

# Package ‘folio’

July 22, 2025

**Title** Datasets for Teaching Archaeology and Paleontology

**Version** 1.5.1

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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://codeberg.org/tesselle/folio>,  
<https://packages.tesselle.org/folio/>

**BugReports** <https://codeberg.org/tesselle/folio/issues>

**Depends** R (>= 2.10)

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.3.2

**X-schema.org-applicationCategory** Archaeological Science

**X-schema.org-isPartOf** <https://www.tesselle.org>

**X-schema.org-keywords** archaeology, archaeological-science,  
paleontology, datasets, r-package

**NeedsCompilation** no

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**Repository** CRAN

**Date/Publication** 2025-05-17 14:50:02 UTC

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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** **character**: sample name.

**age\_expected** **integer**: Expected age (year BP).

**age\_expected\_error** **integer**: Error on age\_expected (year BP).

**age\_found** **integer**: Measured age (year BP).

**age\_found\_error** **integer**: Error on age\_found (year BP).

**activity\_expected** **numeric**: Expected specific activity (cpm/g of carbon).

**activity\_found** **numeric**: Measured specific activity (cpm/g of carbon).

**activity\_found\_error** **numeric**: 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 observations (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](#), [loire](#), [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 observations (periods) and 13 variables (ceramic types).

**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](#), [compiegne](#), [loire](#), [merzbach](#), [mississippi](#), [zuni](#)

bronze

*Chinese Ritual Bronzes***Description**

Chemical analysis of 369 Chinese ritual bronzes. The major elements (Cu, Sn and Pb) were measured using atomic absorption spectroscopy and the trace elements using neutron activation analysis.

**Usage**

bronze

**Format**

A data.frame with 88 observations and 22 variables (chemical elements):

**reference** [integer](#): catalog number.

**chronology** [integer](#): chronology (typology).

**dynasty** ordered [factor](#): dynasty name.

**Cu** [numeric](#): Cu content (ppm).

**Sn** [numeric](#): Sn content (ppm).

**Pb** [numeric](#): Pb content (ppm).

**Zn** [numeric](#): Zn content (ppm).

**Au** [numeric](#): Au content (ppm).

**Ag** [numeric](#): Ag content (ppm).

**As** [numeric](#): As content (ppm).

**Sb** [numeric](#): Sb content (ppm).

### Source

Wood, J. R. & Liu, Y. (2023). A Multivariate Approach to Investigate Metallurgical Technology: The Case of the Chinese Ritual Bronzes. *Journal of Archaeological Method and Theory*, 30: 707-756. [doi:10.1007/s10816022095728](https://doi.org/10.1007/s10816022095728).

### References

Bagley, R. W. (1987). *Shang ritual bronzes in the Arthur M. Sackler collections*. New York: The Arthur M. Sackler Foundation.

Rawson, J. (1990). *Western Zhou ritual bronzes from the Arthur M. Sackler collections*. New York: The Arthur M. Sackler Foundation.

So, J. (1995). *Eastern Zhou ritual bronzes from the Arthur M. Sackler Collections*. New York: The Arthur M. Sackler Foundation.

### See Also

Other chemical data: [kommos](#), [verre](#)

---

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 observations (sites) and 10 variables (ground stone types):

**BMe** *integer*: basin metate.

**SMe** *integer*: slab metate.

**TMe** *integer*: Trough metate.

**IMe** *integer*: indeterminate metate.

**UMa** *integer*: unifacial mano.

**BMa** *integer*: bifacial mano.

**MUHa** *integer*: modified unifacial handstone.

**MBHa** *integer*: modified bifacial handstone.

**UUHa** *integer*: unmodified unifacial handstone.

**UBHa** *integer*: 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](#), [loire](#), [merzbach](#), [mississippi](#), [zuni](#)

---

`cities`

*Roman cities*

---

**Description**

A dataset of population, area, and infrastructural measures for Roman cities of the Imperial period.

**Usage**

`cities`

**Format**

A data.frame with 125 observations (Roman cities) and 8 variables:

**name** *character*: site Name.

**area** *integer*: site area, in hectares.

**population** *integer*: population estimate, following the methodology in Hanson and Ortman (2017).

**forum\_area** *integer*: total area of all fora/agorae in the site, in square meters.

**street\_area** *integer*: total area of streets in the site, in square meters.

**street\_length** *integer*: total length of streets in the site, in meters.

**street\_width** *integer*: average width of streets, in square meters.

**block\_area** *integer*: average area of a block, in square meters.

**Source**

Hanson, J. & Ortman, S. (2019). Population, area, and infrastructural measures for Roman cities of the Imperial period. *tDAR*. doi:10.6067/XCV8448563.

