

Package ‘folio’

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Title Datasets for Teaching Archaeology and Paleontology

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Description Datasets for teaching quantitative approaches and modeling in archaeology and paleontology. This package provides several types of data related to broad topics (cultural evolution, radiocarbon dating, paleoenvironments, etc.), which can be used to illustrate statistical methods in the classroom (multivariate data analysis, compositional data analysis, diversity measurement, etc.).

License GPL (>= 3)

URL <https://folio.tesselle.org>, <https://github.com/tesselle/folio>

BugReports <https://github.com/tesselle/folio/issues>

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arnold1949	<i>Arnold and Libby's Curve of Knowns</i>
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Description

"The agreement between prediction and observation is seen to be satisfactory."

Usage

arnold1949

Format

A data frame with 6 observations and 8 variables:

sample Sample name.

age_expected Expected age (year BP).

age_expected_error Error on age_expected (year BP).

age_found Measured age (year BP).

age_found_error Error on age_found (year BP).

activity_expected Expected specific activity (cpm/g of carbon).

activity_found Measured specific activity (cpm/g of carbon).

activity_found_error Error on activity_found (cpm/g of carbon).

Source

Arnold, J. R. and Libby, W. F. (1949). Age Determinations by Radiocarbon Content: Checks with Samples of Known Age. *Science*, 110(2869), 678-80. doi: [10.1126/science.110.2869.678](https://doi.org/10.1126/science.110.2869.678)

See Also

Other radiocarbon dating: [intcal09](#), [intcal13](#), [intcal20](#)

birds

European Birds

Description

A dataset of birds species abundance in remote European woodlands.

Usage

birds

Format

A data frame with 35 rows (species) and 3 variables (woodlands).

Source

Magurran, A. E. (1988). *Ecological Diversity and its Measurement*. Princeton, NJ: Princeton University Press. doi: [10.1007/9789401573580](https://doi.org/10.1007/9789401573580).

See Also

Other count data: [boves](#), [chevelon](#), [compiegne](#), [merzbach](#), [mississippi](#), [zuni](#)

boves

Boves Ceramics

Description

A dataset containing the ceramic counts from the castle site of Boves (Somme, France). The data are grouped into eight periods ranging from the 10th to the 18th century and thirteen ceramic types.

Usage

boves

Format

A data frame with 8 rows and 13 variables (ceramic types):

I

IIa

IIb

IIc

IIIa

IIIb**IIIc****IVa****IVb****Va****Vb****VI****VII****Source**

Racinet P. (2002). Le site castral et prioral de Boves du Xe au XVIIe siècle. Bilan des recherches 1996-2000. *Revue archéologique de Picardie*. Numéro spécial 20, 123 p.

See Also

Other count data: [birds](#), [chevelon](#), [compiègne](#), [merzbach](#), [mississippi](#), [zuni](#)

chevelon

*Chevelon Ground Stone***Description**

A dataset of ground stone artifact counts from the Cholla project (USA).

Usage

chevelon

Format

A data frame with 12 rows and 10 variables (ground stone types):

BMe Basin metate.

SMe Slab metate.

TMe Trough metate.

IMe Indeterminate metate.

UMa Unifacial mano.

BMa Bifacial mano.

MUHa Modified unifacial handstone.

MBHa Modified bifacial handstone.

UUHa Unmodified unifacial handstone.

UBHa Unmodified bifacial handstone.

Source

Reid, J. J. (ed.) (1982). *Cholla Project Archaeology*. Vol. 2. Archaeological Series 161. Tucson: University of Arizona. doi: [10.6067/XCV8435710](https://doi.org/10.6067/XCV8435710)

See Also

Other count data: [birds](#), [boves](#), [compiegne](#), [merzbach](#), [mississippi](#), [zuni](#)

compiegne

Compiègne Ceramics

Description

A dataset containing the ceramic counts from the Place des Hallettes in Compiègne (Oise, France). The data are grouped into five periods of about a century, ranging from the 9th to the 14th century, and sixteen ceramic types.

