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Description Full descriptive statistics, physical description of sediment, metric or phi sieves. Includes a Shiny web application for interactive grain size analysis and visualization.

License GPL-3

LazyData TRUE

URL https://cran.r-project.org/package=G2Sd, https://github.com/gallonr/G2Sd

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G2Sd *Grain-size Statistics and Description of Sediment*

Description

G2Sd package gives full descriptive statistics and a physical description of sediment obtained with metric or phi sieves according to the grain size distribution.

Details

The G2Sd package is an evolution of the Gradistat v.4.0 macro for MS Excel initially developped by Blott and Pye (2001) for phi sieves and Laser granulometer. This package is suited to analyse data obtained from metric (micrometer) or phi sieves. The user is required to input the weight of sediment retained on sieves spaced at any metric or phi intervals. Statistics are calculated using arithmetic and geometric Method of Moments (micrometer) and using logarithmic Folk and Ward (1957) Method (phi scale): mean, standard-deviation, skewness, kurtosis. The mode(s) is(are) determined graphically by the user (with a maximum of 4 modes). The determination of the mode is optional (no determination by default). Several percentiles and common index are calculated: D10, D50, D90, D90/D10, D90-D10, D75/D25, D75-D25, Trask(So) Index, Krumbein(Qd) Index. Physical description of texture, sorting, skewness or kurtosis are provided as such as the sediment name after Folk (1954). Are also included the percentage of particules falling into each predefined size fraction, modified from Blott and Pye (2001) scale, Udden (1914) and Wentworth (1922). There are four functions. `granstat` is a function which provides all results in a list; `granplot` is a function which provides a histogramm with a cumulative percentage curve; `grandistrib` is a function which provides a barplot of the different fractions composing the sediment;

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References

Blott, S., Pye, K. 2001. Gradistat: grain size distribution and statistics package for the analysis of unconsolidated sediment. Earth, Surface Processes and Landforms **26**, *1237-1248*

Folk, R.L. 1954. The distinction between grain size and mineral composition in sedimentary-rock nomenclature. Journal of Geology **62**, *344-359*

Folk, R.L., Ward, W.C. 1957. Brazos River bar: a study in the significance of grain size parameters. Journal of Sedimentary Petrology **27**, *3-26*

Krumbein, W.C., Pettijohn, F.J. 1938. Manual of Sedimentary Petrography. *Appleton-Century-Crofts, New-York*

Udden, J.A. 1914. Mechanical composition of clastic sediments. Bulletin of the Geological Society of America **25**, *655-744*

Wentworth, C.K. 1922. A scale of grade and class terms for clastic sediments. Journal of Geology **30**, *377-392*

See Also

granstat, granplot, grandistrib

Examples

```
data(granulo)
result=granstat(granulo)
granplot(granulo,1)
```

---

grandistrib *Composition of the sediment*

Description

This function provides a barplot of the different fractions composing the sediment

Usage

```
grandistrib(x, main="", scale = "fine", xlab = "Stations", ylab = "Percentage")
```

Arguments

x	A numeric matrix or data frame (see the shape of data(granulo))
main	a label for the title
scale	If fine, display the detailed composition; If large, display the simplify composition
xlab	a label for the x axis, defaults to a description of x.
ylab	a label for the y axis, defaults to a description of y.

Details

The obtained graph is commonly used by Sedimentologists

Value

A barplot with the composition of sediment for each station sampled

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See Also

granplot, grandistrib

Examples

```
data(granulo)
grandistrib(granulo, scale="fine")
```

---

granplot *Histogram with a cumulative percentage curve*

Description

This function provides a histogram of the grain-size distribution with a cumulative percentage curve

Usage

```
granplot(x, xc = 1, meshmin=1, hist = TRUE, cum = TRUE, main = "",
   col.cum = "red", col.hist="darkgray", cexname=0.9,
   cexlab=1.3, decreasing=FALSE, log.scale=TRUE)
```

