

Package ‘CAVIAR’

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Title Collection of Functions for Processing, Visualizing and
Analyzing Cambial Activity and Wood Formation Monitoring Data

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Depends R (>= 2.10.1)

Suggests gdata (>= 2.7.2)

Description Allows processing, visualisation and analysis of data
coming from cambial activity and wood formation monitoring studies.

License GPL (>= 2)

LazyLoad yes

URL http://www.nancy.inra.fr/foret_bois_lerfob/personnels_de_l_umr/scientifiques/rathgeber_cyrille

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CAVIAR-package	<i>Cambial activity and wood formation: data processing, visualisation and analysis using R</i>
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Description

Process, analyses and plots data from cambial activity and wood formation monitoring studies

Details

Package: CAVIAR
Type: Package
Version: 1.4-0
Date: 2011-01-26
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CAVIAR is a package that allow processing, visualisation and analysis of data coming from cambial activity and wood formation monitoring studies.

The developed functions require input data files as semicolon separated value text files (i.e. CSV format).

The columns names are imposed but not the order. That means that the input table may contain a free number of columns, as long as the compulsory columns, identified by their headers, are provided to the function.

Missing values are coded "NA" in the data table.

Note

Version: 4.1-1

Development started: 27 November 2008

Last modifications: 13 January 2012

Author(s)

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References

Rathgeber C.B.K., Longuetaud F., Mothe F., Cuny H. & Le Moguedec G. 2011. Phenology of wood formation: Data processing, analysis and visualisation using R (Package CAVIAR). *Dendrochronologia* **29**: 139-149.

Rathgeber C.B.K., Rossi S.& Bontemps J.-D. 2011. Cambial activity related to tree size in a mature silver-fir plantation. *Annals of Botany* **108**: 429-438.

See Also

[AMA2006](#), [averageRadialFiles](#), [computeBootstrapTest](#), [computeCriticalDates](#), [computeRingCellNb](#), [readXLSCellCountTable](#), [fitGompertz](#), [plotWoodFormationCalendar](#), [plotWoodFormationDynamics](#), [standardiseCellCount](#)

AMA2006

AMA2006 cell count table

Description

This dataset was obtained from a cambial activity and wood formation monitoring study. Data were collected weekly in 2006 for 15 silver firs and 5 Scots pines grown in the same stand, located in Amance forest near Nancy (northeast France).

Column "Tree" indicates the tree reference number, "Sp" indicates the tree species code, "Crown" Indicates tree crown class, "Sample" indicates the sampling campaign reference number, "DY" indicates the date of the sampling in day of year, RF indicates the radial file reference number. "nC" indicates the number of cells in the cambial zone, "nE" indicates the number of cells in the enlarging zone, "nL" indicates the number of cells in the maturing zone and "nM" indicates the number of mature cells. "P" is measure (in number of cells, expression(μ) or mm) of the previous tree-ring width.

Usage

AMA2006

Format

A data frame containing 11 columns and 1775 rows

Note

Version: 4.1-1

Development started: 4 March 2007 Last modifications: 13 Janvier 2012

Source

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References

Rathgeber C.B.K., Longuetaud F., Mothe F., Cuny H. & Le Moguedec G. 2011. Phenology of wood formation: Data processing, analysis and visualisation using R (Package CAVIAR). *Dendrochronologia* **29**: 139-149.

Rathgeber C.B.K., Rossi S. & Bontemps J.-D. 2011. Cambial activity related to tree size in a mature silver-fir plantation. *Annals of Botany* **108**: 429-438.

See Also

[averageRadialFiles](#), [computeBootstrapTest](#), [computeCriticalDates](#), [computeRingCellNb](#), [readXLSCellCountTable](#), [fitGompertz](#), [plotWoodFormationCalendar](#), [plotWoodFormationDynamics](#), [standardiseCellCount](#)

averageRadialFiles *averageRadialFiles*

Description

Average raw radial file data to compute mean cell numbers by trees

Usage

```
averageRadialFiles(data)
```

Arguments

data	a data frame containing cell count data. This data frame must contain at least 7 imposed columns with compulsory names: Tree, DY, RF, nC, nE, nL, nM (see AMA2006)
------	---

Details

This function takes the raw cell count data (nC, nE, nL, nM and optionally P) recorded by radial file and averages them by trees.

