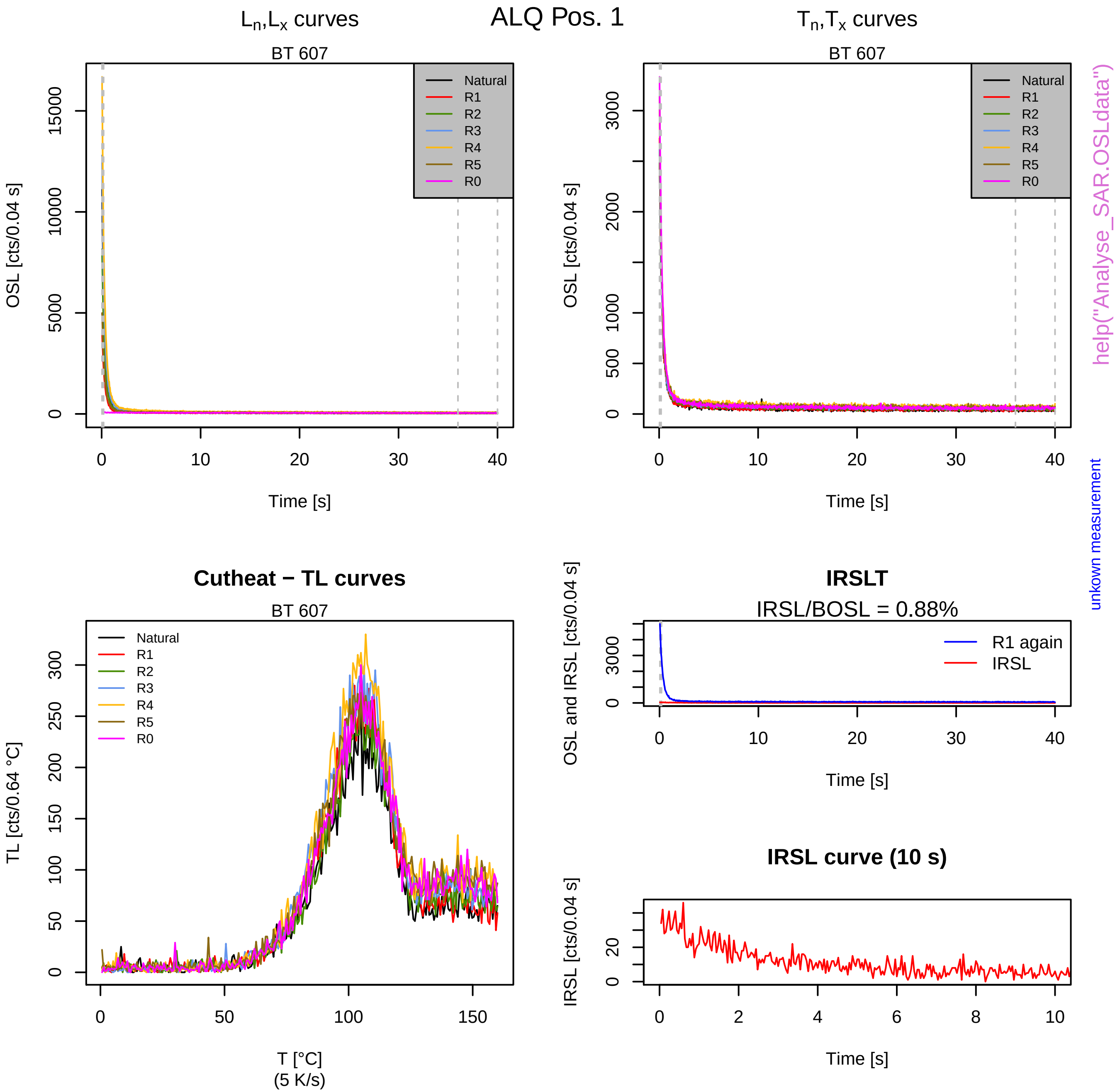
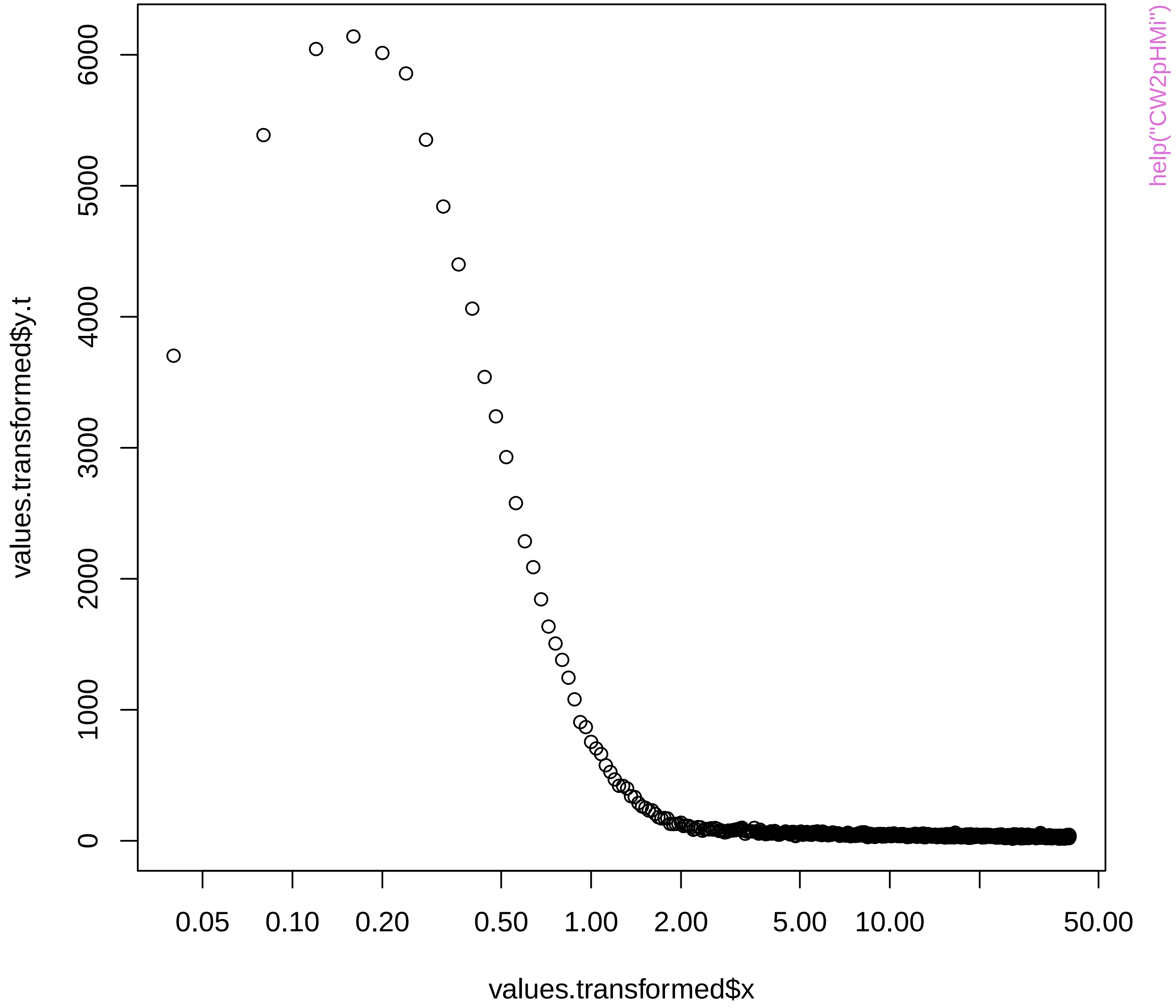
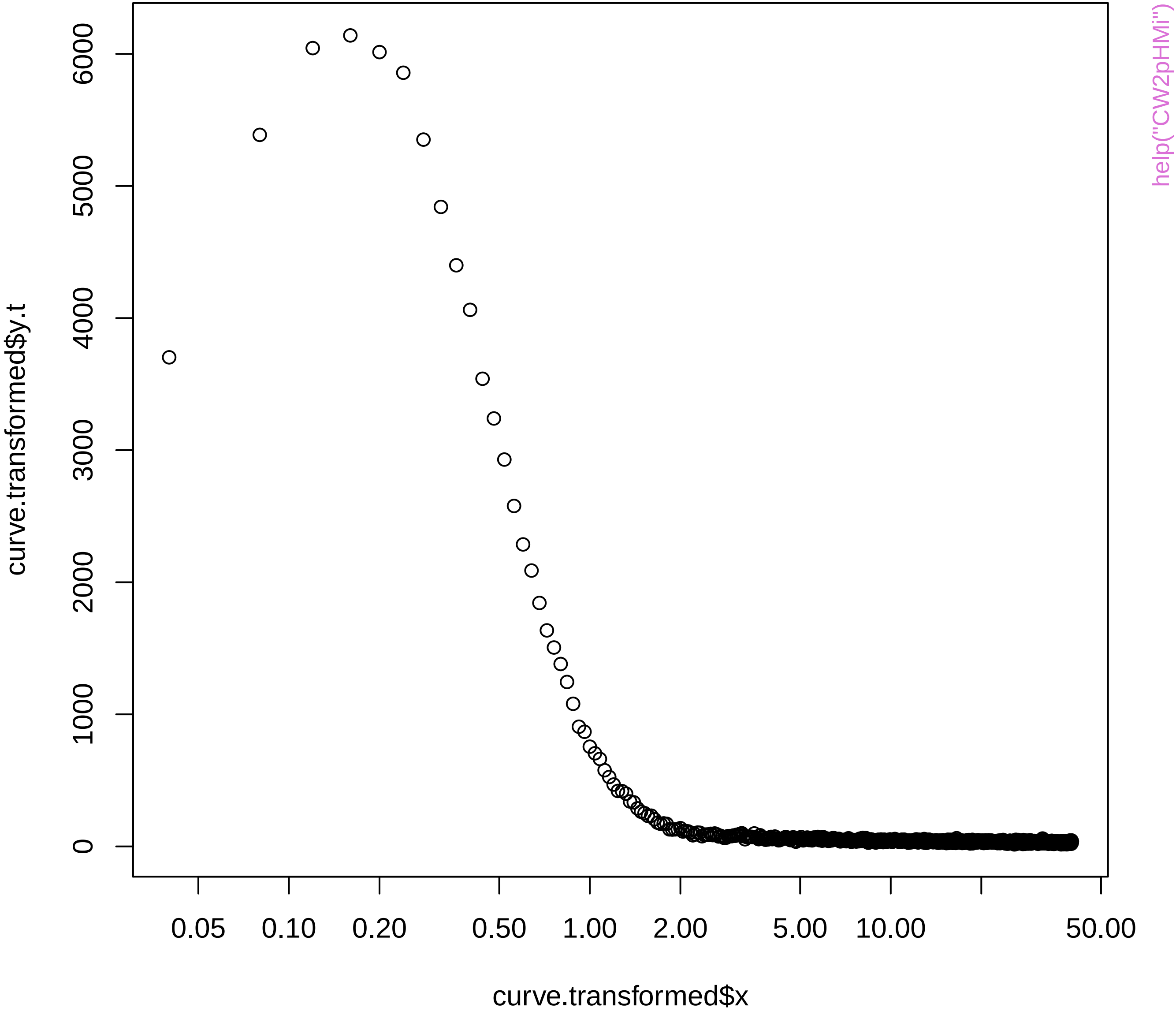


ALQ Pos. 1
L_n, L_x curves
BT 607
T_n, T_x curves
BT 607
Natural
R1
R2
R3
R4
R5
R0
OSL [cts/0.04 s]
Time [s]
help("Analyse_SAR.OSLdata")
unkown measurement
Cutheat − TL curves
BT 607
TL [cts/0.64 °C]
T [°C]
(5 K/s)
IRSLT
IRSL/BOSL = 0.88%
R1 again
IRSL
OSL and IRSL [cts/0.04 s]
IRSL curve (10 s)
IRSL [cts/0.04 s]



values.transformed$y.t
0
1000
2000
3000
4000
5000
6000
0.05
0.10
0.20
0.50
1.00
2.00
5.00
10.00
50.00
values.transformed$x
help("CW2pHMi")



6000
5000
4000
3000
2000
1000
0
curve.transformed$y.t
0.05
0.10
0.20
0.50
1.00
2.00
5.00
10.00
50.00
curve.transformed$x
help("CW2pHMi")