Usage

compiegne

Format

A data frame with 5 rows (chronological periods, numbered from the oldest to the most recent from 1 to 5) and 16 variables (ceramic types):

- A** Red to white ceramics with fine sized inclusions.
- B** Red to white ceramics with medium sized inclusions.
- C** Dark ceramics with fine sized inclusions.
- D** Dark ceramics with medium sized inclusions.
- E** Ceramics close to those of groups B or D, with similarities to group F.
- F** Black, red or beige ceramics with coarse inclusions.
- G** Red polished ceramics with fine to medium sized inclusions.
- H** Black polished ceramics with fine sized inclusions.
- I** Black polished ceramics with medium sized inclusions.
- J** Polished and painted ceramics with fine to medium sized inclusions.
- K** Painted ceramics, similar to those of group A.
- L** Painted ceramics, similar to those of group B.
- M** Painted ceramics with coarse inclusions.
- N** Glazed ceramics.
- O** Stamped ceramics.
- P** Coated ceramics.

Source

Lacroix, M. C. (1997). La céramique médiévale du site des Hallettes à Compiègne (Oise). *Revue archéologique de Picardie*. Numéro spécial, 13(1), 135-168. doi: [10.3406/pica.1997.1945](https://doi.org/10.3406/pica.1997.1945)

See Also

Other count data: [birds](#), [boves](#), [chevelon](#), [merzbach](#), [mississippi](#), [zuni](#)

epica2008

EPICA Dome C

Description

EPICA Dome C 800-ka composite CO_2 data.

Usage

epica2008

Format

A data frame with 2 variables:

age Year BP.

CO2 CO_2 (ppmv).

Source

<https://www.ncdc.noaa.gov/paleo-search/study/6091>

References

Lüthi, D., Le Floch, M., Bereiter, B., Blunier, T., Barnola, J.-M., Siegenthaler, U., Raynaud, D., Jouzel, J., Fischer, H., Kawamura, K. and Stocker, T. F. (2008). High-resolution carbon dioxide concentration record 650,000-800,000 years before present. *Nature*, 453, 379-382. doi: [10.1038/nature06949](https://doi.org/10.1038/nature06949)

Monnin, E., Indermuhle, A., Dallenbach, A., Fluckiger, J., Stauffer, B., Stocker, T. F., Raynaud, D. and Barnola, J.-M. (2001). Atmospheric CO_2 concentrations over the last glacial termination. *Science*, 291, 112-114. doi: [10.1126/science.291.5501.112](https://doi.org/10.1126/science.291.5501.112)

Petit, J. R., Jouzel, J., Raynaud, D., Barkov, N. I., Barnola, J.-M., Basile, I., Benders, M., Chappellaz, J., Davis, M., Delayque, G., Delmotte, M., Kotlyakov, V. M., Legrand, M., Lipenkov, V. Y., Lorius, C., Pepin, L., Ritz, C., Saltzman, E. and Stievenard, M. (1999). Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica. *Nature*, 399, 429-436. doi: [10.1038/20859](https://doi.org/10.1038/20859)

Siegenthaler, U., Stocker, T. F., Monnin, E., Lüthi, D., Schwander, J., Stauffer, B., Raynaud, D., Barnola, J.-M., Fischer, H., Masson-Delmotte, V., Jouzel, J. (2005). Stable Carbon Cycle-Climate Relationship During the Late Pleistocene. *Science*, 310, 1313-1317. doi: [10.1126/science.1120130](https://doi.org/10.1126/science.1120130)

See Also

Other palaeoenvironment: [law2006](#), [lisiecki2005](#), [spratt2016](#)

Examples

```
plot(  
  x = epica2008$age / 1000,  
  y = epica2008$C02,  
  type = "l",  
  xlim = c(800, 0),  
  xlab = "kilo year BP",  
  ylab = expression("CO"[2]~"(ppmv)"),  
  )
```

intcal09

IntCal09

Description

The IntCal series of radiocarbon calibration curves.

Usage

```
intcal09
```

Format

A data frame with 5 variables:

calBP Calendar (calibrated) age (year BP).

age Radiocarbon age (year BP).

error Radiocarbon error (year BP).

delta Isotopic ratio $\Delta^{14}C$ (per mil).

sigma Error on delta (per mil).

Source

Reimer, P. J., Baillie, M. G. L., Bard, E., Bayliss, A., Beck, J. W., Blackwell, P. G., Bronk Ramsey, C. *et al.* (2009). IntCal09 and Marine09 Radiocarbon age Calibration Curves, 0-50,000 Years Cal BP. *Radiocarbon*, 51(4): 1111-50. doi: [10.1017/S0033822200034202](https://doi.org/10.1017/S0033822200034202).