Additionally, it computes the sums of mature and maturing cells ($nLM = nL + nM$) and mature, maturing and enlarging cells ($nELM = nE + nL + nM$).

Value

A data frame of at least 8 columns containing the computed values: Tree, DY, nC, nE, nL, nM, nLM, nELM.

Note

Version: 2.1-1
Development started: 27 November 2008
Last modifications: 25 January 2011

Author(s)

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References

Rathgeber C.B.K., Longuetaud F., Mothe F., Cuny H. & Le Moguedec G. 2011. Phenology of wood formation: Data processing, analysis and visualisation using R (Package CAVIAR). *Dendrochronologia* **29**: 139-149.

See Also

[AMA2006](#), [computeBootstrapTest](#), [computeCriticalDates](#), [computeRingCellNb](#), [readXLSCellCountTable](#), [fitGompertz](#), [plotWoodFormationCalendar](#), [plotWoodFormationDynamics](#), [standardiseCellCount](#)

Examples

```
## Loading the example dataset:  
data(AMA2006)  
  
## Averaging raw data:  
AMA2006.mean <- averageRadialFiles(AMA2006)
```

`computeBootstrapTest` *computeBootstrapTest*

Description

Computes bootstrap test for comparing 2 groups.

Usage

```
computeBootstrapTest(y, z, y.sd = NA, z.sd = NA, stat = "median", centring = FALSE,  
  iter = 1000, var.name = "", out = FALSE, plot = FALSE, plot.label = "")
```

Arguments

<code>y</code>	a vector containing data for the first group
<code>z</code>	a vector containing data for the second group
<code>y.sd</code>	an optional vector containing standard deviations for the first group
<code>z.sd</code>	an optional vector containing standard deviations for the second group
<code>stat</code>	the method to be used: "mean" for mean comparison; "Student" for mean comparison using Student's t statistic; "median" for median comparison (default); "var" for variance comparison; "disp.mean" for dispersion around the mean comparison; "disp.median" for dispersion around the median comparison.
<code>centring</code>	an optional logical indicating if data must be centred or not (default=FALSE)
<code>iter</code>	an optional integer indicating the number of iterations for the bootstrap (default=1000)
<code>var.name</code>	an optional character labeling the variable to be tested
<code>out</code>	an optional logical indicating if bootstrapped series must be outputted or not (default=FALSE)
<code>plot</code>	an optional logical indicating if a plot must be outputted or not (default=FALSE)
<code>plot.label</code>	an optional character containing the plot title

Details

Computes unilateral bootstrap permutation tests for testing equality of mean, median or variance between two groups.

Several test statistics can be used: mean difference, Studentized mean difference, median difference, logarithm ratio of variance, dispersion around the mean ratio and dispersion around the median ratio.

For test statistics based on the mean, data can be centred.

Moreover this function can also be feed with two additional vectors containing standard deviations around the critical dates in order to take dispersion into account. It can plot (optionplot) an histogram of the bootstrap distribution of the tested statistic along with its observed value.

Value

A list containing the results of the test:

<code>summary</code>	Summary of the test
<code>ASL</code>	Signification level of the test
<code>ts.obs</code>	Observed value of the tested statistic ('out=TRUE')
<code>iterations</code>	number of iterations ('out=TRUE')
<code>nb.combinations</code>	number of possible combinations ('out=TRUE')
<code>ts</code>	bootstrap series ('out=TRUE')

Warning

Dispersion is not implemented for tests based on centred statistics ('centring=TRUE')!

Note

Version: 4.1-1
Development started: 14 July 2009
Last modifications: 11 February 2011

Author(s)

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References

Rathgeber C.B.K., Longuetaud F., Mothe F., Cuny H. & Le Moguedec G. 2011. Phenology of wood formation: Data processing, analysis and visualisation using R (Package CAVIAR). *Dendrochronologia* **29**: 139-149.

