

Package: G2Sd (via r-universe)

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Type Package

Title Grain-Size Statistics and Description of Sediment

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Imports ggplot2, dplyr, tidyr, tibble, viridis, patchwork, scales, shiny, bslib, shinyWidgets, plotly

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>

NeedsCompilation no

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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 developed 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 histogram 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 | <i>Composition of the sediment</i> |
|-------------|------------------------------------|

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

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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 determined graphically by the user. If FALSE, the mode is not determined. If this argument is not used, no determination of the mode is proposed |
| FromLargetoSmall | If TRUE, sieves are ordered from the larger to the smaller . If FALSE, sieves are ordered 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 D_{25}/D_{75} (mm scale) |
| Krumbein(Qd) | the Krumbein Index (Qd) defined as $(D_{25}-D_{75})/2$ (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 (63 μ m - 2mm), and Mud (<63 μ m). 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 (63 μ m - 2mm) |
| Mud | Percentage of mud (<63 μ m) |
| 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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