**References**

Hanson J. W. & Ortman S. G. (2017). A systematic method for estimating the populations of Greek and Roman settlements. *Journal of Roman Archaeology*, 30: 301-324. doi:10.1017/S1047759400074134.

Hanson J. W., Ortman S. G., Bettencourt L. M. A. & Mazur L. C. (2019). Urban form, infrastructure and spatial organisation in the Roman Empire. *Antiquity*, 93(369): 702-718. doi:10.15184/aqy.2018.192.

**See Also**

Other geographical data: [inrap](#)

---

compiègne

*Compiègne Ceramics*

---

**Description**

A dataset containing the ceramic counts from the Place des Halles 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**

compiègne

**Format**

A data.frame with 5 observations (periods) and 16 variables (ceramic types):

- A** [integer](#): red to white ceramics with fine sized inclusions.
- B** [integer](#): red to white ceramics with medium sized inclusions.
- C** [integer](#): dark ceramics with fine sized inclusions.
- D** [integer](#): dark ceramics with medium sized inclusions.
- E** [integer](#): ceramics close to those of groups B or D, with similarities to group F.
- F** [integer](#): black, red or beige ceramics with coarse inclusions.
- G** [integer](#): red polished ceramics with fine to medium sized inclusions.
- H** [integer](#): black polished ceramics with fine sized inclusions.
- I** [integer](#): black polished ceramics with medium sized inclusions.
- J** [integer](#): polished and painted ceramics with fine to medium sized inclusions.
- K** [integer](#): painted ceramics, similar to those of group A.

**L** *integer*: painted ceramics, similar to those of group B.

**M** *integer*: painted ceramics with coarse inclusions.

**N** *integer*: glazed ceramics.

**O** *integer*: stamped ceramics.

**P** *integer*: coated ceramics.

Chronological periods are numbered from the oldest to the most recent (from 1 to 5).

### 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

### See Also

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

---

epica2008

*EPICA Dome C*

---

### Description

EPICA Dome C 800-ka composite  $CO_2$  data.

### Usage

epica2008

### Format

A data.frame with 1096 observations and 2 variables:

**age** *integer*: year BP.

**CO2** *numeric*:  $CO_2$  (ppmv).

### Source

<https://www.ncei.noaa.gov/access/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<sub>2</sub> 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 data: [law2006](#), [lisiecki2005](#), [ngrip2004](#), [ngrip2010](#), [spratt2016](#)

## Examples

```
plot(
  x = epica2008$age / 1000,
  y = epica2008$CO2,
  type = "l",
  xlim = c(800, 0),
  xlab = "kilo year BP",
  ylab = expression("CO"[2]~"(ppmv)"))
)
```

---

inrap

*Location of Inrap Archaeological Sites*


---

## Description

A dataset of geographical locations of archaeological sites in France.

## Usage

```
inrap
```

**Format**

A data.frame with 625 observations (archaeological sites) and 11 variables:

**X** **numeric**: longitude (RGF93 v1 / Lambert-93).

**Y** **numeric**: latitude (RGF93 v1 / Lambert-93).

**region** **character**: French region.

**departement** **character**: French departement.

**commune** **character**: French city.

**site** **character**: name of the site.

**start** **Date**: excavation start date.

**end** **Date**: excavation end date.

**period** **list**: chronology periods.

**theme** **list**: themes.

**type** **character**.

**Details**

This dataset presents the geographical locations of a selection of preventive archaeological excavations carried out in France by the Institut national de recherches archéologiques préventives (Inrap).

**Source**

<https://www.data.gouv.fr/fr/datasets/r/b098d16a-ae19-48e4-8c58-e659e0603acd> (last update: 2024-06-03)

**See Also**

Other geographical data: [cities](#)

**Examples**

```
# library(sf)
# coord <- st_as_sf(inrap, coords = c("X", "Y"), crs = st_crs(2154))
# plot(coord["region"])
```

---

|          |                 |
|----------|-----------------|
| intcal09 | <i>IntCal09</i> |
|----------|-----------------|

---

**Description**

The IntCal series of radiocarbon calibration curves.