See Also

Other radiocarbon dating: [arnold1949](#), [intcal13](#), [intcal20](#)

intcal13

IntCal13

Description

The IntCal series of radiocarbon calibration curves.

Usage

intcal13

Format

A data frame with 5 variables:

calBP Calendar (calibrated) age (year BP).

age Radiocarbon age (year BP).

error Radiocarbon error (year BP).

delta Isotopic ratio $\Delta^{14}C$ (per mil).

sigma Error on del ta (per mil).

Source

Reimer, P. J., Bard, E. Bayliss, A., Beck, J. W., Blackwell, P. G., Bronk Ramsey, C., Buck, C. E. *et al.* (2013). IntCal13 and Marine13 Radiocarbon age Calibration Curves 0-50,000 Years cal BP. *Radiocarbon*, 55(4): 1869-87. doi: [10.2458/azu_js_rc.55.16947](https://doi.org/10.2458/azu_js_rc.55.16947).

See Also

Other radiocarbon dating: [arnold1949](#), [intcal09](#), [intcal20](#)

intcal20

IntCal20

Description

The IntCal series of radiocarbon calibration curves.

Usage

intcal20

Format

A data frame with 5 variables:

calBP Calendar (calibrated) age (year BP).

age Radiocarbon age (year BP).

error Radiocarbon error (year BP).

delta Isotopic ratio $\Delta^{14}C$ (per mil).

sigma Error on delta (per mil).

Source

Reimer, P. J., Austin, W. E. N., Bard, E., Bayliss, A., Blackwell, P. G., Bronk Ramsey, C., Butzin, M. *et al.* (2020). The IntCal20 Northern Hemisphere Radiocarbon Age Calibration Curve (0-55 Cal KBP). *Radiocarbon*, 62(4), 725-757. doi: [10.1017/RDC.2020.41](https://doi.org/10.1017/RDC.2020.41).

See Also

Other radiocarbon dating: [arnold1949](#), [intcal09](#), [intcal13](#)

kommos

Transport Jars from Kommos (Crete).

Description

Chemical analysis (neutron activation analysis) of 88 Late Bronze Age transport jars found in excavations at Kommos, Crete.

Usage

kommos

Format

A data frame with 22 variables (chemical elements):

type CJ: Canaanite jar; EJ: Egyptian jar; TSJ: transport stirrup jar; SNA: short-necked amphora.

date Chronology (period).

Sm (ppm).

Lu (ppm).

U (ppm).

Yb (ppm).

As (ppm).

Sb (ppm).

Ca (ppm).

Na (ppm).
La (ppm).
Ce (ppm).
Th (ppm).
Cr (ppm).
Hf (ppm).
Cs (ppm).
Sc (ppm).
Rb (ppm).
Fe (ppm).
Ta (ppm).
Co (ppm).
Eu (ppm).

References

Day, P. M., Quinn, P. S., Rutter, J. B. & Kilikoglou, V. (2011). A World of Goods: Transport Jars and Commodity Exchange at the Late Bronze Age Harbor of Kommos, Crete. *Hesperia*, 80, 511-558. doi: [10.2972/hesperia.80.4.0511](https://doi.org/10.2972/hesperia.80.4.0511)

law2006

Law Dome Ice Core

Description

Law Dome Ice Core 2000-year CH_4 , CO_2 and N_2O data.

Usage

law2006

Format

A data frame with 2004 observations and 8 variables:

year Year AD.

NOAA04 NOAA04 CH_4 scale.

CH4_spl CH_4 spline (ppb).

CH4_grw CH_4 growth Rate (ppb/yr).

CO2_spl CO_2 spline (ppb).

CO2_grw CO_2 growth Rate (ppb/yr).

N2O_spl N_2O spline (ppb).

N2O_grw N_2O growth Rate (ppb/yr).

Source

<https://www.ncdc.noaa.gov/paleo-search/study/9959>

References

MacFarling Meure, C., Etheridge, D., Trudinger, C., Steele, P., Langenfelds, R., van Ommen, T., Smith, A. and Elkins, J. (2006). The Law Dome CO₂, CH₄ and N₂O Ice Core Records Extended to 2000 years BP. *Geophysical Research Letters*, 33(14), L14810. doi: [10.1029/2006GL026152](https://doi.org/10.1029/2006GL026152).

