Package 'IsoplotR'

May 5, 2016

Title Statistical Toolbox for Radiometric Geochronology

Version 0.2

Description An R implementation of Ken Ludwig's popular Isoplot add-in to Microsoft Excel. Currently plots U-Pb data on Wetherill and Tera-Wasserburg concordia diagrams, taking into account error correlations. Future versions will include functionality for the Ar-Ar, Rb-Sr, Sm-Nd, Re-Os, U-Th-He, fission track and cosmogenic nuclide methods, including isochrons, age spectra, ternary diagrams, kernel density estimates, radial plots, banana diagrams and multidimensional scaling plots. A graphical user interface is provided as an RStudio Shiny app.

Author Pieter Vermeesch [aut, cre]

Maintainer Pieter Vermeesch <p.vermeesch@ucl.ac.uk>

Depends R (>= 3.0.0)

Imports methods

License GPL-2

LazyData true

RoxygenNote 5.0.1

R topics documented:

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concordia.plot	*Concordia diagram*

Description

Wetherill and Tera-Wasserburg concordia diagrams

Usage

```
concordia.plot(x, limits = NULL, alpha = 0.05, wetherill = TRUE,
  show.numbers = FALSE, ellipse.col = rgb(0, 1, 0, 0.5),
  concordia.col = "darksalmon", dcu = TRUE)
```

Arguments

x	an object of class UPb
limits	age limits of the concordia line
alpha	confidence cutoff for the error ellipses
wetherill	boolean flag (FALSE for Tera-Wasserburg)
show.numbers	boolean flag (TRUE to show grain numbers)
ellipse.col	background colour of the error ellipses
concordia.col	colour of the concordia line
dcu	show decay constant uncertainty?

Examples

```
data(UPb)
concordia.plot(UPb)
```

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get.covmat	*Get the covariance matrix of a sample*

Description

Returns the covariance matrix of the ith sample

Usage

```
get.covmat(x, i)
```

Arguments

x	an object of class UPb
i	the index of the sample of interest

Value

a covariance matrix of size [3x3]

Examples

```
data(UPb)
get.covmat(UPb,2)
```

---

get.ellipse *Get coordinates of error ellipse for plotting*

Description

Construct an error ellipse age a given confidence level from its centre and covariance matrix

Usage

```
get.ellipse(x, y, covmat, alpha = 0.05)
```

Arguments

x	x-coordinate (scalar) for the centre of the ellipse
y	y-coordinate (scalar) for the centre of the ellipse
covmat	covariance matrix of the x-y coordinates
alpha	the probability cutoff for the error ellipses

Value

a [50x2] matrix of plot coordinates

Examples

```
x = 99; y = 101;
covmat <- matrix(c(1,0.9,0.9,1),nrow=2)
ell <- get.ellipse(x,y,covmat)
plot(c(90,110),c(90,110),type='l')
polygon(ell,col=rgb(0,1,0,0.5))
points(x,y,pch=21,bg='black')
```

---

get.ratios   *Calculate the isotopic ratio for a given age*

Description

Predict the daughter/parent ratio for a given U-Pb age

Usage

```
get.ratios(age, method = "U-Pb")
```

Arguments

age	the geological age [Ma]
method	currently only `'U-Pb'`, other chronometers will be added later

Value

a two element list containing:

x: a vector with predicted isotopic ratios

cov: the covariance matrix of the predicted isotopic ratios taking into account decay constant uncertainties

Examples

```
get.ratios(4567,'U-Pb')
```

I.A   *Isotope abundance*

Description

Returns the natural abundance of isotopes

Usage

```
I.A(nuclide)
```

Arguments

nuclide	one of either `'U'`, `'U238'`, `'U235'`, or `'Th232'`

Value

a two element list containing:

x: a number or a vector of numbers between 0 (absent) and 1 (dominant)

and

e: the standard error or covariance matrix of x

or, if `nuclide = 'U'`:

cov: the covariance matrix of all naturally occurring isotopes

Examples

```
I.A('U238')
```

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lambda   *Decay constants*

Description

Returns the decay constants of radioactive istopes

Usage

```
lambda(nuclide)
```

Arguments

nuclide   the nuclide name

Value

a two-item list containing:

x: the decay constant [in Ma-1]

e: the standard error of the decay constant

Examples

```
lambda('U238')
```

---

read.data   *Read geochronology data*

Description

Cast a .csv file into one of IsoplotR's data classes

Usage

```
read.data(fname, method = "U-Pb", format = 1, ...)
```

Arguments

fname	file name (.csv format)
method	one of 'U-Pb', 'Ar-Ar', 'Rb-Sr', 'Sm-Nd', 'Re-Os', 'U-Th-He', 'fission tracks', 'cosmogenic nuclides' or 'other'
format	formatting option, depends on the value of method. If method = 'U-Pb', then format is one of either:
	1: 7/6, s[7/6], 6/8, s[6/8], 7/5, s[7/5]
...	optional arguments to the read.csv function

Value

an object of class 'UPb', 'ArAr', 'RbSr', 'SmNd', 'ReOs', 'UThHe', 'fission', 'cosmogenics', or 'other'

Examples

```
# load one of the built-in .csv files:
fname <- system.file("UPb.csv",package="IsoplotR")
UPb <- read.data(fname,'U-Pb')
concordia.plot(UPb)
```

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read.matrix   *Read geochronology data*

Description

Cast a matrix into one of IsoplotR's data classes

Usage

```
read.matrix(x, method = "U-Pb", format = 1)
```

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