**Usage**

intcal09

**Format**

A data.frame with 3522 observations and 5 variables:

**calBP** *integer*: calendar (calibrated) age (year BP).

**age** *integer*: radiocarbon age (year BP).

**error** *integer*: radiocarbon error (year BP).

**delta** *numeric*: isotopic ratio  $\Delta^{14}C$  (per mil).

**sigma** *numeric*: 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 5141 observations and 5 variables:

**calBP** *integer*: calendar (calibrated) age (year BP).

**age** *integer*: radiocarbon age (year BP).

**error** *integer*: radiocarbon error (year BP).

**delta** *numeric*: isotopic ratio  $\Delta^{14}C$  (per mil).

**sigma** *numeric*: error on delta (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 | <i>IntCal20</i> |
|----------|-----------------|

---

**Description**

The IntCal series of radiocarbon calibration curves.

**Usage**

```
intcal20
```

**Format**

A data.frame with 9501 observations and 5 variables:

**calBP** *integer*: calendar (calibrated) age (year BP).

**age** *integer*: radiocarbon age (year BP).

**error** *integer*: radiocarbon error (year BP).

**delta** *numeric*: isotopic ratio  $\Delta^{14}C$  (per mil).

**sigma** *numeric*: 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.

**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 88 observations and 22 variables (chemical elements):

**type** **factor**: CJ (Canaanite jar), EJ (Egyptian jar); TSJ (transport stirrup jar), SNA (short-necked amphora).

**date** **character**: chronology (period).

**Sm** **numeric**: Sm content (ppm).

**Lu** **numeric**: Lu content (ppm).

**U** **numeric**: U content (ppm).

**Yb** **numeric**: Yb content (ppm).

**As** **numeric**: As content (ppm).

**Sb** **numeric**: Sb content (ppm).

**Ca** **numeric**: Ca content (ppm).

**Na** **numeric**: Na content (ppm).

**La** **numeric**: La content (ppm).

**Ce** **numeric**: Ce content (ppm).

**Th** **numeric**: Th content (ppm).

**Cr** **numeric**: Cr content (ppm).

**Hf** **numeric**: Hf content (ppm).

**Cs** **numeric**: Cs content (ppm).

**Sc** **numeric**: Sc content (ppm).

**Rb** **numeric**: Rb content (ppm).

**Fe** **numeric**: Fe content (ppm).

**Ta** **numeric**: Ta content (ppm).

**Co** **numeric**: Co content (ppm).

**Eu** **numeric**: Eu content (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)

## See Also

Other chemical data: [bronze](#), [verre](#)

---

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** *integer*: year AD.

**NOAA04** *numeric*: NOAA04  $CH_4$  scale.

**CH4\_spl** *numeric*:  $CH_4$  spline (ppb).

**CH4\_grw** *numeric*:  $CH_4$  growth Rate (ppb/yr).

**CO2\_spl** *numeric*:  $CO_2$  spline (ppb).

**CO2\_grw** *numeric*:  $CO_2$  growth Rate (ppb/yr).

**N2O\_spl** *numeric*:  $N_2O$  spline (ppb).

**N2O\_grw** *numeric*:  $N_2O$  growth Rate (ppb/yr).

## Source

<https://www.ncei.noaa.gov/access/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  $CO_2$ ,  $CH_4$  and  $N_2O$  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 data: [epica2008](#), [lisiecki2005](#), [ngrip2004](#), [ngrip2010](#), [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 2115 observations and 3 variables:

**age** **numeric**: calendar age (kilo year cal BP).

**delta** **numeric**: benthic  $\delta^{18}O$  (per mil).

**error** **numeric**: 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.ncei.noaa.gov/access/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 data: [epica2008](#), [law2006](#), [ngrip2004](#), [ngrip2010](#), [spratt2016](#)

Other isotopic data: [ngrip2004](#), [ngrip2010](#), [nydal1996](#), [spratt2016](#), [vegetation](#)

## Examples

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

---

loire

---

*Medieval Ceramics from the Loire Basin*


---

## Description

A dataset containing the ceramic counts from the Loire Basin (France).