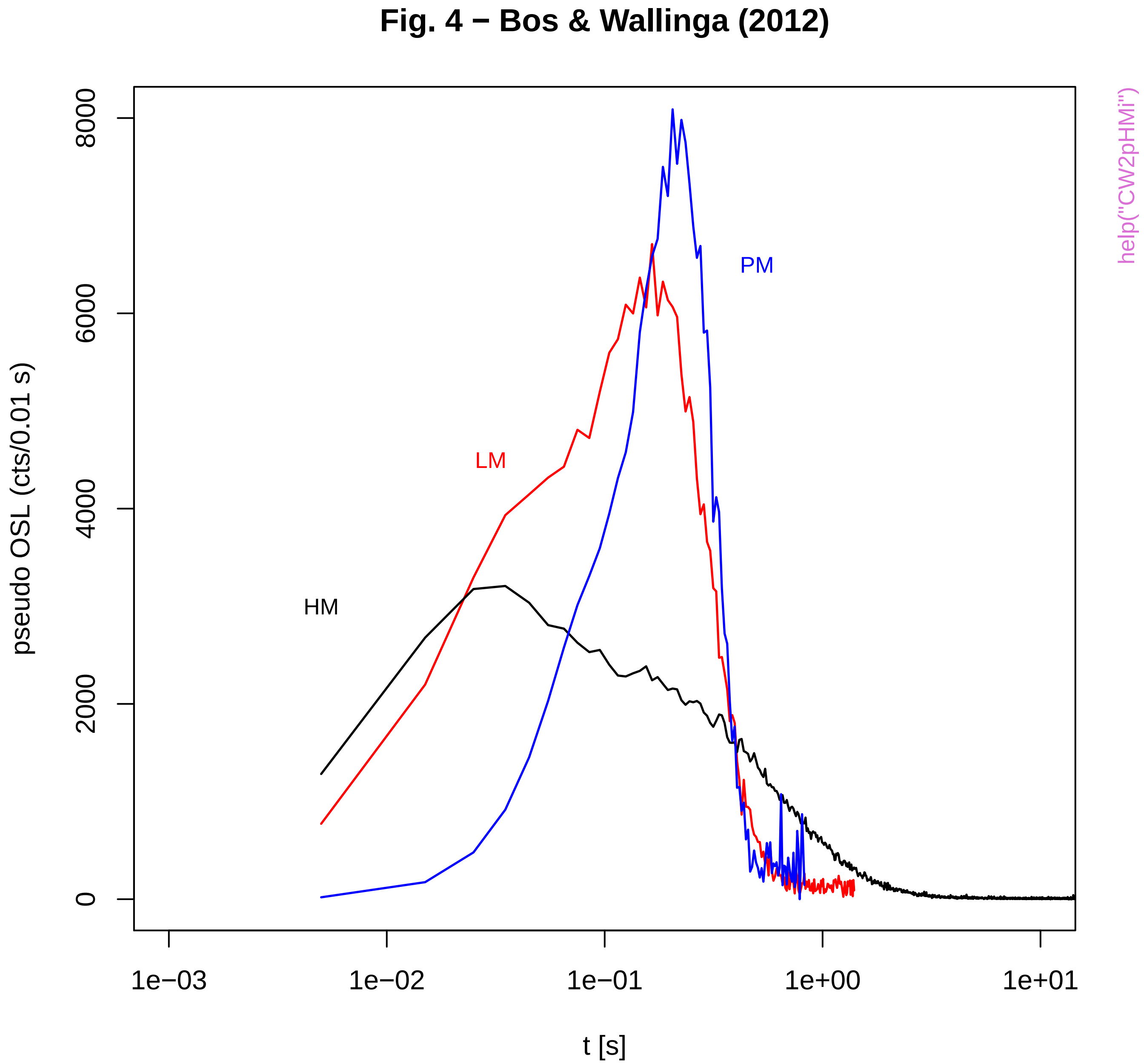
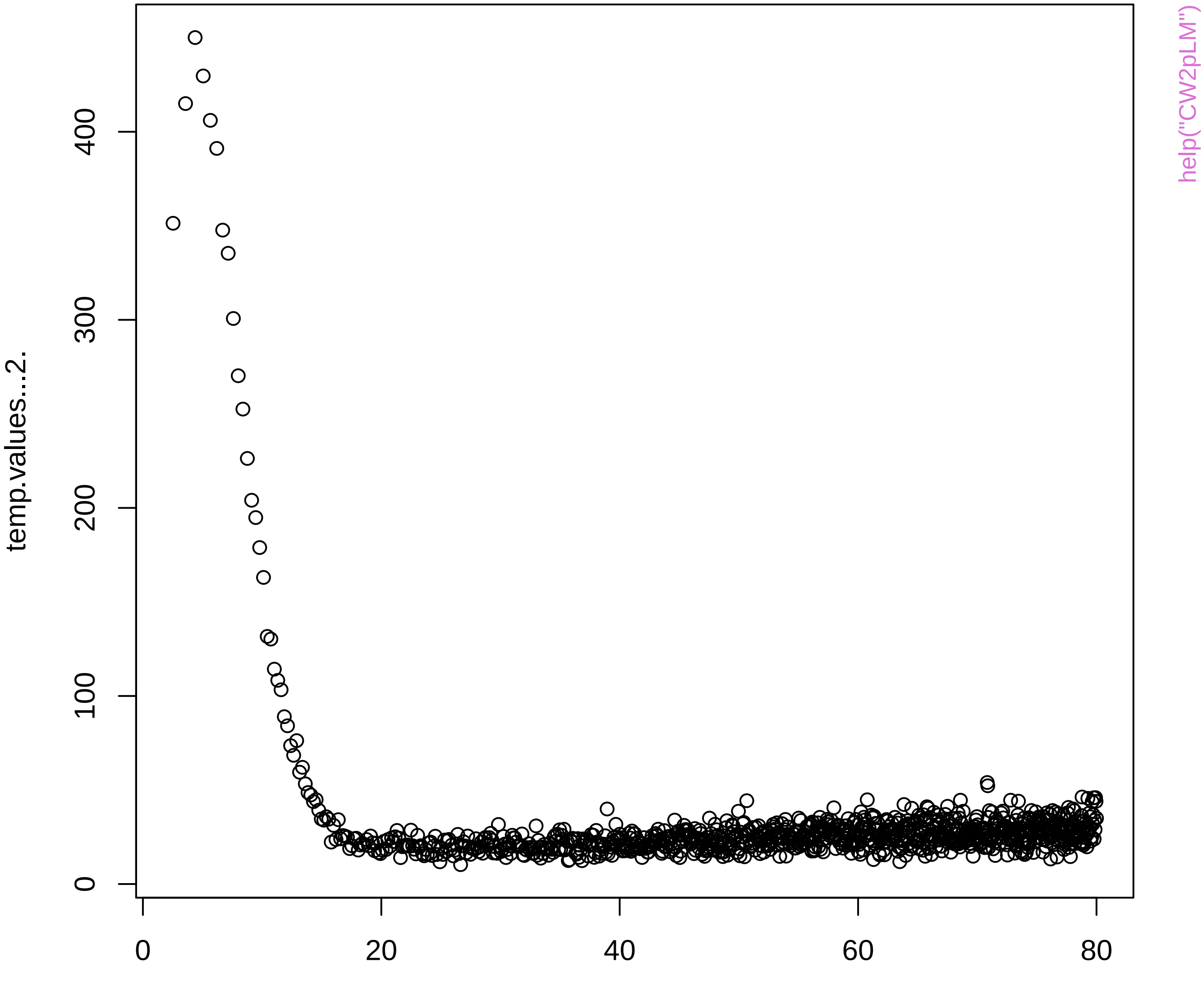
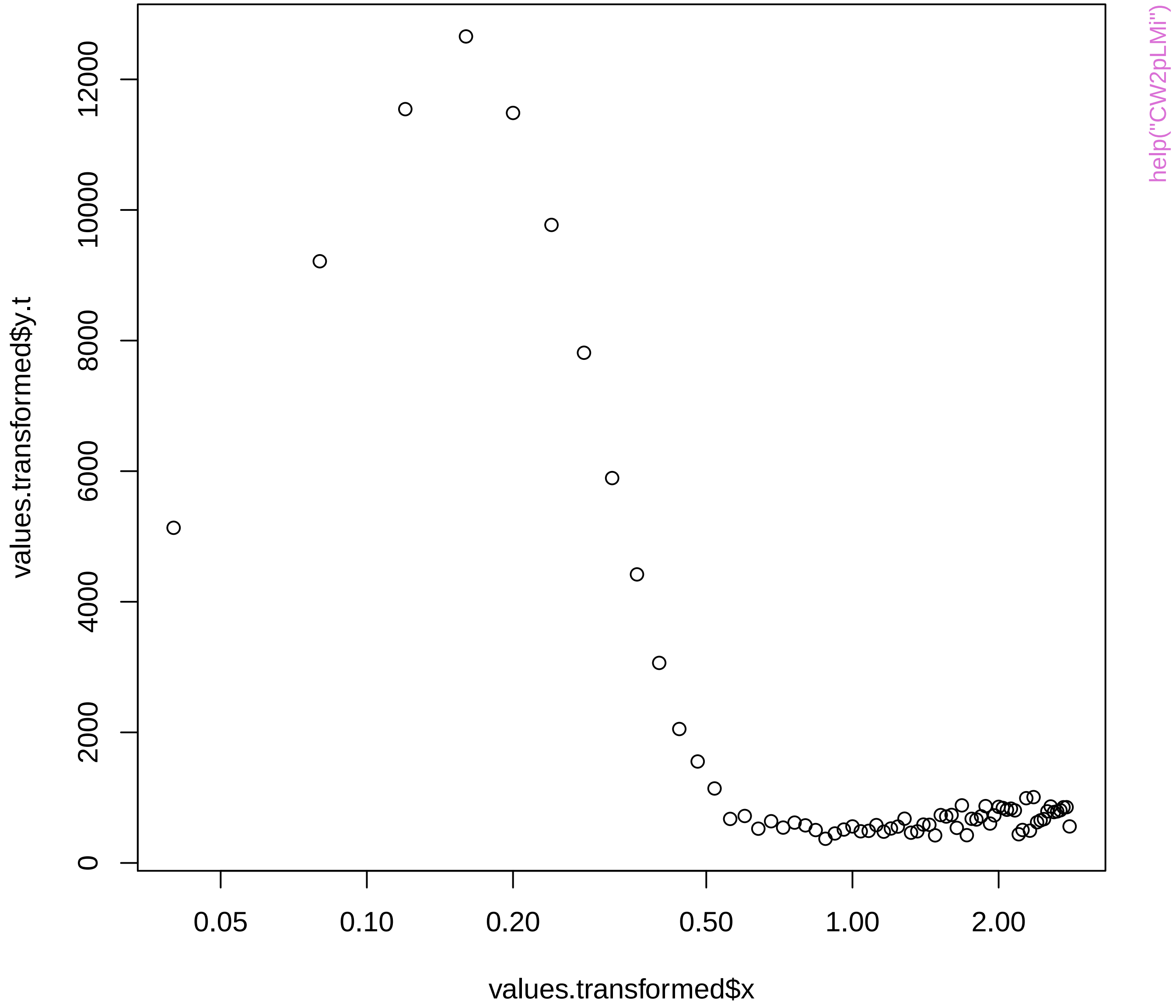


Fig. 4 − Bos & Wallinga (2012)
pseudo OSL (cts/0.01 s)
0
2000
4000
6000
8000
t [s]
1e−03
1e−02
1e−01
1e+00
1e+01
HM
LM
PM
help("CW2pHMi")



temp.values...2.
u
0
100
200
300
400
0
20
40
60
80
help("CW2pLM")



0
2000
4000
6000
8000
10000
12000
values.transformed$y.t
0.05
0.10
0.20
0.50
1.00
2.00
values.transformed$x
help("CW2pLMi")