Arguments

x	A numeric matrix or data frame (see the shape of data(granulo))
xc	A numeric value or a numeric vector to define columns
meshmin	Define the size of the smallest meshsize if it is 0 in raw data
hist	If TRUE, display a histogram; if FALSE, do not display a histogram (only for only one column)
cum	If TRUE, display a cumulative percentage curve; if FALSE do not display a cumulative percentage curve (only for only one column)
main	Add a title to the current plot
col.cum	Color in which cumulative percentage curve will be drawn
col.hist	Color in which histogram will be drawn
cexname	A numerical value giving the amount by which plotting text and symbols should be magnified relative to the default.
cexlab	A numerical value giving the amount by which axis labels should be magnified relative to the default.
decreasing	A logical value defining the order increasing or decreasing
log.scale	A logical value; if TRUE (default), use logarithmic scale for x-axis; if FALSE, use linear scale

Details

The obtained graph is the most commonly used by Sedimentologists

Value

A histogram with a cumulative percentage curve

Author(s)

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See Also

grandistrib

Examples

```
data(granulo)
granplot(granulo,xc=1,hist=TRUE,cum=TRUE,main="Grain-size Distribution",
   col.hist="gray",col.cum="red")

granplot(granulo,xc=2:4,main="Grain-size Distribution")
```

---

granstat *Calculates all descriptive statistics*

Description

Statistics are calculated using arithmetic and geometric Method of Moments (micrometer) and using logarithmic Folk and Ward (1957) Method (phi scale): mean, standard-deviation, skewness, kurtosis. The mode(s) is(are) determined graphically by the user (with a maximum of 4 modes). The determination of the mode is optional (no determination by default). Several percentiles and common index are calculated: D10, D50, D90, D90/D10, D90-D10, D75/D25, D75-D25, Trask(So) Index, Krumbein(Qd) Index. Physical description of texture, sorting, skewness or kurtosis are provided as such as the sediment name after Folk (1954). Are also included the percentage of particules falling into each predefined size fraction, modified from Blott and Pye (2001) scale, Udden (1914) and Wentworth (1922). granstat is a function which provides all results organized in two ways: a complete matrix (by default) or by separate items.

Usage

```
granstat(x, phiSize=FALSE, web_interface=FALSE, statistic = "all", modes = FALSE,
FromLargetoSmall=TRUE)
```

Arguments

x	A numeric matrix or data frame
phiSize	If TRUE, phi meshsizes are used . If FALSE, micrometer meshsizes are used
web_interface	if TRUE, a simplified interface is displayed from your default web browser
statistic	Statistic used: "arithmetic", "geometric", "folk.ward", "all". If this argument is not used, all statistics are calculated
modes	If TRUE, the mode must be determinated graphically by the user. If FALSE, the mode is not determinated. If this argument is not used, no determination of the mode is proposed
FromLargetoSmall	If TRUE, sieves are odered from the larger to the smaller . If FALSE, sieves are odered from the smaller to the larger.

Details

For the determination of the mode (modes=TRUE). All the samples are successively shown with a graph. The user can choose graphically the mode (1 in 4 maximum) by a click on the graph. If 4 modes are chosen, the following graph appears automatically. If 1, 2 or 3 modes are chosen, the user has to use the function stop locator in the graphic window.

If the weight of sediment retained on the broadest sieve exceeds 5 percent of the total mass of the sample, the Folk and Ward statistics cannot be computed.

Value

A list containing

mean.arith	the mean of grain-size distribution (arithmetic method of moments)
sd.arith	the standard-deviation of grain-size distribution (arithmetic method of moments)
skewness.arith	the skewness of grain-size distribution (arithmetic method of moments)
kurtosis.arith	the kurtosis of grain-size distribution (arithmetic method of moments)
mean.geom	the mean of grain-size distribution (geometric method of moments
sd.geom	the standard-deviation of grain-size distribution (geometric method of moments)
skewness.geom	the skewness of grain-size distribution (geometric method of moments)
kurtosis.geom	the kurtosis of grain-size distribution (geometric method of moments)
Sediment	physical description of the sediment, the sorting, the skewness and the kurtosis
Mean.fw.mm	the mean of grain-size distribution (logarithmic Folk and Ward method, mm scale)
Sd.fw.mm	the standard-deviation of grain-size distribution (logarithmic Folk and Ward method, mm scale)
Skewness.fw.mm	the skewness of grain-size distribution (logarithmic Folk and Ward method, mm scale)
Kurtosis.fw.mm	the kurtosis of grain-size distribution (logarithmic Folk and Ward method, mm scale)