See Also

[AMA2006](#), [averageRadialFiles](#), [computeCriticalDates](#), [computeRingCellNb](#), [readXLSCellCountTable](#), [fitGompertz](#), [plotWoodFormationCalendar](#), [plotWoodFormationDynamics](#), [standardiseCellCount](#)

Examples

```
## Loading the example dataset:
data(AMA2006)

## Computing wood formation critical dates for dominant firs and pines:
Fir.cdd <- computeCriticalDates(AMA2006[AMA2006$Sp=="ABAL" & AMA2006$Crown=="Dom", ])
Pine.cdd <- computeCriticalDates(AMA2006[AMA2006$Sp=="PISY", ])

## Testing if pines start xylogenesis before firs
#computeBootstrapTest(Fir.cdd$bE, Pine.cdd$bE)

## Testing if pines start xylogenesis before firs with taking dispersion into account
#computeBootstrapTest(Fir.cdd$bE, Pine.cdd$bE, Fir.cdd$bE.sd, Pine.cdd$bE.sd)
```

computeCriticalDates *computeCriticalDates*

Description

Computes wood formation critical dates and durations and their standard deviations

Usage

```
computeCriticalDates(data, plot=TRUE)
```

Arguments

data	a data frame containing cell count data. This data frame must contain at least 7 imposed columns with compulsory names: Tree, DY, RF, nC, nE, nL, nM (see AMA2006)
plot	an optional logical indicating if a PDF plot must be outputted or not (default=TRUE)

Details

This function computes wood formation critical dates and durations from a raw data table containing cell count (for each radial file) for the 4 development phases (cambial, enlarging, maturing & mature) per sampling dates (see [AMA2006](#)).

Critical dates as well as their associated standard deviations are computed using logistic regressions `glm`, the main date corresponds to the 50% probability of the phase being active while the confidence interval limits corresponds to the 2.5 and 97.5% probabilities. The standard deviation is obtained by dividing the 95% confidence interval by 2.

From these critical dates, the function computes 3 critical durations with their associated standard deviations (assuming independence between dates).

By default ('plot=TRUE'), the function outputs a PDF plot entitled 'Critical dates computation report... .pdf', illustrating the computation of each critical date for a quick visual checking.

Value

A data frame containing the computed critical dates and durations with their associated standard deviations.

This data frame is composed of 5 columns for the critical dates, which are the beginning of enlarging phase (bE), the beginning of maturing phase (bL), the beginning of mature phase (bM), the cessation of the enlarging phase (cE), the cessation of the maturing phase (cL); 3 columns for the critical durations, which are: the duration of the enlarging phase ($dE = cE - bE$), the duration of the maturing phase ($dL = cL - bL$), and the total duration of the xylogenesis ($dX = cL - bE$); as well as 8 columns for their associated standard deviations noted `xX.sd` (e.g. `bE.sd`, `cE.sd`, `dE.sd`).

Note

Version: 4.1-1

Development started: 21 October 2009

Last modifications: 21 December 2012

Author(s)

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References

Rathgeber C.B.K., Longuetaud F., Mothe F., Cuny H. & Le Moguedec G. 2011. Phenology of wood formation: Data processing, analysis and visualisation using R (Package CAVIAR). *Dendrochronologia* **29**: 139-149.

Rathgeber C.B.K., Rossi S. & Bontemps J.-D. 2011. Cambial activity related to tree size in a mature silver-fir plantation. *Annals of Botany* **108**: 429-438.

See Also

[AMA2006](#), [averageRadialFiles](#), [computeBootstrapTest](#), [computeRingCellNb](#), [readXLSCellCountTable](#), [fitGompertz](#), [plotWoodFormationCalendar](#), [plotWoodFormationDynamics](#), [standardiseCellCount](#)

Examples

```
## Loading the example dataset:
data(AMA2006)

## Computing wood formation critical dates and durations for dominant firs and pines:
Fir.cdd <- computeCriticalDates(AMA2006[AMA2006$Sp=="ABAL" & AMA2006$Crown=="Dom", ])
Pine.cdd <- computeCriticalDates(AMA2006[AMA2006$Sp=="PISY", ])
```

<code>computeRingCellNb</code>	<i>computeRingCellNb</i>
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Description

Computes characteristic ring cell numbers

Usage

```
computeRingCellNb(data, stat="median")
```

Arguments

<code>data</code>	a data frame containing cell count data. This data frame must contain at least 6 imposed columns with compulsory names: <code>Tree</code> , <code>DY</code> , <code>nC</code> , <code>nE</code> , <code>nL</code> , <code>nM</code> (see AMA2006)
<code>stat</code>	an optional string of characters indicating if the function must compute mean or median (default) as summary statistic

Details

This function computes characteristic tree ring cell numbers (median or mean depending on the option selected) as well as their associated measure of *s* (median absolute deviation or standard deviation) for each tree of the data frame.