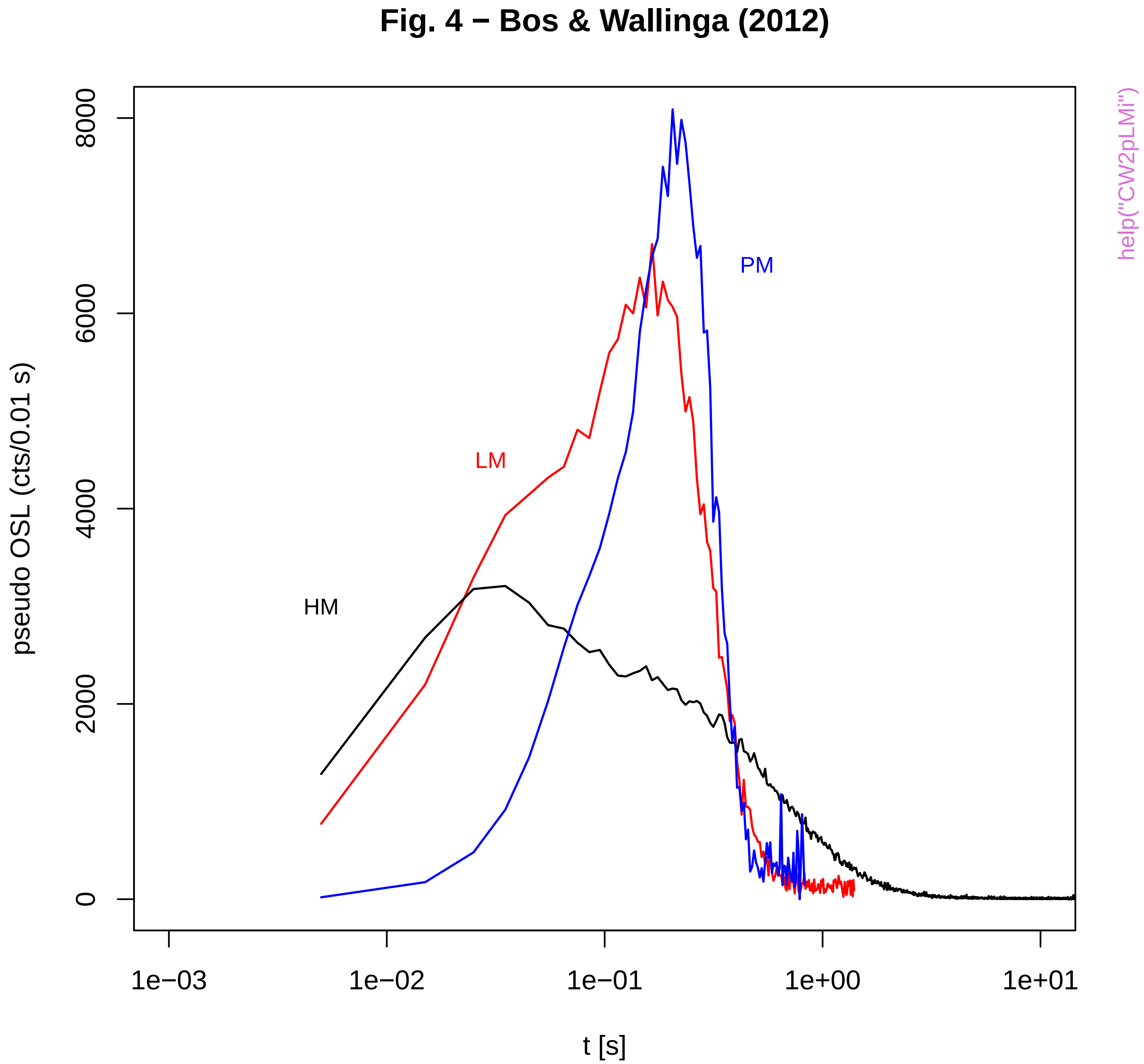
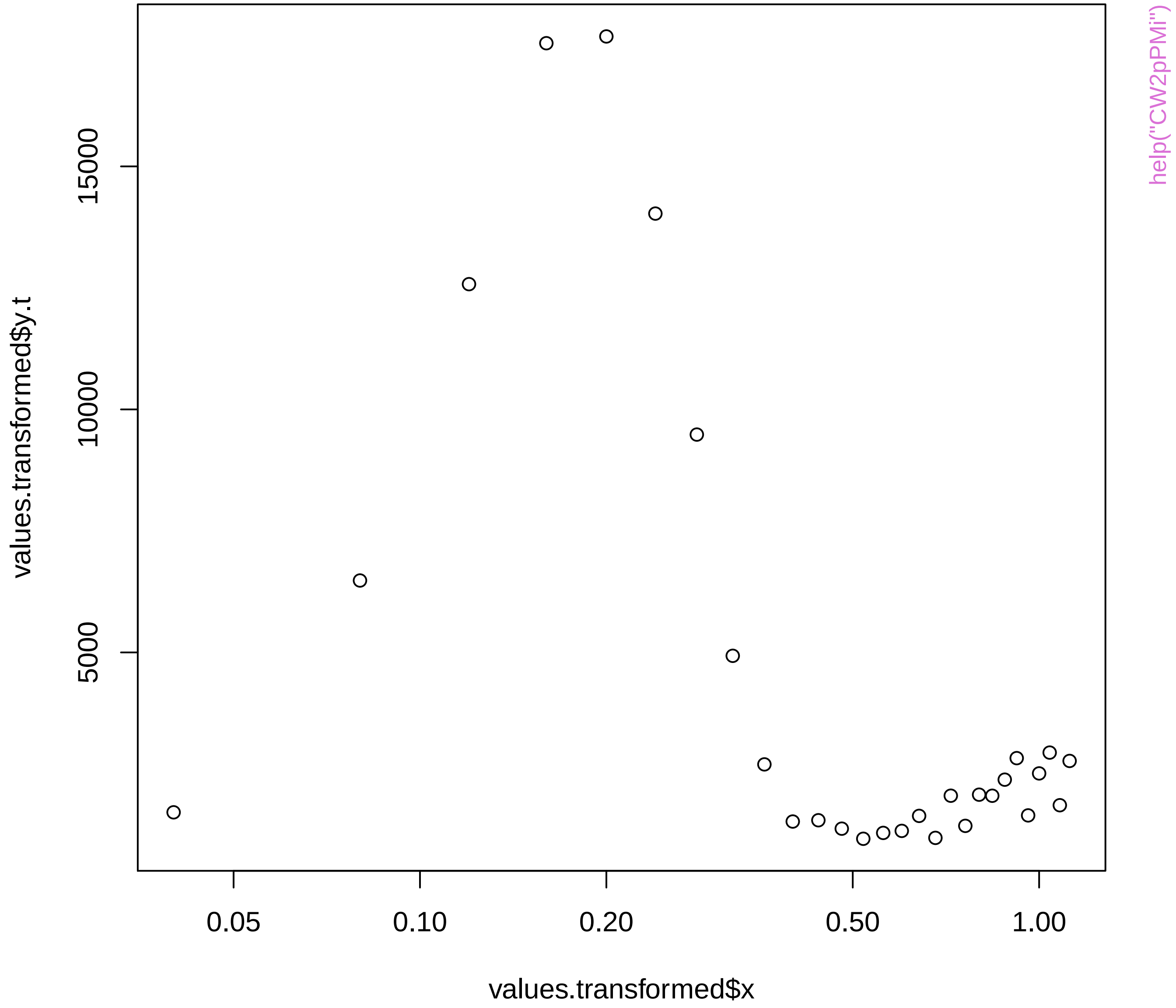


Fig. 4 − Bos & Wallinga (2012)
pseudo OSL (cts/0.01 s)
0
2000
4000
6000
8000
HM
LM
PM
1e−03
1e−02
1e−01
1e+00
1e+01
t [s]
help("CW2pLMi")


15000
10000
5000
values.transformed$y.t
0.05
0.10
0.20
0.50
1.00
values.transformed$x
help("CW2pPMi")

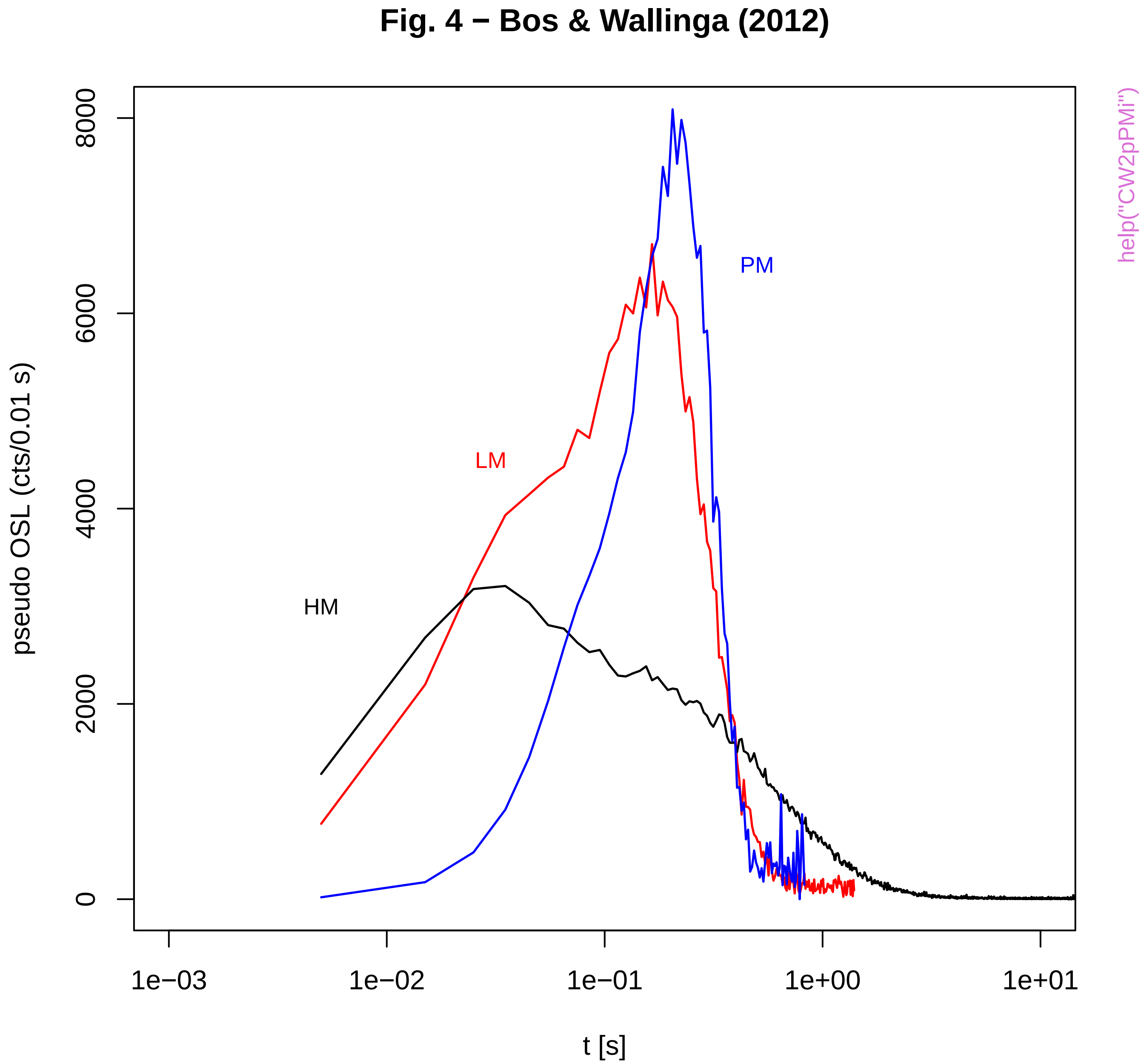
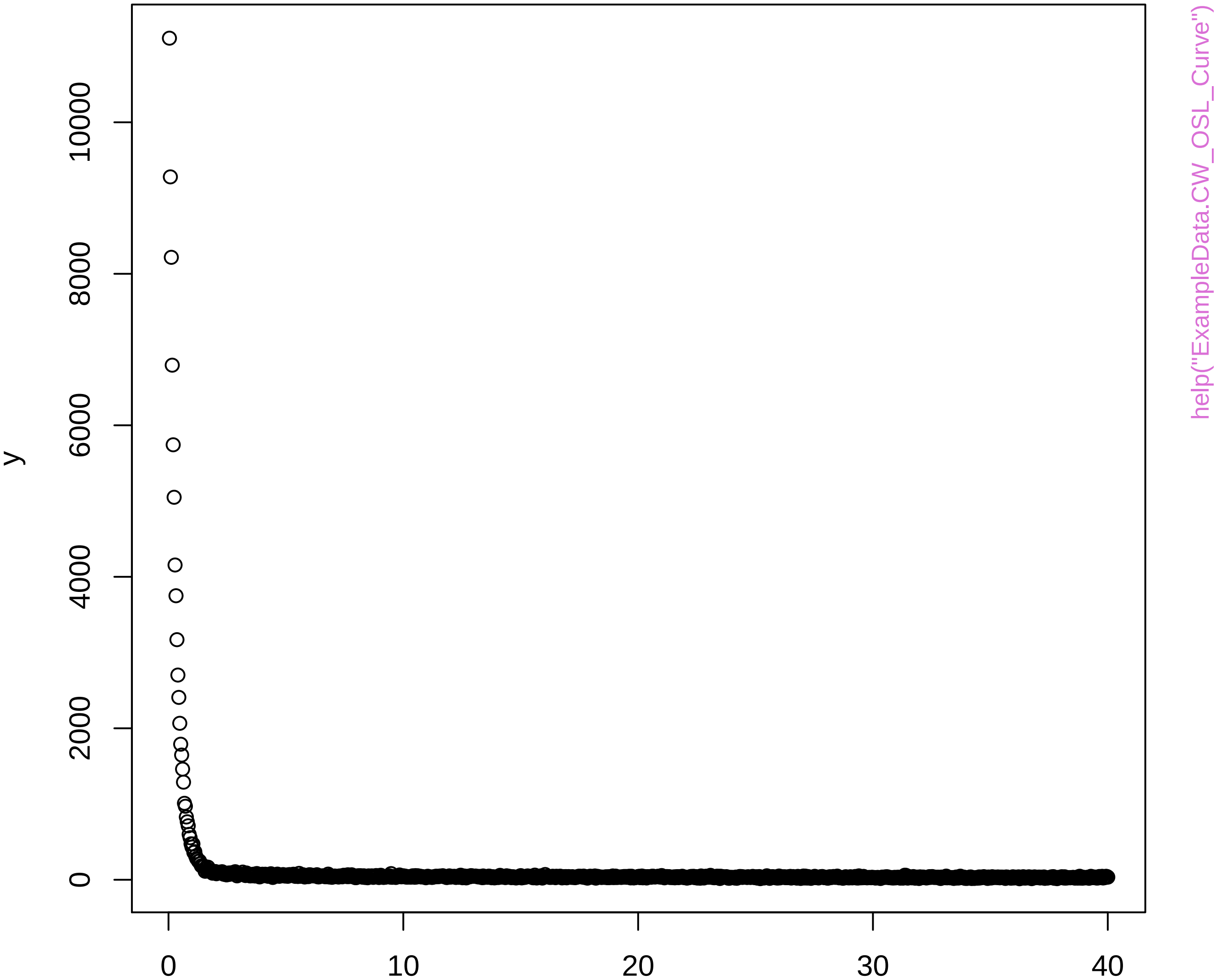
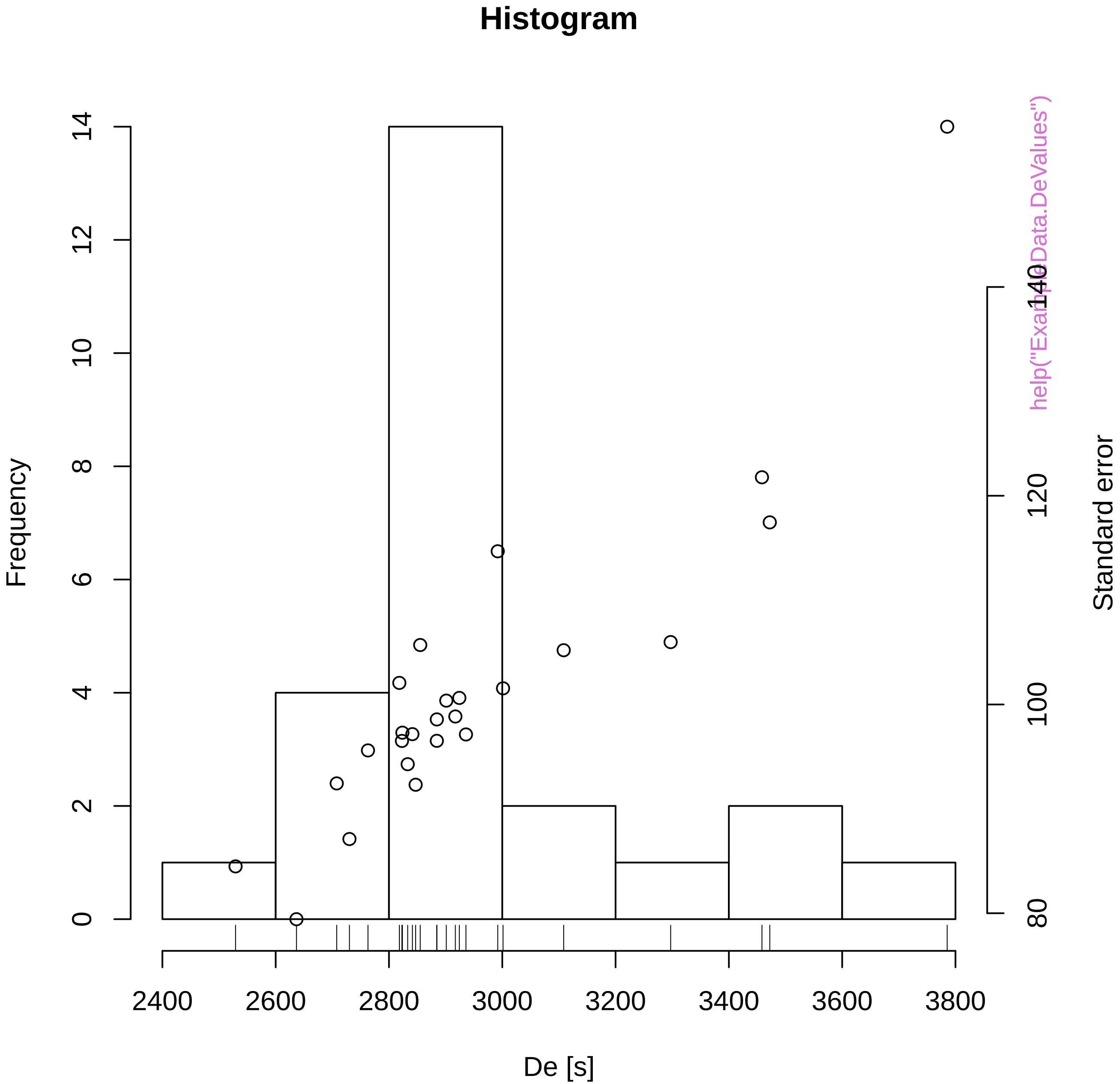