## Usage

```
loire
```

## Format

A data.frame with 332 observations (assemblages) and 331 variables (ceramic types). The first five columns provide background information, the next columns give the MNI of each ceramic types:

**site** *character*: name of the archaeological site.

**city** *character*: city.

**area** *character*: geographical area.

**lower** *integer*: lower bound of the temporal range (year AD).

**upper** *integer*: upper bound of the temporal range (year AD).

## Source

<https://ceramedvaldeloire.huma-num.fr/editions/suppl79racf2022/accueil>

## References

Husi, P. (dir.). (2022). *La céramique médiévale et moderne du bassin de la Loire moyenne, chronotypologie et transformation des aires culturelles dans la longue durée (6e-19e s.)*. Suppléments à la revue Archéologique du Centre de la France, 79.

## See Also

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



---

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 observations (chronological phases) and 36 variables (pottery motifs).

**Source**

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.

**References**

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.

**See Also**

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

---

mississippi*Mississippi Ceramics*

---

**Description**

A dataset containing ceramic counts from the Mississippi region.

**Usage**

mississippi

**Format**

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

**ParkinPunctate** [integer](#).  
**BartonKentMPI** [integer](#).  
**Painted** [integer](#).  
**FortuneNoded** [integer](#).  
**RanchIncised** [integer](#).  
**WallsEngraved** [integer](#).  
**WallaceIncised** [integer](#).  
**RhodesIncised** [integer](#).  
**VernonPaulApplique** [integer](#).  
**HullEngraved** [integer](#).

**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](#).

**See Also**

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

---

munsingen

*Münsingen Cemetery*


---

**Description**

A dataset of data set of artifact presence/absence for the Celtic Münsingen-Rain cemetery (Switzerland).

**Usage**

```
munsingen
```

**Format**

A data.frame with 59 observations (graves) and 70 variables (artefact types).

**References**

Hodson, F. R. (1968). *The La Tene Cemetery at Münsingen-Rain*. Stämpfli, Bern.  
 Kendall, D. G. (1971). Seriation from abundance matrices. In Hodson, F. R., Kendall, D. G. and Tautu, P. (eds), *Mathematics in the Archaeological and Historical Sciences*. Edinburgh University Press, Edinburgh, 215-232.

**See Also**

Other artefact data: [shipwrecks](#)

**Examples**

```
heatmap(  
  x = as.matrix(munsingen),  
  Rowv = NA,  
  Colv = NA,  
  scale = "none",  
  col = c("white", "black")  
)
```

---

ngrip2004

*NGRIP 50-year Average*

---

**Description**

50-year averaged oxygen isotope data from the North Greenland Ice Core Project (ss09sea time scale).

**Usage**

```
ngrip2004
```

**Format**

A data.frame with 4918 observations and 2 variables:

**age** *integer*: calendar age (years before 2000 AD), ss09sea time scale.

**delta** *numeric*:  $\delta^{18}O$  (per mil).

**Source**

<https://www.ncei.noaa.gov/access/paleo-search/study/2481>

**References**

North Greenland Ice Core Project members (2004). High-resolution record of Northern Hemisphere climate extending into the last interglacial period. *Nature*, 431(7005), 147-151. doi:[10.1038/nature02805](#)

**See Also**

Other palaeoenvironment data: [epica2008](#), [law2006](#), [lisiecki2005](#), [ngrip2010](#), [spratt2016](#)

Other isotopic data: [lisiecki2005](#), [ngrip2010](#), [nydal1996](#), [spratt2016](#), [vegetation](#)

**Examples**

```
plot(
  x = ngrip2004$age / 1000,
  y = ngrip2004$delta,
  type = "l",
  xlim = c(120, 0),
  xlab = "ss09sea (ka b2k)",
  ylab = expression(delta^{18}*0")
)
```

---

ngrip2010

---

*NGRIP 20-year Average*


---

**Description**

20-year averaged oxygen isotope data from the North Greenland Ice Core Project (GICC05 time scale).

**Usage**

```
ngrip2010
```

**Format**

A data.frame with 6114 observations and 4 variables:

**age** *integer*: calendar age (years before 2000 AD), GICC05 time scale (or GICC05modelext when going beyond 60 ka b2k).

**depth** *numeric*: depth (meters).

**delta** *numeric*:  $\delta^{18}O$  (per mil).

**MCE** *numeric*: maximum counting error (years).

**Note**

Use the labels GICC05 (or GICC05modelext when going beyond 60 ka b2k) on graphs.

