Package 'bayclumpr'

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Type Package

Title Bayesian Analysis of Clumped Isotope Datasets

Version 0.1.0

URL https://bayclump.tripatilab.epss.ucla.edu/,

https://tripati-lab.github.io/bayclumpr/

BugReports https://github.com/Tripati-Lab/bayclumpr/issues

Description Simulating synthetic clumped isotope dataset, fitting
linear regression models under Bayesian and non-Bayesian frameworks,
and generating temperature reconstructions for the same two approaches.
Please note that models implemented in this package are described
in Roman-Palacios et al. (2021) <doi:10.1002/essoar.10507995.1>.

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Encoding UTF-8

RoxygenNote 7.2.0

Imports parallel, loo, deming, IsoplotR, rstan, stats

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr

Config/testthat/edition 3

NeedsCompilation no

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R topics documented:

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cal.bayesian	*Bayesian regressions to calibrate the clumped isotopes paleother-mometer using* stan.

Description

Bayesian regressions to calibrate the clumped isotopes paleothermometer using stan.

Usage

```
cal.bayesian(
  calibrationData,
  numSavedSteps = 3000,
  priors = "Informative",
  MC = TRUE
)
```

Arguments

calibrationData

                The target calibration dataset.

numSavedSteps   Number of MCMC iterations to save.

priors   Either Informative, Weak, or Uninformative on the slope and intercept.

MC   Multicore (TRUE/FALSE)

Value

A list the raw models fit in stan and a multi-model comparison based on loo.

---

cal.ci | *This function is used to generate CI estimates at given intervals. It is currently used for plotting in BayClump.*

Description

This function is used to generate CI estimates at given intervals. It is currently used for plotting in BayClump.

Usage

```
cal.ci(data, from, to, length.out = 100)
```

Arguments

data	A data.frame with two columns named as beta and alpha. This should be the result of bootstrapping or the posterior distribution for a given calibration set.
from	the lower limit in x.
to	the upper limit in x.
length.out	the number of breaks.

Value

A data.frame or list of data.frames with the confidence interval for a given model in a given range of X.

---

cal.dataset | *Generate a synthetic dataset for clumped isotopes calibrations*

Description

Generate a synthetic dataset for clumped isotopes calibrations

Usage

```
cal.dataset(error = "S1", nobs = 1000)
```

Arguments

error	Error scenario: low (S1), Intermediate (S2), or High (S3)
nobs	Number of observations in the simulated dataset

Value

A data.frame with true and measured values as well as their uncertainties.

---

cal.deming   *Fit Deming regression models on a given calibration dataset*

Description

Fit Deming regression models on a given calibration dataset

Usage

```
cal.deming(data, replicates, samples = NULL)
```

Arguments

data	The calibration dataset
replicates	Number of bootstrap replicates
samples	Number of samples per bootstrap replicate

Value

a `data.frame` with replicate-level regression parameters

---

cal.ols   *Fit OLS regression models on a given calibration dataset*

Description

Fit OLS regression models on a given calibration dataset

Usage

```
cal.ols(data, replicates, samples = NULL)
```

Arguments

data	The calibration dataset
replicates	Number of bootstrap replicates
samples	Number of samples per bootstrap replicate

Value

a `data.frame` with replicate-level regression parameters

---

cal.prior	*Generate a dataset reflecting the priors used to run the analyses*

Description

Generate a dataset reflecting the priors used to run the analyses

Usage

```
cal.prior(prior, n = 1000)
```

Arguments

prior	Informative or not
n	number of observations to simulate

Value

A `data.frame` with prior distributions.

---

cal.wols	*Fit weighted OLS regression models on a given calibration dataset*

Description

Fit weighted OLS regression models on a given calibration dataset

Usage

```
cal.wols(data, replicates, samples = NULL)
```

Arguments

data	The calibration dataset
replicates	Number of bootstrap replicates
samples	Number of samples per bootstrap replicate

Value

a `data.frame` with replicate-level regression parameters

---

cal.york   *Fit York regression models on a given calibration dataset*

Description

Fit York regression models on a given calibration dataset

Usage

```
cal.york(data, replicates, samples = NULL)
```

Arguments

data	The calibration dataset
replicates	Number of bootstrap replicates
samples	Number of samples per bootstrap replicate

Value

a data.frame with replicate-level regression parameters

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rec.bayesian   *This function generate temperature predictions (in 10^6/T2) based on*
                                a calibration dataset and target D47. Note that this approach addi-
                                tionally accounts for measured error in the target D47. This approach
                                is congruent with the one used in McClelland et al. (2022).

Description

This function generate temperature predictions (in 10^6/T2) based on a calibration dataset and target D47. Note that this approach additionally accounts for measured error in the target D47. This approach is congruent with the one used in McClelland et al. (2022).

Usage

```
rec.bayesian(
  calModel,
  recData,
  iter = 1000,
  mixed = FALSE,
  postcalsamples = NULL,
  MC = TRUE
)
```

Arguments

calModel	The stan model to be analyzed.
recData	The reconstruction dataset.
iter	Number of replicates to retain.
mixed	whether the model calModel is mixed or not.
postcalsamples	Number of posterior samples to analyze from the calibration step.
MC	Multicore (TRUE/FALSE)

Value

a data.frame with temperature reconstructions and the original values used in the reconstruction.

---

rec.clumped	*This function performs temp reconstruction (10^6/T^2 with T in K) for multiple replicates of the same target.*

Description

This function performs temp reconstruction ($10^6/T^2$ with T in K) for multiple replicates of the same target.

Usage

```
rec.clumped(recData, obCal)
```

Arguments

recData	Reconstruction dataset
obCal	A data.frame summarizing the distribution of slopes and intercepts

Value

a data.frame with temperature reconstructions and the original values used in the reconstruction.

---

rec.prior   *Generate a dataset reflecting the priors used to run the analyses*

Description

Generate a dataset reflecting the priors used to run the analyses

Usage

```
rec.prior(prior, n = 1000)
```

Arguments

prior	Informative or not
n	number of observations to simulate

Value

A `data.frame` with prior distributions.

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