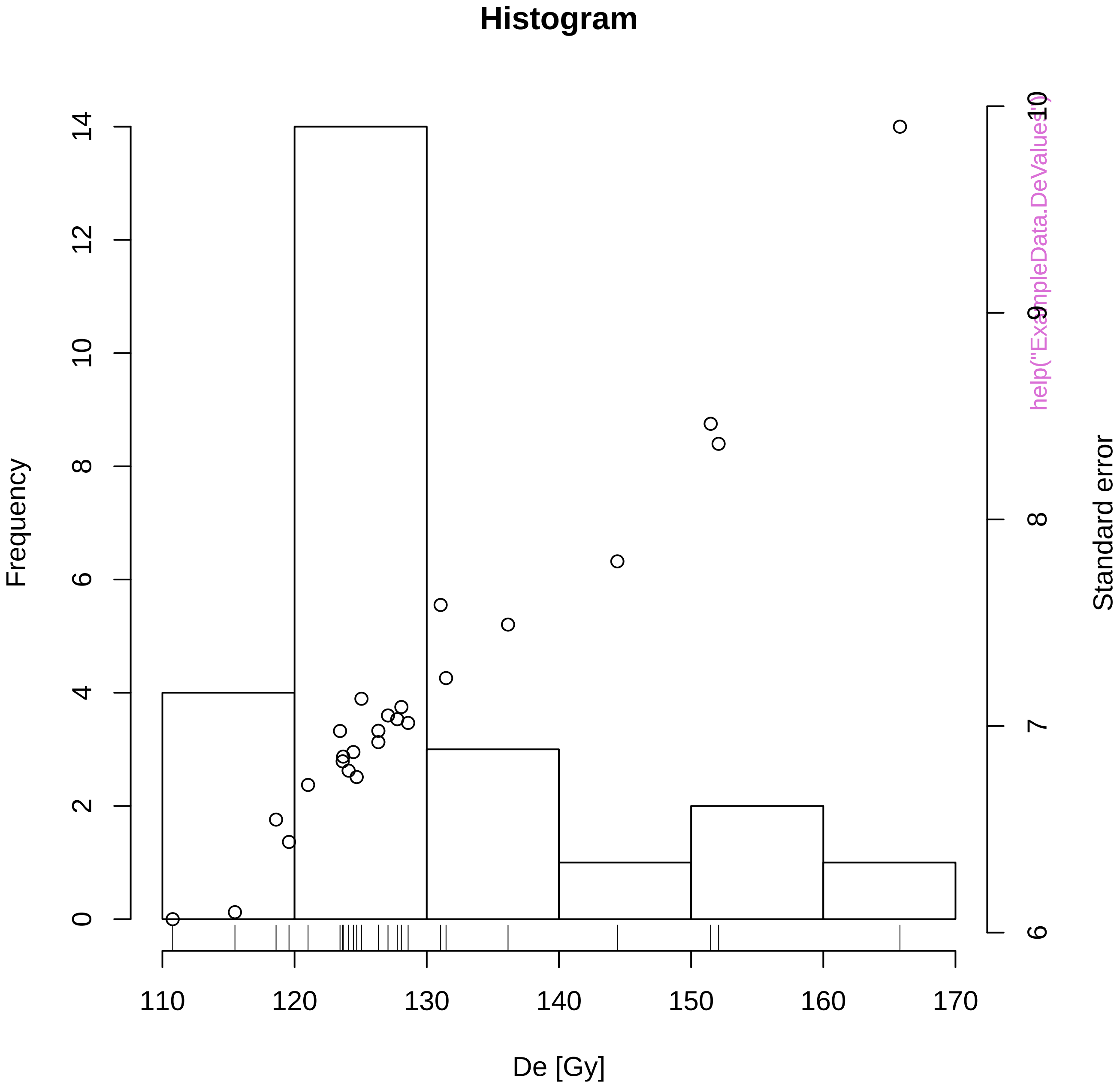
Fig. 4 − Bos & Wallinga (2012)
pseudo OSL (cts/0.01 s)
t [s]
0
2000
4000
6000
8000
1e−03
1e−02
1e−01
1e+00
1e+01
HM
LM
PM
help("CW2pPMi")



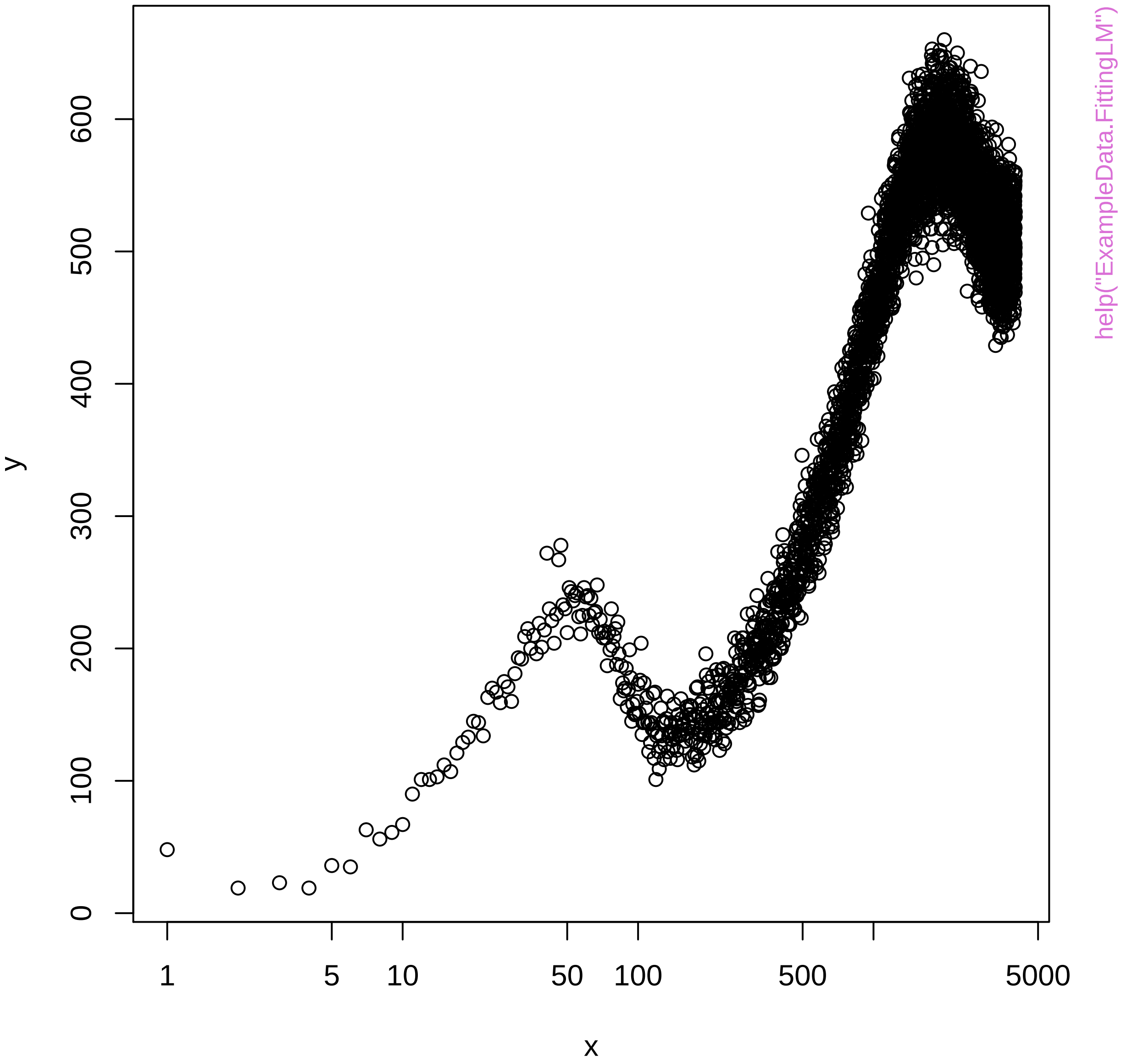
0
2000
4000
6000
8000
10000
y
0
10
20
30
40
x
help("ExampleData.CW_OSL_Curve")