See Also

Other palaeoenvironment: [epica2008](#), [lisiecki2005](#), [spratt2016](#)

Examples

```
plot(  
  x = law2006$year,  
  y = law2006$CO2_spl,  
  type = "l",  
  xlab = "Year AD",  
  ylab = expression("CO"[2]~"(ppm)")  
)
```

lisiecki2005

Global Benthic $\delta^{18}O$ Stack

Description

A global Pliocene-Pleistocene benthic $\delta^{18}O$ stack.

Usage

```
lisiecki2005
```

Format

A data frame with 3 variables:

age Calendar (calibrated) age (kilo year).

delta Benthic $\delta^{18}O$ (per mil).

error Standard error (per mil).

Details

The LR04 stack spans 5.3 Myr and is an average of 57 globally distributed benthic $\delta^{18}O$ records (which measure global ice volume and deep ocean temperature) collected from the scientific literature.

Source

<https://www.ncdc.noaa.gov/paleo-search/study/5847>

References

Lisiecki, L. E. and Raymo, M. E. (2005). A Pliocene-Pleistocene stack of 57 globally distributed benthic $\delta^{18}O$ records. *Paleoceanography*, 20, PA1003. doi: [10.1029/2004PA001071](https://doi.org/10.1029/2004PA001071)

See Also

Other palaeoenvironment: [epica2008](#), [law2006](#), [spratt2016](#)

Other isotopic data: [nydal1996](#), [spratt2016](#)

Examples

```
plot(  
  x = lisiecki2005$age,  
  y = lisiecki2005$delta,  
  type = "l",  
  xlim = c(500, 0),  
  xlab = "kilo year BP",  
  ylab = expression(delta^{18}*"0")  
)
```

merzbach

Merzbach Ceramics

Description

A dataset containing the ceramic counts from the Merzbach assemblage (Germany). The data are grouped into eight phases.

Usage

merzbach

Format

A data frame with 8 rows (phases, numbered from VII to XIV) and 36 variables (pottery motifs).

Source

Crema, E. R., Kandler, A. & Shennan, S. (2016). Revealing Patterns of Cultural Transmission from Frequency Data: Equilibrium and Non-Equilibrium Assumptions. *Scientific Reports*, 6(1). doi: [10.1038/srep39122](https://doi.org/10.1038/srep39122).

Crema, E. R. (2016). Sample codes and data for "Revealing patterns of cultural transmission from frequency data: equilibrium and non-equilibrium assumptions". *Zenodo*, v1.0. doi: [10.5281/zenodo.187558](https://doi.org/10.5281/zenodo.187558).

See Also

Other count data: [birds](#), [boves](#), [chevelon](#), [compiegne](#), [mississippi](#), [zuni](#)

mississippi

Mississippi Ceramics

Description

A dataset containing ceramic counts from the Mississippi region.

Usage

mississippi

Format

A data frame with 20 rows and 10 variables (ceramic types):

ParkinPunctate

BartonKentMPI

Painted

FortuneNoded

RanchIncised

WallsEngraved

WallaceIncised

RhodesIncised

VernonPaulApplique

HullEngraved

Source

Lipo, C. P., Madsen, M. E. & Dunnell, R. C. (2015). A Theoretically-Sufficient and Computationally-Practical Technique for Deterministic Frequency Seriation. *PLOS ONE*, 10(4), e0124942. doi: [10.1371/journal.pone.0124942](https://doi.org/10.1371/journal.pone.0124942).

See Also

Other count data: [birds](#), [boves](#), [chevelon](#), [compiegne](#), [merzbach](#), [zuni](#)

nydal1996 $\delta^{14}C$ Measurements in Atmospheric CO₂

Description

Corrected ^{14}C measurements from air samples collected at five Norwegian sites from 1962-1993.

Usage

nydal1996

Format

A data frame with 5 variables:

site Sampling station.

start Beginning date of the sampling period.

end Ending date of the sampling period.

delta Isotopic ratio $\Delta^{14}C$ (per mil).

sigma Error on del ta (per mil).

Source

Nydal, R. and Lövseth, K. (1996). *Carbon-14 Measurements in Atmospheric CO₂ from Northern and Southern Hemisphere Sites, 1962-1993*. ORNL/CDIAC-93; NDP-057. Washington, DC: USDOE Office of Energy Research. doi: [10.2172/461185](https://doi.org/10.2172/461185)

See Also

Other isotopic data: [lisiiecki2005](#), [spratt2016](#)

Examples

```
plot(  
  x = nydal1996$start,  
  y = nydal1996$delta,  
  type = "p",  
  xlab = "Date",  
  ylab = expression(Delta^{14}*"%C")  
)
```

spratt2016

Late Pleistocene Sea Level Stack

Description

A Late Pleistocene sea level stack based on marine sediment core data (foraminiferal carbonate $\delta^{18}O$).