The characteristic tree ring cell numbers are: the final ring cell number (RCN), the initial number of dormant cambial cells (ICN) and the final number of dormant cambial cells (FCN)

Value

A data frame containing the computed characteristic tree ring cell numbers mean or median (e.g. RCN.median or RCN.mean) with their associated measure of variations (e.g. ICN.mad or FCN.sd) and signal-to-noise ratio (SNR).

Note

Version: 1.4-1
Development started: 25 March 2010
Last modifications: 27 January 2011

Author(s)

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References

Rathgeber C.B.K., Longuetaud F., Mothe F., Cuny H. & Le Moguedec G. 2011. Phenology of wood formation: Data processing, analysis and visualisation using R (Package CAVIAR). *Dendrochronologia* **29**: 139-149.

Rathgeber C.B.K., Rossi S.& Bontemps J.-D. 2011. Cambial activity related to tree size in a mature silver-fir plantation. *Annals of Botany* **108**: 429-438.

See Also

[AMA2006](#), [averageRadialFiles](#), [computeBootstrapTest](#), [computeCriticalDates](#), [readXLSCellCountTable](#), [fitGompertz](#), [plotWoodFormationCalendar](#), [plotWoodFormationDynamics](#), [standardiseCellCount](#)

Examples

```
## Loading the example dataset:  
data(AMA2006)  
  
## Computing characteristic ring cell numbers for dominant firs and pines:  
Fir.RCN <- computeRingCellNb(AMA2006[AMA2006$Sp=="ABAL" & AMA2006$Crown=="Dom", ])  
Pine.RCN <- computeRingCellNb(AMA2006[AMA2006$Sp=="PISY", ])
```

fitGompertz	<i>fitGompertz</i>
-------------	--------------------

Description

fits a Gompertz model to the observations.

Usage

```
fitGompertz(data, asymptote=NULL, plot.fitting=FALSE, ttl="", lblx="Date", lbly="Total cumulated cell
```

Arguments

data	a data.frame containing dates in day of year and total cell numbers for each tree to be treated
asymptote	a data.frame containing a value for the asymptote parameter for each tree
plot.fitting	an optional logical indicating if a graph of the fitting must be plotted (default) or not
ttl	an optional string of characters containing the plot title
lblx	an optional string of characters containing x-axis label
lbly	an optional string of characters containing y-axis label
plot.OP	an optional logical indicating if a verification graph must be plotted or not (default)

Details

This function fits a Gompertz model (!!! provide here the equation !!!) to the observations and records model parameters, predicted values and goodness-of-fit. Additionally it computes characteristic biological parameters.

Value

A data.frame containing the results of the fitting:

a	parameter a of the model
b	parameter b of the model
k	parameter k of the model
t5	date at which 5 percent of the cells are produced
tip	date at which the cell production is maximal (Gompertz curve inflection point)
t95	date at which 95 percent of the cells are produced
Dt90	time elapsed between t5 and t95
rmax	maximal rate of cell production

r90	mean rate of cell production computed between t5 and t95
R2	R-square
EF	Modelling Efficiency
RMSD	Root Mean Squared Deviation

Note

Version: 2.1-1

Development started: 27 November 2008 Last modifications: 27 January 2011

Author(s)

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References

Rathgeber C.B.K., Rossi S.& Bontemps J.-D. 2011. Cambial activity related to tree size in a mature silver-fir plantation. *Annals of Botany* **108**: 429-438.