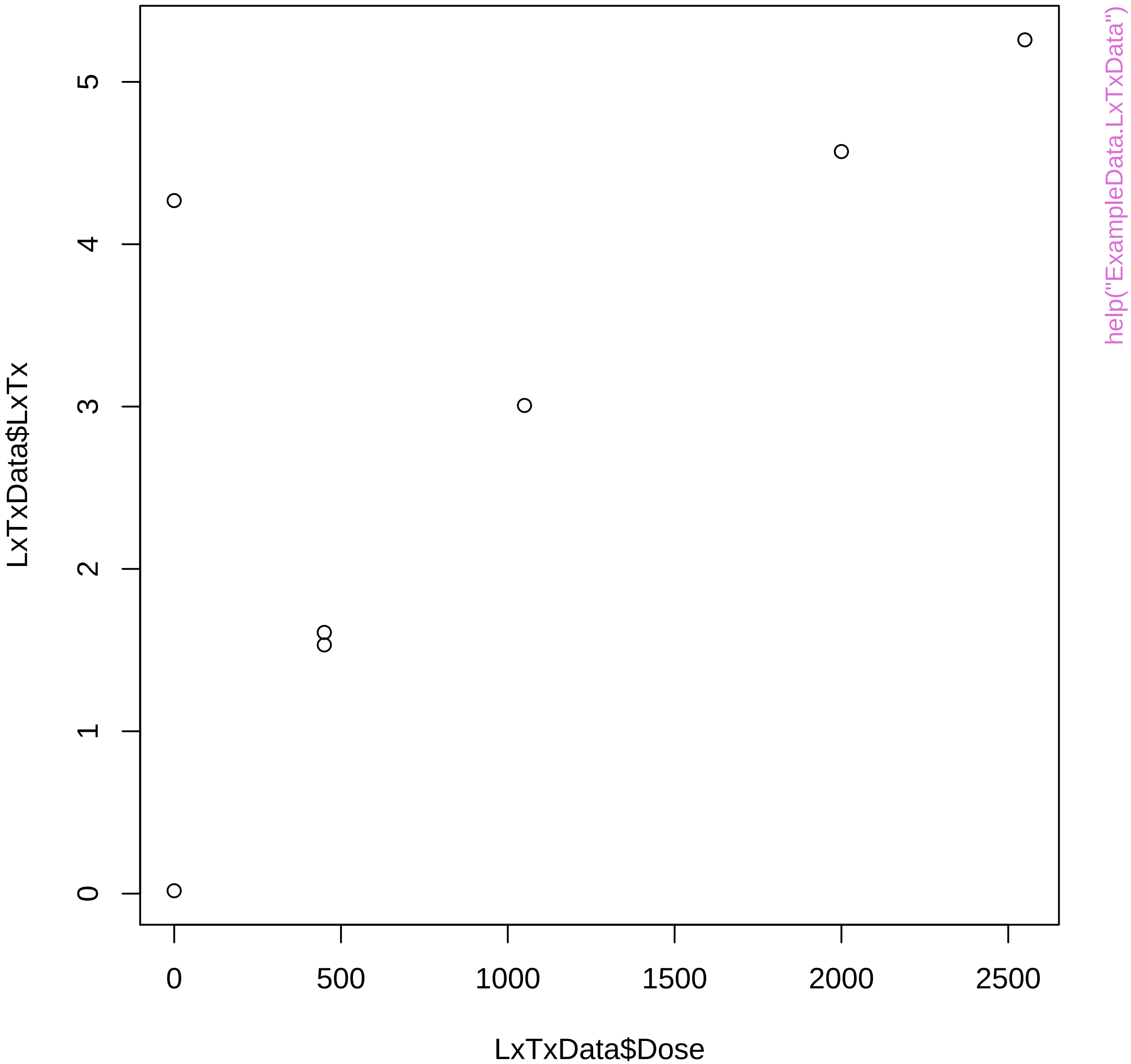
Histogram
Frequency
0
2
4
6
8
10
12
14
2400
2600
2800
3000
3200
3400
3600
3800
De [s]
Standard error
80
100
120
140
help("ExampleData.DeValues")



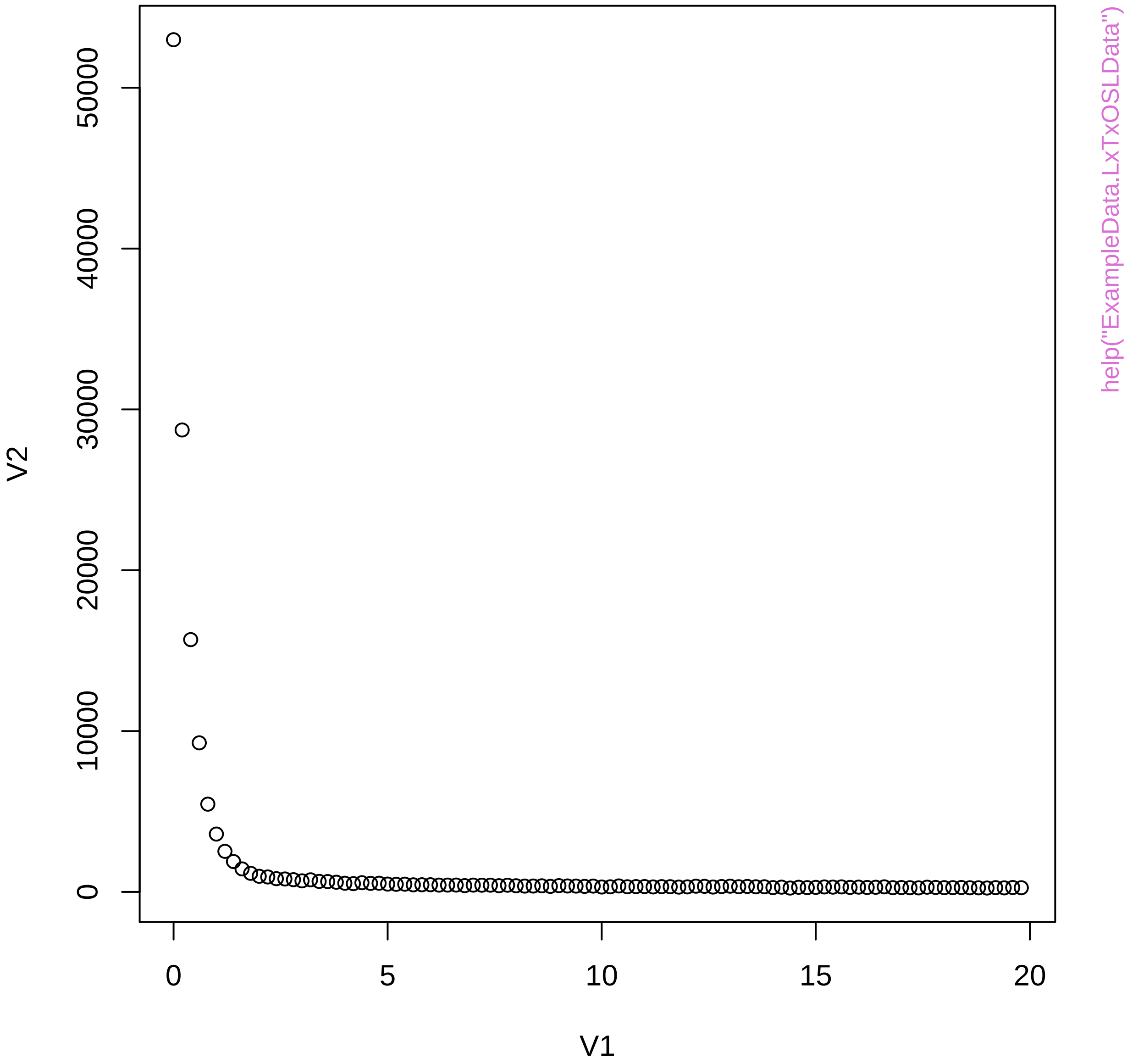
Histogram
Frequency
0
2
4
6
8
10
12
14
110
120
130
140
150
160
170
De [Gy]
Standard error
6
7
8
9
10
help("ExampleData.DeValues")

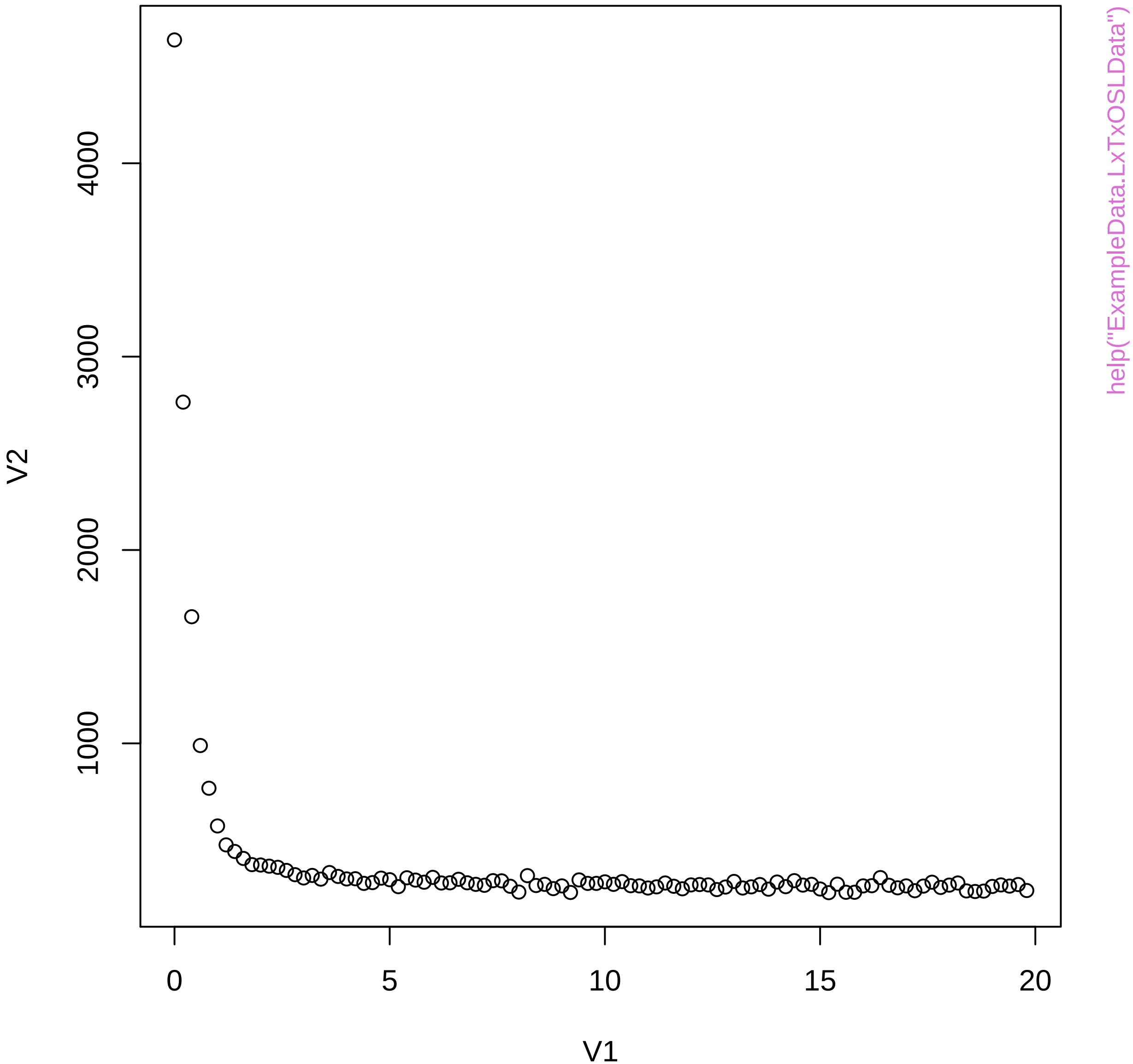


help("ExampleData.FittingLM")
y
x
0
100
200
300
400
500
600
1
5
10
50
100
500
5000