**Source**

<https://www.iceandclimate.nbi.ku.dk/data/>

## References

- Vinther, B. M., Clausen, H. B., Johnsen, S. J., Rasmussen, S. O., Andersen, K. K., Buchardt, S. L., Dahl-Jensen, D., Seierstad, I. K., Siggaard-Andersen, M.-L., Steffensen, J. P., Svensson, A. M., Olsen, J. & Heinemeier, J. (2006). A synchronized dating of three Greenland ice cores throughout the Holocene. *Journal of Geophysical Research*, 111, D13102. doi:10.1029/2005JD006921.
- Rasmussen, S. O., Andersen, K. K., Svensson, A. M., Steffensen, J. P., Vinther, B. M., Clausen, H. B., Siggaard-Andersen, M.-L., Johnsen, S. J., Larsen, L. B., Dahl-Jensen, D., Bigler, M., Röthlisberger, R., Fischer, H., Goto-Azuma, K., Hansson, M. E. & Ruth, U. (2006). A new Greenland ice core chronology for the last glacial termination. *Journal of Geophysical Research*, 111, D06102. doi:10.1029/2005JD006079.
- Andersen, K. K., Svensson, A., Johnsen, S. J., Rasmussen, S. O., Bigler, M., Röthlisberger, R., Ruth, U., Siggaard-Andersen, M.-L., Steffensen, J. P., Dahl-Jensen, D., Vinther, B. M. & Clausen, H.B. (2005). The Greenland Ice Core Chronology 2005, 15-42 ka. Part 1: Constructing the time scale. *Quaternary Science Reviews*, 25(23-24):3246-3257. doi:10.1016/j.quascirev.2006.08.002.
- Svensson, A., Andersen, K. K., Bigler, M., Clausen, H. B., Dahl-Jensen, D., Davies, S. M., Johnsen, S. J., Muscheler, R., Rasmussen, S. O., Röthlisberger, R., Seierstad, I., Steffensen, J. P. & Vinther, B. M. (2008). A 60,000 year Greenland stratigraphic ice core chronology. *Climate of the Past*, 4:47–57. doi:10.5194/cp4472008.
- Wolff, E. W., Chappellaz, J., Blunier, T., Rasmussen, S. O. & Svensson, A. (2010). Millennial-scale variability during the last glacial: The ice core record. *Quaternary Science Reviews*, 29:2828-2838. doi:10.1016/j.quascirev.2009.10.013.

## See Also

Other palaeoenvironment data: [epica2008](#), [law2006](#), [lisiecki2005](#), [ngrip2004](#), [spratt2016](#)  
 Other isotopic data: [lisiecki2005](#), [ngrip2004](#), [nydal1996](#), [spratt2016](#), [vegetation](#)

## Examples

```
plot(
  x = ngrip2010$age / 1000,
  y = ngrip2010$delta,
  type = "l",
  xlim = c(120, 0),
  xlab = "GICC05",
  ylab = expression(delta^{18}*10^0))
```

---

nydal1996

<sup>14</sup>C Measurements in Atmospheric CO<sub>2</sub>


---

## Description

Corrected <sup>14</sup>C measurements from air samples collected at five Norwegian sites from 1962-1993.

**Usage**

nydal1996

**Format**

A data.frame with 620 observations and 5 variables:

**site** *character*: sampling station.

**start** *Date*: beginning date of the sampling period.

**end** *Date*: ending date of the sampling period.

**delta** *numeric*: isotopic ratio  $\Delta^{14}C$  (per mil).

**sigma** *numeric*: error on delta (per mil).

**Source**

Nydal, R. and Lövseth, K. (1996). *Carbon-14 Measurements in Atmospheric CO<sub>2</sub> from Northern and Southern Hemisphere Sites, 1962-1993*. ORNL/CDIAC-93; NDP-057. Washington, DC: USDOE Office of Energy Research. doi:10.2172/461185

**See Also**

Other isotopic data: [lisiecki2005](#), [ngrip2004](#), [ngrip2010](#), [spratt2016](#), [vegetation](#)

**Examples**

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

---

shipwrecks

*Mediterranean Shipwrecks*

---

**Description**

A dataset of Mediterranean shipwrecks.