Mean.fw.phi	the mean of grain-size distribution (logarithmic Folk and Ward method, phi scale)
Sd.fw.phi	the standard-deviation of grain-size distribution (logarithmic Folk and Ward method, phi scale)
Skewness.fw.phi	the skewness of grain-size distribution (logarithmic Folk and Ward method, phi scale)
Kurtosis.fw.phi	the kurtosis of grain-size distribution (logarithmic Folk and Ward method, phi scale)
Mode	the mode (mm scale), graphically defined by the user
D10(mm)	the 10th percentile
D50(mm)	the median
D90(mm)	the 90th percentile
D90/D10	ratio of the 90th percentile and the 10th percentile
D90-D10	difference between the the 90th percentile and the 10th percentile
D75/D25	ratio of the 75th percentile and the 25th percentile
D75-D25	difference between the the 75th percentile and the 25th percentile
Trask(So)	the Trask Index (So) defined as D25/D75 (mm scale)
Krumbein(Qd)	the Krumbein Index (Qd) defined as (D25-D75)/2 (phi scale)
Texture	physical description of the texture of the sediment
Boulder	percentage of sediment of the grain-size distribution retained in the Boulder class (upper to 63 mm)
Gravel	percentage of sediment of the grain-size distribution retained in the Gravel class (between 2 mm and 63 mm)
Sand	percentage of sediment of the grain-size distribution retained in the Sand class (between 63 micrometer and 2 mm)
Mud	percentage of sediment of the grain-size distribution retained in the Mud class (down to 63 micrometer)
Boulder	percentage of sediment of the grain-size distribution retained in the Boulder class (upper to 63 mm)
vcgravel	percentage of sediment of the grain-size distribution retained in the Very Coarse Gravel class (between 31.5 mm and 63 mm)
cgravel	percentage of sediment of the grain-size distribution retained in the Coarse Gravel class (between 16 mm and 31.5 mm)
mgravel	percentage of sediment of the grain-size distribution retained in the Medium Gravel class (between 8 mm and 16 mm)
fgravel	percentage of sediment of the grain-size distribution retained in the Fine Gravel class (between 4 mm and 8 mm)
vfgravel	percentage of sediment of the grain-size distribution retained in the Very Fine Gravel class (between 2 mm and 4 mm)

vcsand	percentage of sediment of the grain-size distribution retained in the Very Coarse Sand class (between 1 mm and 2 mm)
csand	percentage of sediment of the grain-size distribution retained in the Coarse Sand class (between 500 micrometer and 1 mm)
msand	percentage of sediment of the grain-size distribution retained in the Medium Sand class (between 250 micrometer and 500 micrometer)
fsand	percentage of sediment of the grain-size distribution retained in the Fine Sand class (between 125 micrometer and 250 micrometer)
vfsand	percentage of sediment of the grain-size distribution retained in the Very Fine Sand class (between 63 micrometer and 125 micrometer)
vcsilt	percentage of sediment of the grain-size distribution retained in the Very Coarse Silt class (between 40 micrometer and 63 micrometer)
silt	percentage of sediment of the grain-size distribution retained in the Silt class (lower than 40 micrometer)

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References

Blott, S., Pye, K. 2001. Gradistat: grain size distribution and statistics package for the analysis of unconsolidated sediment. Earth, Surface Processes and Landforms **26**, *1237-1248*

Folk, R.L. 1954. The distinction between grain size and mineral composition in sedimentary-rock nomenclature. Journal of Geology **62**, *344-359*

Folk, R.L., Ward, W.C. 1957. Brazos River bar: a study in the significance of grain size parameters. Journal of Sedimentary Petrology **27**, *3-26*

Krumbein, W.C., Pettijohn, F.J. 1938. Manual of Sedimentary Petrography. *Appleton-Century-Crofts, New-York*

Udden, J.A. 1914. Mechanical composition of clastic sediments. Bulletin of the Geological Society of America **25**, *655-744*