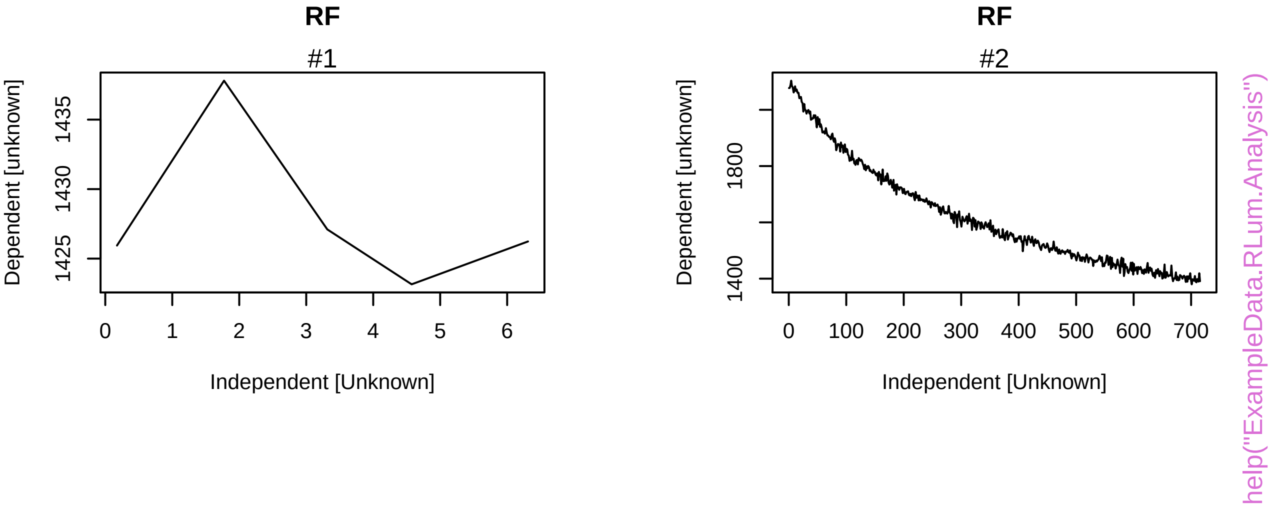


help("ExampleData.LxTxData")
LxTxData$LxTx
0
1
2
3
4
5
0
500
1000
1500
2000
2500
LxTxData$Dose

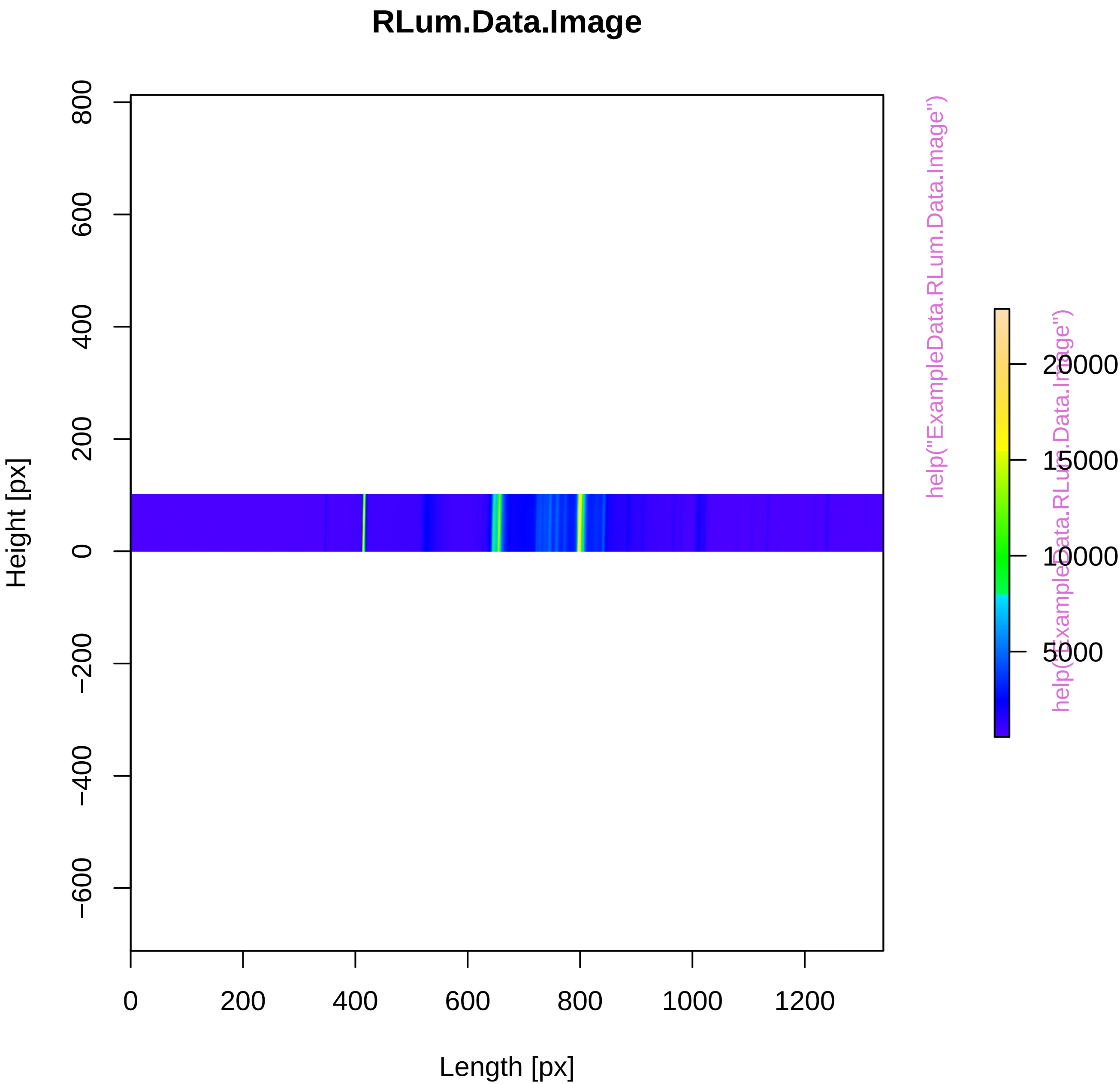

V2
0
10000
20000
30000
40000
50000
V1
0
5
10
15
20
help("ExampleData.LxTxOSLData")



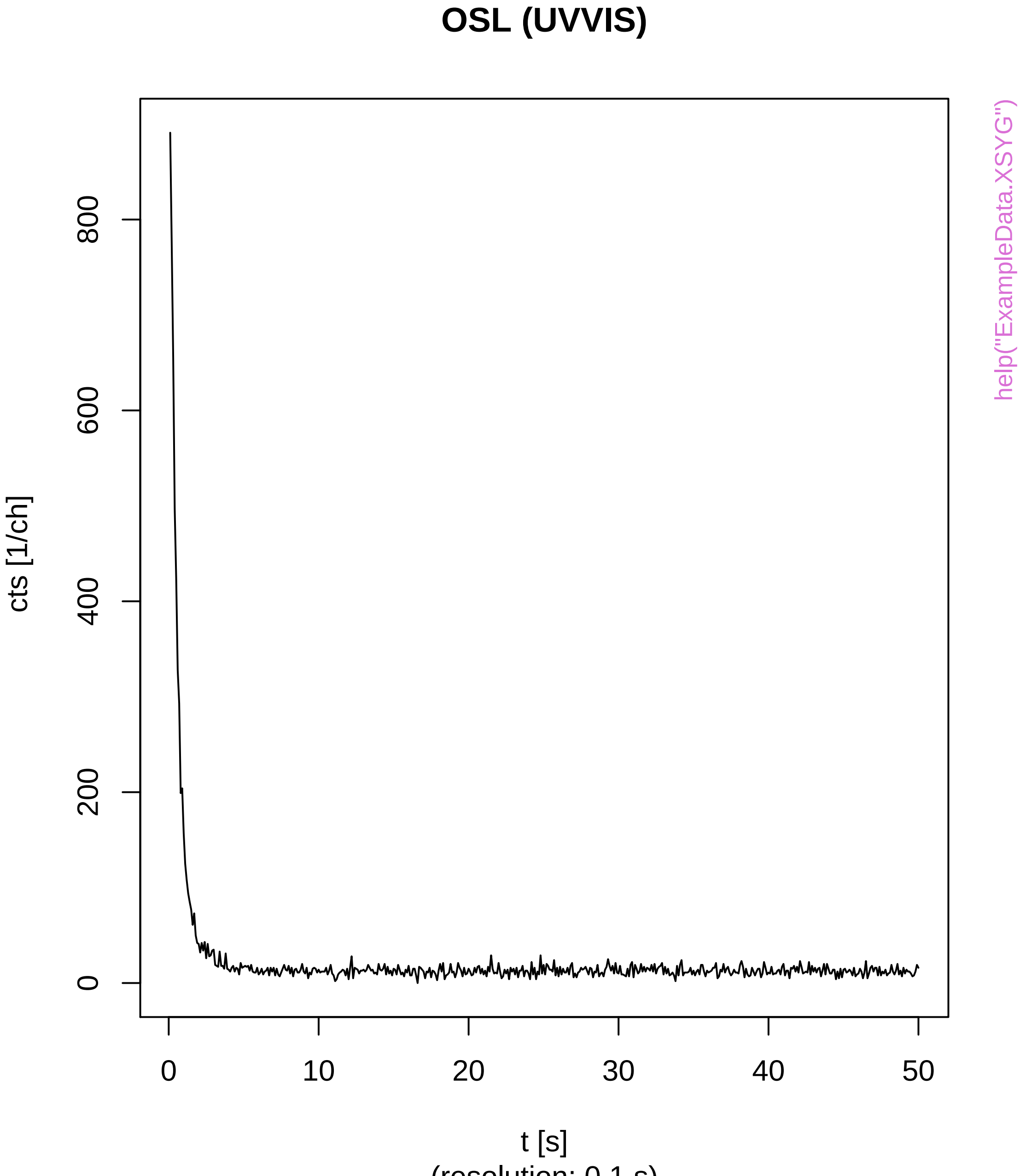
help("ExampleData.LxTxOSLData")
V2
4000
3000
2000
1000
0
5
10
15
20
V1