**Usage**

shipwrecks

**Format**

A data.frame with 1784 observations (wrecks) and 13 variables:

**name** *character*: wreck name.  
**sea** *character*: region of the sea where the wreck was discovered.  
**country** *character*: country where the wreck was discovered.  
**region** *character*: region where the wreck was discovered.  
**depth\_min** *integer*: minimum depth of the wreck (m).  
**depth\_max** *integer*: maximum depth of the wreck (m).  
**depth** *character*: depth of the wreck (m).  
**period** *character*: chronology (period).  
**dating** *character*: chronology (dating).  
**date\_early** *integer*: earliest date.  
**date\_late** *integer*: latest date.  
**origin** *character*: place of origin.  
**destination** *character*: place of destination.

**Note**

This dataset contains typos and needs to be normalized.

**Source**

Strauss, J. (2013). *Shipwrecks Database*. Version 1.0. Accessed 2022-08-13. URL: [https://oxrep.classics.ox.ac.uk/databases/shipwrecks\\_database/](https://oxrep.classics.ox.ac.uk/databases/shipwrecks_database/)

**References**

Parker, A. J. (1992). *Ancient Shipwrecks of the Mediterranean and the Roman Provinces*. British Archaeological Reports International Series 580. Oxford.

Strauss, E. J. (2007). *Roman Cargo: Underwater Evidence from the Eastern Mediterranean*. Doctoral thesis, University College London. URL: <https://discovery.ucl.ac.uk/id/eprint/1349806>.

**See Also**

Other artefact data: [munsingen](#)

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 799 observations and 9 variables:

**age\_calkaBP** *integer*: age (calendar kilo year BP).

**SeaLev\_shortPC1** *numeric*: sea Level (meters above present day), climate reconstructions (scaled first principal component of seven sea level reconstructions (0-430 ka)).

**SeaLev\_shortPC1\_err\_sig** *numeric*: 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** *numeric*: 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** *numeric*: sea Level 95% confidence interval upper bound (meters), climate reconstructions (scaled first principal component of seven sea level reconstructions (0-430 ka)).

**SeaLev\_longPC1** *numeric*: sea Level (meters above present day), climate reconstructions (scaled first principal component of five sea level reconstructions (0-798 ka)).

**SeaLev\_longPC1\_err\_sig** *numeric*: 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** *numeric*: 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** *numeric*: 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.ncei.noaa.gov/access/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 data: [epica2008](#), [law2006](#), [lisiecki2005](#), [ngrip2004](#), [ngrip2010](#)

Other isotopic data: [lisiecki2005](#), [ngrip2004](#), [ngrip2010](#), [nydal1996](#), [vegetation](#)

## 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)"
)
```

---

stratigraphy

*Chronostratigraphic Chart*


---

## Description

The ICS international chronostratigraphic chart (v2022/2).

## Usage

```
stratigraphy
```

## Format

A data.frame with 176 observations and 5 variables:

**type** [character](#): unit type ("eon", "era", "period", "series" or "stage"). Precambrian and Hadean are informal units.

**name** [character](#): unit name.

**age** [numeric](#): numerical age (Ma).

**error** [numeric](#): error on numerical age (Ma).

**parent** [character](#): parent unit.

## Source

<https://stratigraphy.org/ICSchart/ChronostratChart2022-02.pdf>

## References

Cohen, K. M., Finney, S. C., Gibbard, P. L. and Fan, J.-X. (2013). The ICS International Chronostratigraphic Chart. *Episodes*, 36(3): 199-204. doi:[10.18814/epiiugs/2013/v36i3/002](https://doi.org/10.18814/epiiugs/2013/v36i3/002)

---

|            |                                      |
|------------|--------------------------------------|
| vegetation | $\delta^{13}C$ Values for Vegetation |
|------------|--------------------------------------|

---

## Description

$\delta^{13}C$  Values for Vegetation

## Usage

vegetation

## Format

A data.frame with 155 observations and 5 variables:

**family** *character*: plant family.

**species** *character*: plant species.

**type** *character*: C3 or C4 plant.

**delta** *numeric*: isotopic ratio  $\delta^{13}C$  (per mil).

**country** *character*: country.

## Source

Cerling, T. E. and Harris, J. M. (1999). Carbon isotope fractionation between diet and bioapatite in ungulate mammals and implications for ecological and paleoecological studies. *Oecologia*, 120, 347-363. doi:[10.1007/s004420050868](https://doi.org/10.1007/s004420050868)

## See Also

Other isotopic data: [lisiecki2005](#), [ngrip2004](#), [ngrip2010](#), [nydal1996](#), [spratt2016](#)

## Examples