Usage

spratt2016

Format

A data frame with 9 variables:

age_calkaBP Age (calendar kilo year BP).

SeaLev_shortPC1 Sea Level (meters above present day), climate reconstructions (scaled first principal component of seven sea level reconstructions (0-430 ka)).

SeaLev_shortPC1_err_sig Sea Level standard deviation from bootstrap (meters), climate reconstructions (scaled first principal component of seven sea level reconstructions (0-430 ka)).

SeaLev_shortPC1_err_lo Sea Level 95% confidence interval lower bound (meters), climate reconstructions (scaled first principal component of seven sea level reconstructions (0-430 ka)).

SeaLev_shortPC1_err_up Sea Level 95% confidence interval upper bound (meters), climate reconstructions (scaled first principal component of seven sea level reconstructions (0-430 ka)).

SeaLev_longPC1 Sea Level (meters above present day), climate reconstructions (scaled first principal component of five sea level reconstructions (0-798 ka)).

SeaLev_longPC1_err_sig Sea Level standard deviation from bootstrap (meters), climate reconstructions (scaled first principal component of five sea level reconstructions (0-798 ka)).

SeaLev_longPC1_err_lo Sea Level 95% confidence interval lower bound (meters), climate reconstructions (scaled first principal component of five sea level reconstructions (0-798 ka)).

SeaLev_longPC1_err_up Sea Level 95% confidence interval upper bound (meters), climate reconstructions (scaled first principal component of five sea level reconstructions (0-798 ka)).

Source

<https://www.ncdc.noaa.gov/paleo-search/study/19982>

References

Spratt, R. M. and Lisiecki, L. E. (2016). A Late Pleistocene sea level stack. *Climate of the Past*, 12, 1079-1092. doi: [10.5194/cp1210792016](https://doi.org/10.5194/cp1210792016)

See Also

Other palaeoenvironment: [epica2008](#), [law2006](#), [lisiecki2005](#)

Other isotopic data: [lisiecki2005](#), [nydal1996](#)

Examples

```
plot(
  x = spratt2016$age_calkaBP,
  y = spratt2016$SeaLev_longPC1,
  type = "l",
  xlim = c(500, 0),
  xlab = "kilo year BP",
  ylab = "Sea level (meters above present)"
)
```

 zuni

Zuni Ceramics

Description

A dataset containing ceramic counts from the Zuni region of the American Southwest.

Usage

```
zuni
```

Format

A data frame with 420 rows (assemblages) and 18 variables (ceramic types). The numbers in brackets correspond to the date range of each type (in AD years):

LINO Lino Gray (575-875).

KIAT Kiatuthlanna Black-on-white (850-910).

RED Red Mesa Black-on-white (900-1030).

GALL Gallup Black-on-white (1025-1150).

ESC Escavada Black-on-white (1050-1150).

PUBW Puerco Black-on-white (1050-1200).

RES Reserve Black-on-white (1071-1115).

TULA Tularosa Black-on-white (1175-1300).

PINE Pinedale Black-on-white (1275-1325).

PUBR Puerco Black-on-red (1050-1200).

WING Wingate Black-on-red (1070-1200).

WIPO Wingate Polychrome (1150-1250).

SJ St. Johns Black-on-red/Polychrome (1200-1300).

LSJ St. Johns glaze, Techado Polychrome (1275-1300).

SPR Springerville Polychrome (1250-1300).

PINER Pinedale Black-on-red/Polychrome (1275-1325).

HESH Heshotauthla Polychrome (1285-1400).

KWAK Kwakina Polychrome (1285-1400).

Source

Peebles, M. A., & Schachner, G. (2012). Refining correspondence analysis-based ceramic seriation of regional data sets. *Journal of Archaeological Science*, 39(8), 2818-2827. doi: [10.1016/j.jas.2012.04.040](https://doi.org/10.1016/j.jas.2012.04.040).

See Also

Other count data: [birds](#), [boves](#), [chevelon](#), [compiegne](#), [merzbach](#), [mississippi](#)

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