

Source

Scussolini, P., van Sebille, E., & Durgadoo, J. V. (2013). Paleo Agulhas rings enter the subtropical gyre during the penultimate deglaciation. Climate of the Past, 9(6), 2631–2639. https://doi.org/10.5194/cp-9-2631-2013

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sedproxy   *sedproxy: Simulation of Sediment Archived Climate Proxy Records*

Description

The sedproxy package provides functions to simulate sediment archived proxies

---

ShinySedproxy   *Run ShinySedproxy*

Description

Launches the shiny app GUI interface to sedproxy

Usage

```
ShinySedproxy()
```

Value

No return value, called for side effects.

Examples

```
## Not run: ShinySedproxy()
```

---

stage.labels   *Labels for proxy stages*

Description

Labels for proxy stages. For plotting.

Usage

```
stage.labels
```

Format

A named character vector

---

stages.key   *Description of proxy stages*

Description

A description of the proxy stages in the output of `ClimToProxyClim` and default labels, colours and order for plotting

Usage

```
stages.key
```

Format

A data frame with 13 rows and 6 variables:

stage	proxy stage
label	label for proxy stage
description	description of proxy stage
plot.order	default plotting order of stages
plotting.colour	default colour for plotting
plotting.alpha	default alpha level for plotting

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