```
hist(
  x = vegetation$delta,
  breaks = 20,
  main = "C3 and C4 plants",
  xlab = expression(delta^{13}*C"),
  xlim = c(-40, 0)
)

boxplot(
  delta ~ type,
```

```

data = vegetation,
horizontal = TRUE,
xlab = expression(delta^{13}*"%"),
ylab = "Plant",
ylim = c(-40, 0)
)

```

verre

*French Medieval Glass Composition*

### Description

Chemical analysis (electron probe X-ray micro analysis) of 398 medieval glass vessels found in France.

### Usage

```
verre
```

### Format

A data.frame with 398 observations and 17 variables:

**Site factor:** CNL (Cour Napoléon, Louvre), ORL (Orléans), POI (Poitiers), ANG (Angers), OMO (Omonville, Seine Maritime), ROU (Rouen), MEA (Meaux), CHL (Châlons-sur-Marne), PAI (Pairu, Argonne, Ardennes), BER (Bercettes, Argonne, Ardennes), BIN (Binois, Argonne, Ardennes), CHE (Chevrie, Argonne, Ardennes), MIT (Mitte, Argonne, Ardennes), MET (Metz), CHM (Chambaran).

**Sample character:** sample code.

**Type character:** typology.

**Age character:** century.

**Periode factor:** I (9th-12th century), II (13th-first half of the 15th century), III (end of the 15th to end of the 16th century), IV (end of 16th to end of the 17th century).

**Tint factor:** ? (unknown), B (blue), CL (colourless), CLg (colourless – greyish tint), PB (pale blue; PGE: pale greenish), PGE-B (pale green-blue or blue-green), PGY-B (pale grey-blue), R (opaque red), W (opaque white), \*av (added aventurine spots), \*bl (added thread blue or blue spots), \*r (added thread opaque red or opaque red spots), \*w (added thread opaque white).

**Na2O numeric:** Na2O content (percent).

**CaO numeric:** CaO content (percent).

**K2O numeric:** K2O content (percent).

**MgO numeric:** MgO content (percent).

**P2O5 numeric:** P2O5 content (percent).

**SiO2 numeric:** SiO2 content (percent).

**Al2O3 numeric:** Al2O3 content (percent).

**FeO** *numeric*: FeO content (percent).

**MnO** *numeric*: MnO content (percent).

**Cl** *numeric*: Cl content (percent).

**Reference** *character*: site reference.

## References

Barrera J., Velde B. (1989). A study of french medieval glass composition. *Archéologie médiévale*, 19, 81-130. doi:[10.3406/arcme.1989.953](https://doi.org/10.3406/arcme.1989.953).

## See Also

Other chemical data: [bronze](#), [kommos](#)

## Examples

```
plot(
  x = verre$Na2O,
  y = verre$CaO / (verre$CaO + verre$K2O),
  type = "p",
  xlab = expression("Na"[2]*"O (%)"),
  ylab = expression("CaO"/"(CaO"+"K"[2]*"O)"),
)
```

---

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 observations (assemblages) and 18 variables (ceramic types):

**LINO** *integer*: Lino Gray (575-875).

**KIAT** *integer*: Kiatuthlanna Black-on-white (850-910).

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

**GALL** *integer*: Gallup Black-on-white (1025-1150).

**ESC** *integer*: Escavada Black-on-white (1050-1150).

**PUBW** *integer*: Puerco Black-on-white (1050-1200).

**RES** *integer*: Reserve Black-on-white (1071-1115).

**TULA** [integer](#): Tularosa Black-on-white (1175-1300).  
**PINE** [integer](#): Pinedale Black-on-white (1275-1325).  
**PUBR** [integer](#): Puerco Black-on-red (1050-1200).  
**WING** [integer](#): Wingate Black-on-red (1070-1200).  
**WIPO** [integer](#): Wingate Polychrome (1150-1250).  
**SJ** [integer](#): St. Johns Black-on-red/Polychrome (1200-1300).  
**LSJ** [integer](#): St. Johns glaze, Techado Polychrome (1275-1300).  
**SPR** [integer](#): Springerville Polychrome (1250-1300).  
**PINER** [integer](#): Pinedale Black-on-red/Polychrome (1275-1325).  
**HESH** [integer](#): Heshotauthla Polychrome (1285-1400).  
**KWAK** [integer](#): Kwakina Polychrome (1285-1400).

The numbers in brackets correspond to the date range of each type (in AD years).

### 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.

### See Also

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

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