See Also

[AMA2006](#), [averageRadialFiles](#), [computeBootstrapTest](#), [computeCriticalDates](#), [computeRingCellNb](#), [readXLSCellCountTable](#), [plotWoodFormationCalendar](#), [plotWoodFormationDynamics](#), [standardiseCellCount](#)

Examples

```
## Loading the example dataset:
data(AMA2006)

## Averaging radial files for dominant firs
DF <- averageRadialFiles(AMA2006[AMA2006$Sp=="ABAL" & AMA2006$Crown=="Dom", ])

## Fitting Gompertz
R1 <- fitGompertz(data=DF, plot.fitting=TRUE, ttl="", lblx="Date", lbly="Total cumulated cell number", plot.OP=TRUE)

## Compute the ring cell number to constrain the asymptote of the Gompertz
RCN <- computeRingCellNb(DF, stat="median")

asympt <- RCN[, c("Tree", "RCN.median")]
names(asympt) <- c("Tree", "A")

## Fitting Gompertz with fixed asymptotes
R2 <- fitGompertz(data=DF, asymptote=asympt, plot.fitting=TRUE, ttl="", lblx="Date", lbly="Total cumulated cell number")
```

```
plotWoodFormationCalendar  
    plotWoodFormationCalendar
```

Description

Plots wood formation calendar

Usage

```
plotWoodFormationCalendar(data, main = " ", sub = " ", xlim=NULL, plotype = 4)
```

Arguments

data	a data frame of critical dates and durations with 8 compulsory columns located by their names (bE, bL, bM, cE, cL, dE, dL, dX), typically output from computeCriticalDates function
main	an optional character containing the plot title
sub	an optional character containing the plot subtitle
xlim	an optional vector indicating the x-axis minimum and maximum values
plotype	an optional integer indicating the type of plot 1: individual critical dates plot, 2: group critical dates plot, 3: group critical durations plot, 4: group critical dates and durations plots (default).

Details

Critical dates can be first plotted for each individual tree (5 trees per page) in order to allow a visual checking of date consistencies using 'plotype = 1'.

Consistent dates can then be used to draw a wood formation calendar using 'plotype = 2' for dates and 'plotype = 3' for durations.

Xylem development phase (enlarging: E, maturing: L, mature: M) onsets and cessations are represented by diamond-crossed-by-a-line marks. The left end of the line represents the minimum, the left end of the diamond the first quartile, the middle of the diamond the median, the right end of the diamond the third quartile and the right end of the line the maximum. 'plotype = 4' plots dates and durations at the same time.

NB. These representations are specially designed for five trees datasets. They also work when more trees are available, but then the graph represents a summary of the dataset and not all the data individually.

Value

A data frame of the critical dates and durations median and median absolute deviation.

Note

Version: 4.1

Last modifications: 03 January 2011

Author(s)

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References

Rathgeber C.B.K., Longuetaud F., Mothe F., Cuny H. & Le Moguedec G. 2011. Phenology of wood formation: Data processing, analysis and visualisation using R (Package CAVIAR). *Dendrochronologia* **29**: 139-149.

See Also

[AMA2006](#), [averageRadialFiles](#), [computeBootstrapTest](#), [computeCriticalDates](#), [computeRingCellNb](#), [readXLSCellCountTable](#), [fitGompertz](#), [plotWoodFormationDynamics](#), [standardiseCellCount](#)