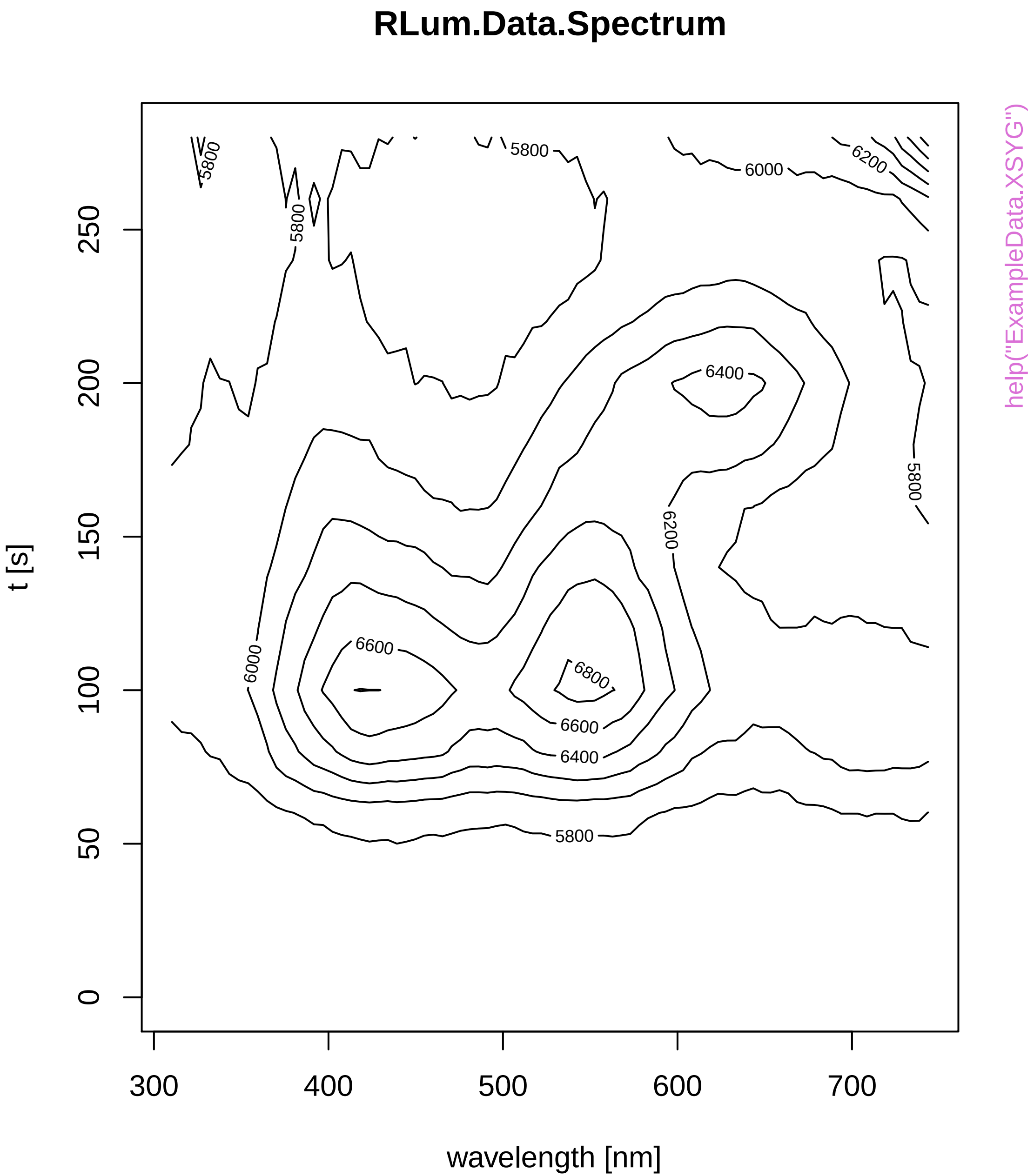


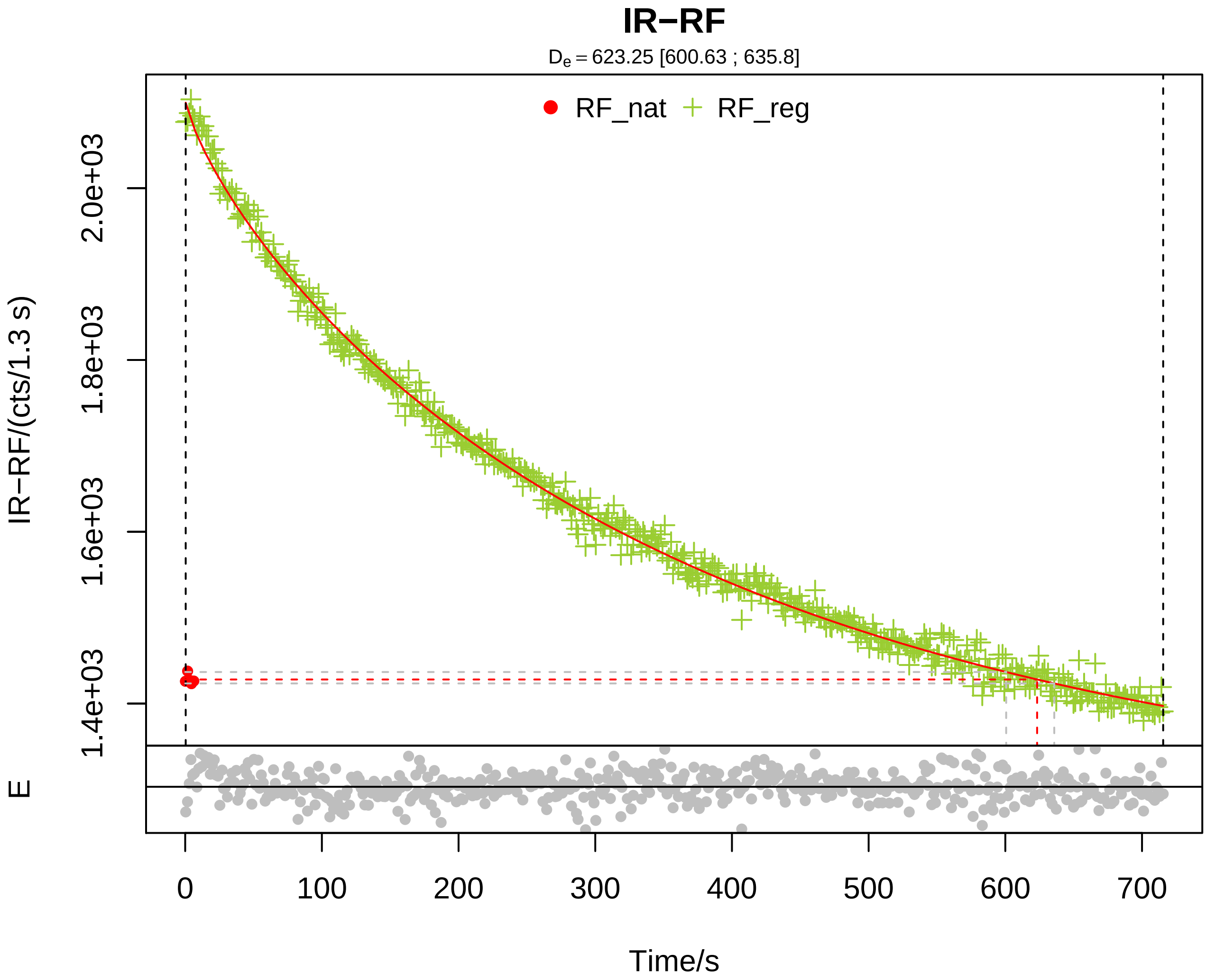
RF
#1
Dependent [unknown]
1425
1430
1435
0
1
2
3
4
5
6
Independent [Unknown]
RF
#2
Dependent [unknown]
1400
1800
0
100
200
300
400
500
600
700
Independent [Unknown]
help("ExampleData.RLum.Analysis")



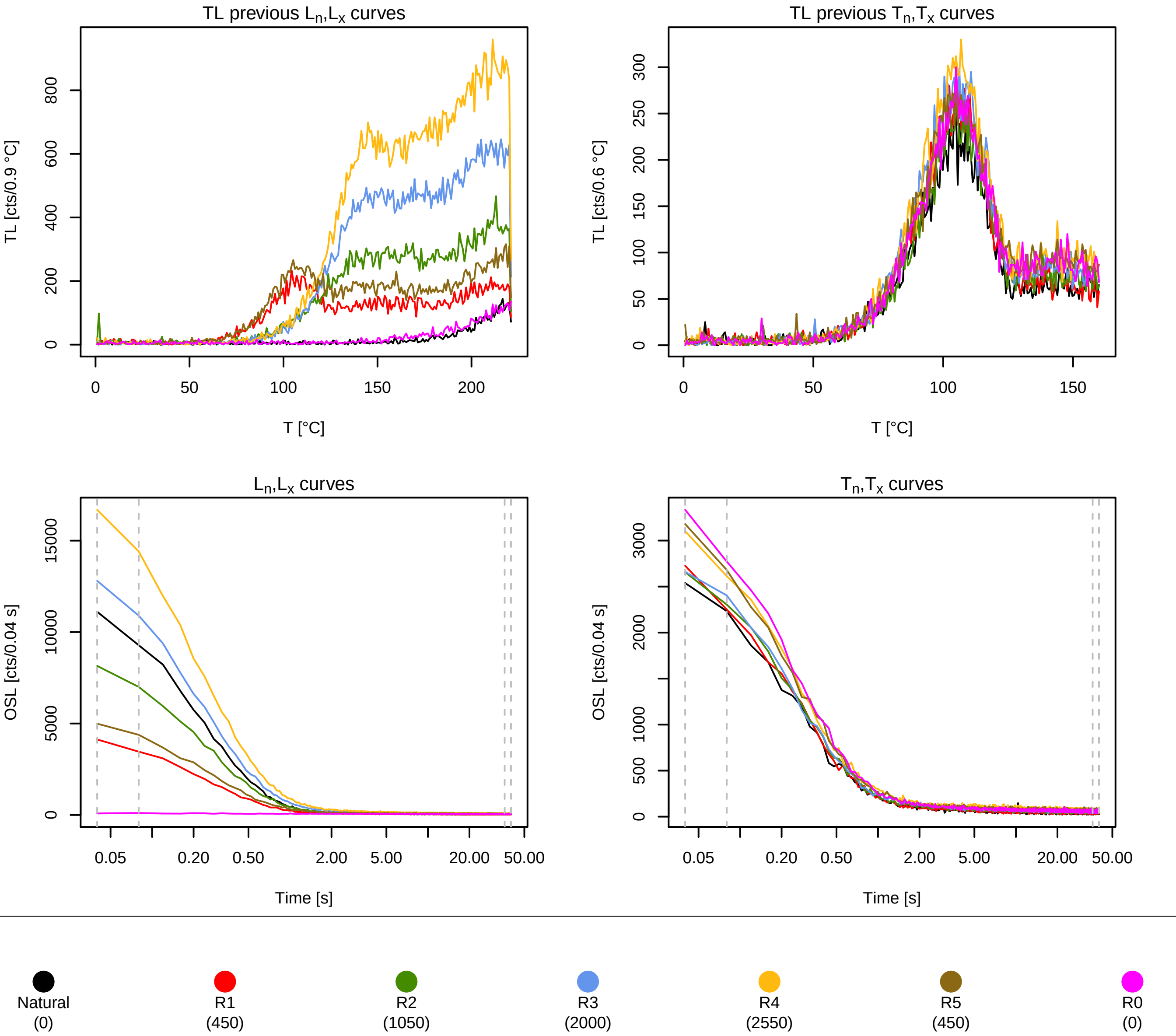
RLum.Data.Image
Height [px]
Length [px]
800
600
400
200
0
−200
−400
−600
0
200
400
600
800
1000
1200
20000
15000
10000
5000
help("ExampleData.RLum.Data.Image")
help("ExampleData.RLum.Data.Image")

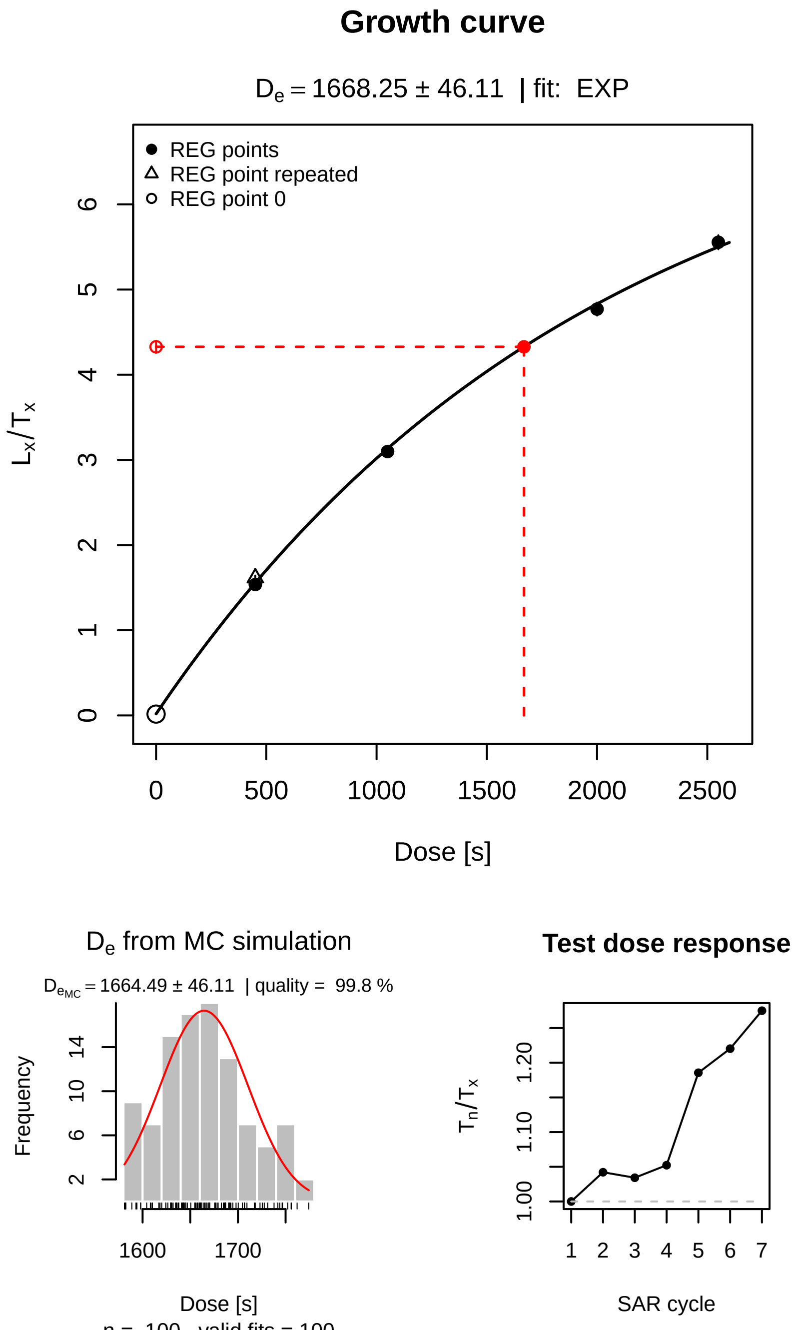

OSL (UVVIS)
cts [1/ch]
800
600
400
200
0
0
10
20
30
40
50
t [s]
(resolution: 0.1 s)
help("ExampleData.XSYG")