Wentworth, C.K. 1922. A scale of grade and class terms for clastic sediments. Journal of Geology **30**, *377-392*

Examples

```
#granulo is the data set
data(granulo)
granstat(granulo)
granstat(granulo,statistic="all",modes=FALSE)
granstat(granulo,statistic="folk.ward",modes=TRUE)

#to display the simplified interface
#granstat(web_interface=TRUE)
```

grantern *Ternary diagram for sediment composition*

Description

This function provides a ternary diagram (Folk triangle) showing the relative proportions of Gravel, Sand, and Mud in sediment samples

Usage

```
grantern(x, main = "Ternary Diagram", show_labels = TRUE,
         point_size = 3, point_color = "steelblue", show_grid = TRUE)
```

Arguments

x	A numeric matrix or data frame (see the shape of data(granulo))
main	A label for the title of the plot
show_labels	A logical value; if TRUE (default), display sample labels on the plot; if FALSE, display only points
point_size	A numeric value specifying the size of the points (default: 3)
point_color	A character string specifying the color of the points (default: "steelblue")
show_grid	A logical value; if TRUE (default), display a ternary grid with 10% intervals; if FALSE, display only the triangle outline

Details

The ternary diagram (also known as the Folk triangle) is a standard tool in sedimentology for visualizing the relative proportions of three sediment fractions: Gravel (>2mm), Sand (63µm - 2mm), and Mud (<63µm). Each corner of the triangle represents 100% of one component, and points are plotted based on their relative percentages.

The function uses ggplot2 to create the diagram, with proper coordinate transformation from ternary to Cartesian coordinates. A grid is optionally displayed to facilitate reading of percentages.

The sediment texture is automatically calculated from the grain-size distribution data using the internal function `.texture.sedim`.

Value

Displays a ternary plot and invisibly returns a data frame containing:

samples	Sample names
Gravel	Percentage of gravel (>2mm)
Sand	Percentage of sand (63µm - 2mm)
Mud	Percentage of mud (<63µm)
x	Cartesian x-coordinate for plotting
y	Cartesian y-coordinate for plotting

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References

Folk, R.L. (1954). The distinction between grain size and mineral composition in sedimentary-rock nomenclature. Journal of Geology, 62(4), 344-359.

See Also

granplot, grandistrib, granstat

Examples

```
# Load example data
data(granulo)

# Basic ternary diagram with grid and labels
grantern(granulo, main = "Folk Triangle - Sediment Composition")

# Ternary diagram without sample labels
grantern(granulo, main = "Folk Triangle", show_labels = FALSE)

# Customized diagram with larger red points and no grid
grantern(granulo, main = "Sediment Texture",
         point_size = 5, point_color = "darkred", show_grid = FALSE)

# Minimal diagram
grantern(granulo, show_labels = FALSE, show_grid = FALSE)
```

---

granulo *Data frame for G2Sd package*

Description

granulo is a data frame of 29 observations and 21 variables. The first column corresponds to the apertures sizes of AFNOR sieves, in micrometer (25000, 20000, 16000, 12500, 10000, 8000, 6300, 5000, 4000, 2500, 2000, 1600, 1250, 1000, 800, 630, 500, 400, 315, 250, 200, 160, 125, 100, 80, 63, 50, 40, 0). Warning ! the last sieve 0 corresponds to the material retained in the < 40 micrometer pan after sieving. The others columns corresponds to the weight of samples beside each size class

Usage

```
data(granulo)
```

Format

A data frame with 29 rows corresponding to the apertures sizes on the following 21 stations sampled

Details

This example provide a data frame of sedimentary data obtained with AFNOR sieves (in micrometer)

Source

Godet, L., Fournier, J., Toupoint, N., Olivier, F. 2009. Mapping and monitoring intertidal benthic habitats: a review of techniques and proposal of a new visual methodology for the European coasts. Progress in Physical Geography **33**, *378-402*

References

Fournier, J., Godet, L., Bonnot-Courtois, C., Baltzer, A., Caline, B. 2009. Distribution des formations superficielles de l archipel de Chausey (Manche). Geologie de la France **1**, *5-17*

Examples

```
data(granulo)
```

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