Examples

```
## Loading the AMA2006 dataset:
data(AMA2006)

## Computing wood formation critical dates for dominant firs and pines:
Fir.cdd <- computeCriticalDates(AMA2006[AMA2006$Sp=="ABAL" & AMA2006$Crown=="Dom", ])
Pine.cdd <- computeCriticalDates(AMA2006[AMA2006$Sp=="PISY", ])

# Computing medians and medians absolute deviation for firs critical dates and durations
Fir.medians <- plotWoodFormationCalendar(Fir.cdd)

## Visualising wood formation critical dates and durations on the screen for firs:
# Dates by trees individually
plotWoodFormationCalendar(Fir.cdd, plotype=1)
# Dates by group of trees
plotWoodFormationCalendar(Fir.cdd, plotype=2)
# Duration by group of trees
plotWoodFormationCalendar(Fir.cdd, plotype=3)

## Plotting wood formation calendar for firs and pines in a PDF file
# General settings
pdf(file="Wood formation calendar.pdf")
layout(matrix(c(1, 2, 3, 4), nrow=2, ncol=2, byrow=TRUE))
par(mar=c(4, 4, 4, 1))

# Drawing the first plot - Firs critical dates
plotWoodFormationCalendar(Fir.cdd, xlim= c(100,305) , sub="a. Fir critical dates", plotype=2)

# Drawing the second plot - Firs critical durations
```

```

plotWoodFormationCalendar(Fir.cdd, xlim= c(100, 210), sub="b. Fir critical durations", plotype=3)

# Drawing the third plot - Pines critical dates
plotWoodFormationCalendar(Pine.cdd, xlim= c(100,305), sub="c. Pine critical dates", plotype=2)

# Drawing the fourth plot - Pines critical durations
plotWoodFormationCalendar(Pine.cdd, xlim= c(100, 210), sub="d. Pine critical durations", plotype=3)

dev.off()

```

```

plotWoodFormationDynamics
      plotWoodFormationDynamics

```

Description

Plots intra-annual dynamics of wood formation

Usage

```
plotWoodFormationDynamics(data, main = " ", sub=" ", x.axis.labels = "DOY", wrap = FALSE)
```

Arguments

data	a data frame of cell counting with 4 compulsory columns (nC, nE, nL, nM) and 8 optional columns (nC.inf, nC.sup, nE.inf, nE.sup, nL.inf, nL.sup, nM.inf, nM.sup) located by their names, typically output from averageRadialFiles function
main	an optional character containing the plot title
sub	an optional character containing the plot subtitle
x.axis.labels	an optional character for selecting between day of year (DOY, by default) or sample number (Sample)
wrap	an optional logical indicating if an envelope must be drawn around the main curves (if the 8 optional columns are provided!)

Details

Cell counting can be plotted for each individual tree in order to allow a visual checking of data consistencies using 'wrap = FALSE'.

Cell counting can then be plotted for a population of tree taking advantage of the 'wrap = TRUE'.

Value

none

Note

Version: 1.1-1
 Development started: 27 November 2008
 Last modifications: 4 November 2010

Author(s)

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 Email: <cyrille.rathgeber@nancy.inra.fr>

References

Rathgeber C.B.K., Longuetaud F., Mothe F., Cuny H. & Le Moguedec G. 2011. Phenology of wood formation: Data processing, analysis and visualisation using R (Package CAVIAR). *Dendrochronologia* **29**: 139-149.

See Also

[AMA2006](#), [averageRadialFiles](#), [computeBootstrapTest](#), [computeCriticalDates](#), [computeRingCellNb](#), [readXLSCellCountTable](#), [fitGompertz](#), [plotWoodFormationCalendar](#), [standardiseCellCount](#)

Examples

```
## Loading the AMA2006 dataset:
data(AMA2006)

## Averaging raw data for dominant trees:
AMA2006.mean <- averageRadialFiles(AMA2006[AMA2006$Crown=="Dom", ])

## Visualising intra-annual dynamics of wood formation:
## Plotting data for one tree
plotWoodFormationDynamics(AMA2006.mean[AMA2006$Tree==1, ])

## Plotting data for a group of trees
# Computing the median
FirMed <- aggregate(AMA2006.mean[, c("nC", "nE", "nL", "nM")], by=list(AMA2006.mean$DY), FUN=median, na.rm=TRUE)
names(FirMed) <- c("DY", "nC", "nE", "nL", "nM")

# Computing the first quartile
FirInf <- aggregate(AMA2006.mean[, c("nC", "nE", "nL", "nM")], by=list(AMA2006.mean$DY), FUN=quantile, probs=0.25)
names(FirInf) <- c("DY", "nC.inf", "nE.inf", "nL.inf", "nM.inf")

# Computing the third quartile
FirSup <- aggregate(AMA2006.mean[, c("nC", "nE", "nL", "nM")], by=list(AMA2006.mean$DY), FUN=quantile, probs=0.75)
names(FirSup) <- c("DY", "nC.sup", "nE.sup", "nL.sup", "nM.sup")

# Creating the final data frame
Temp <- merge(FirMed, FirInf)
Fir <- merge(Temp, FirSup)
```

```
plotWoodFormationDynamics(Fir, main = "Firs, Amance Forest, year 2006", wrap = TRUE)
```

```
readXLSCellCountTable readXLSCellCountTable
```

Description

Convert Excel spreadsheet file to database-like text file

Usage

```
readXLSCellCountTable(xls.file.name, sheets, sampling.dates, tree.names)
```

Arguments

`xls.file.name` a character containing the path to the Excel file
`sheets` a vector containing the numbers of the sheet to be read
`sampling.dates` a data.frame containing the correspondence between sampling numbers and dates (in DOY)
`tree.names` a vector containing a key to identify records like the names of the trees

Details

This function takes the selected sheets of an Excel file and convert them into one single database-like data.frame.

The function requires that the sheets contain 13 compulsory columns: Sample, C1, C2, C3, E1, E2, E3, L1, L2, L3, M1, M2, M3.

Additionally the sheets can contain the 3 supplementary columns: P1, P2, P3.

Other columns are discarded.

Value

A data frame of at least 8 columns containing the values: Tree, Sample, DY, RF, nC, nE, nL, nM, and optionally P.

Note

Version: 1.3

Development started: 13 October 2010 Last modifications: 12 January 2012

Author(s)

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References

Rathgeber C.B.K., Longuetaud F., Mothe F., Cuny H. & Le Moguedec G. 2011. Phenology of wood formation: Data processing, analysis and visualisation using R (Package CAVIAR). *Dendrochronologia* **29**: 139-149.

See Also

[AMA2006](#), [averageRadialFiles](#), [computeBootstrapTest](#), [computeCriticalDates](#), [computeRingCellNb](#), [fitGompertz](#), [plotWoodFormationCalendar](#), [plotWoodFormationDynamics](#), [standardiseCellCount](#)

Examples

```
## Setting the parameters of the function
library(gdata)

xls.file.name <- file.path(.path.package('CAVIAR'), 'extdata', 'AMA2006.xls')

sheets <- 2:21
DY <- c(seq(82, 320, 7), 340)
Sample <- 1:36
sampling.dates <- data.frame(Sample, DY)

tree.names <- 1:20

## Converting the Excel file
converted.data.frame <- readXLSCellCountTable(xls.file.name=xls.file.name, sheets=sheets, sampling.dates=sampling.dates)
```

standardiseCellCount *standardiseCellCount*

Description

Standardise average cell count values (nC, nE, nL, nM) using previous ring cell count or measurements (P)

Usage

```
standardiseCellCount(data, na.rm="FALSE")
```

Arguments

data	a data frame of cell counting with 6 compulsory columns (Tree, DY, nC, nE, nL, nM, P) located by their names, typically output from averageRadialFiles function
na.rm	logical indicating if lines where P is missing should be left as they are without applying any standardisation (FALSE by default) or should be removed from the record (TRUE)

Details

This function standardizes average cell count values (nC, nE, nL, nM) using previous ring cell count or measurements (P). ! Insert formula here !

The function requires that the input data frame contains 6 compulsory columns: Tree, DY, nC, nE, nL, nM and P, typically output from [averageRadialFiles](#) function.

Value

A data frame similar to the input data frame but containing standardized values for the columns: nC, nE, nL, nM

Note

Version: 1.0-0

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References

Rathgeber C.B.K., Rossi S.& Bontemps J.-D. 2011. Cambial activity related to tree size in a mature silver-fir plantation. *Annals of Botany* **108**: 429-438.

See Also

[AMA2006](#), [averageRadialFiles](#), [computeBootstrapTest](#), [computeCriticalDates](#), [computeRingCellNb](#), [fitGompertz](#), [plotWoodFormationCalendar](#), [plotWoodFormationDynamics](#), [readXLSCellCountTable](#)

Examples

```
## Loading the example dataset:
data(AMA2006)

## Averaging raw data for dominant trees:
AMA2006.mean <- averageRadialFiles(AMA2006[AMA2006$Crown=="Dom", ])

## Standardising data:
AMA2006.std <- standardiseCellCount(AMA2006.mean)
```

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