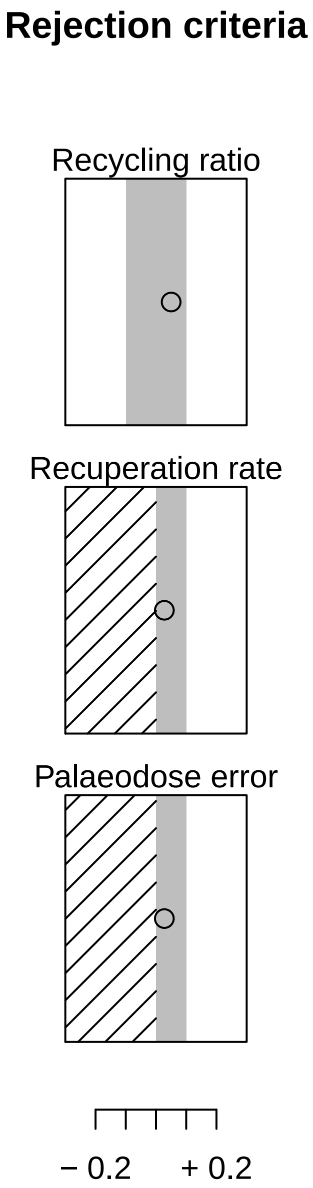

RLum.Data.Spectrum
t [s]
wavelength [nm]
help("ExampleData.XSYG")
0
50
100
150
200
250
300
400
500
600
700
5800
6000
6200
6400
6600
6800

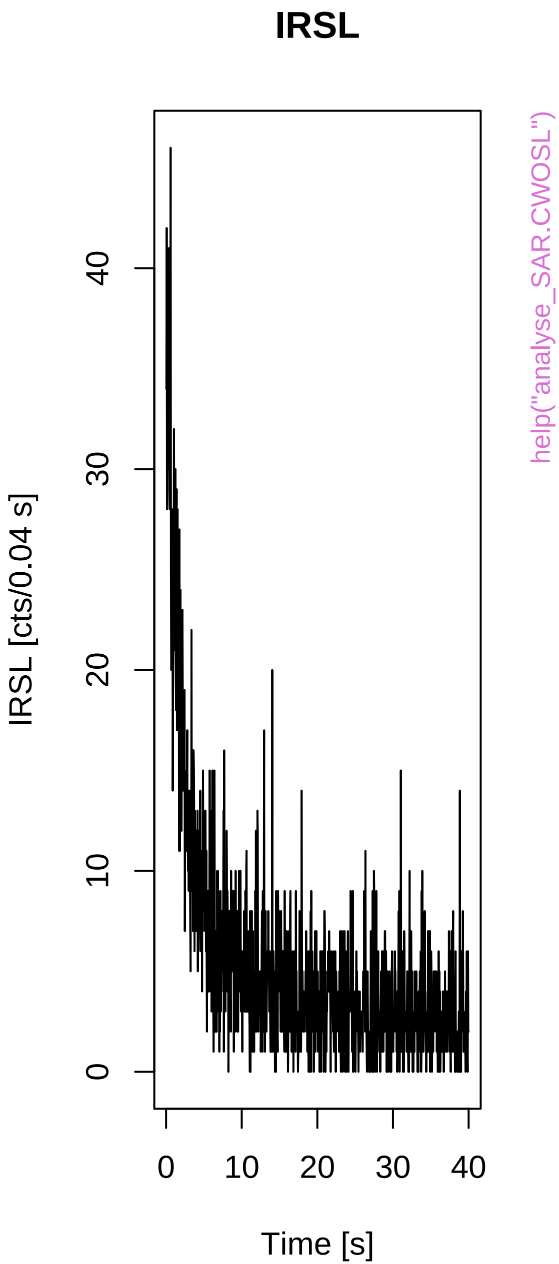


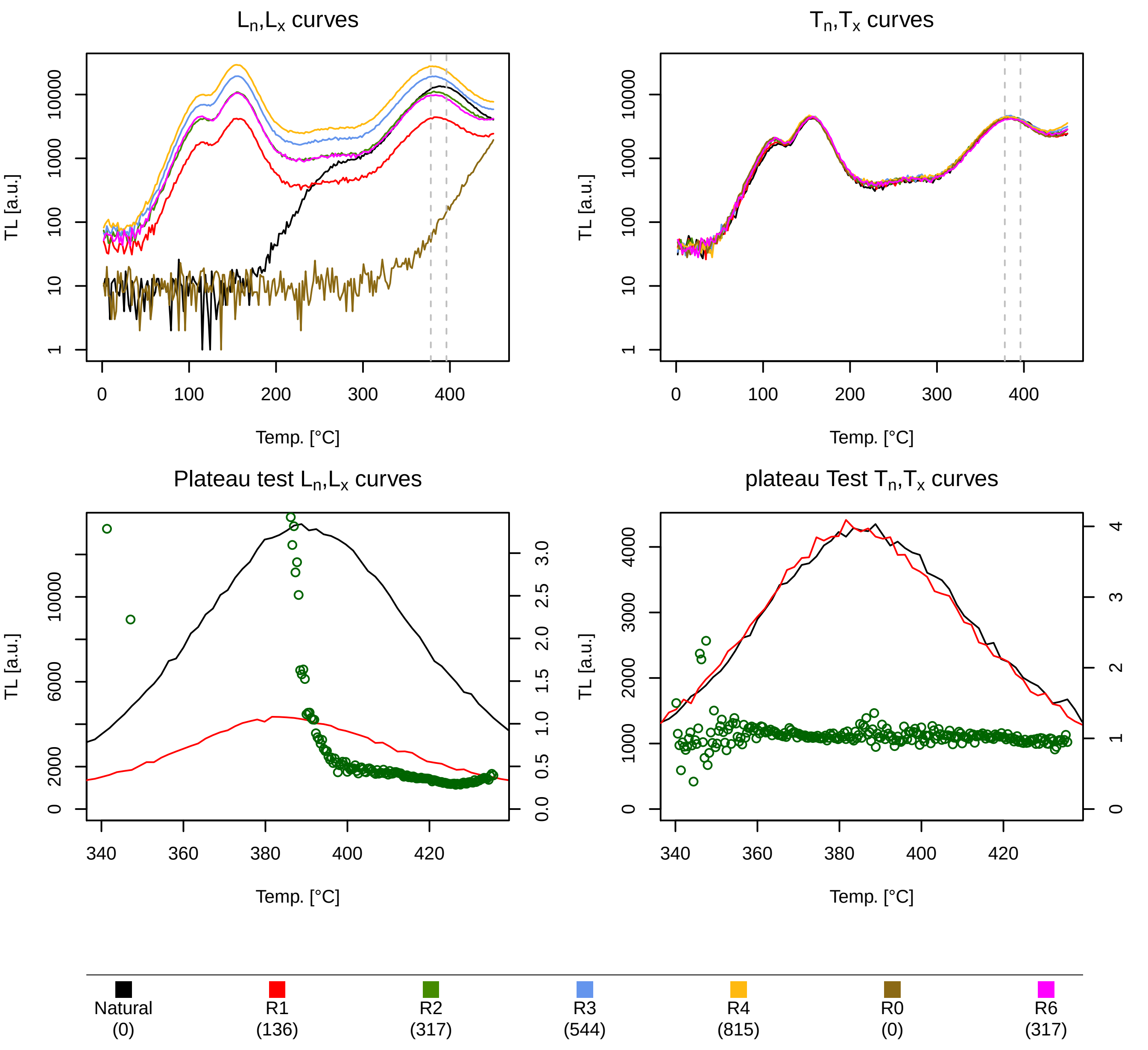
IR−RF
$D_e = 623.25$ [600.63 ; 635.8]
RF_nat
RF_reg
IR−RF/(cts/1.3 s)
2.0e+03
1.8e+03
1.6e+03
1.4e+03
E
0
100
200
300
400
500
600
700
Time/s


TL previous L_n,L_x curves
TL [cts/0.9 °C]
T [°C]
TL previous T_n,T_x curves
TL [cts/0.6 °C]
T [°C]
L_n,L_x curves
OSL [cts/0.04 s]
Time [s]
T_n,T_x curves
OSL [cts/0.04 s]
Time [s]
Natural (0)
R1 (450)
R2 (1050)
R3 (2000)
R4 (2550)
R5 (450)
R0 (0)

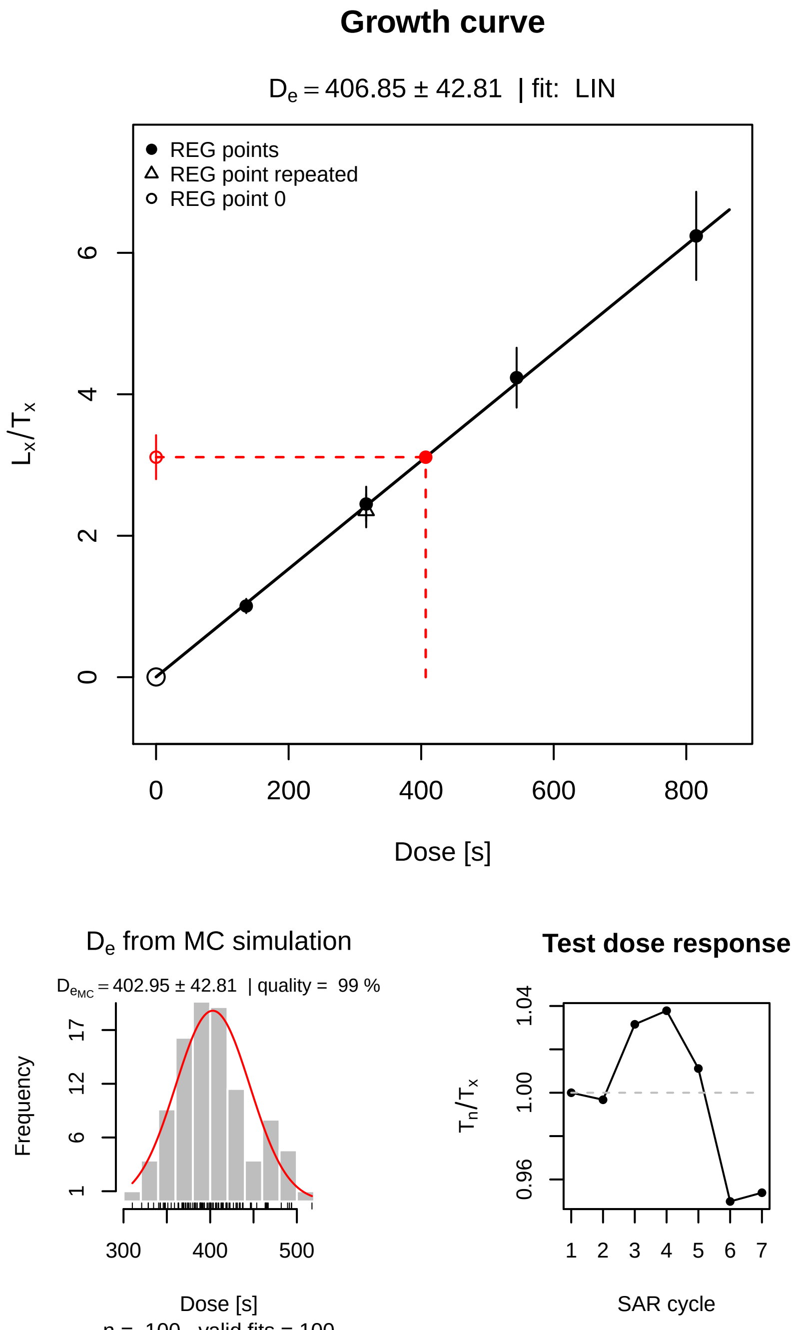

Growth curve
De = 1668.25 ± 46.11 | fit: EXP
REG points
REG point repeated
REG point 0
Lx/Tx
Dose [s]
De from MC simulation
DeMC = 1664.49 ± 46.11 | quality = 99.8 %
Frequency
Dose [s]
Test dose response
Tn/Tx
SAR cycle


Rejection criteria
Recycling ratio
Recuperation rate
Palaeodose error
− 0.2
+ 0.2


IRSL
IRSL [cts/0.04 s]
0
10
20
30
40
Time [s]
help("analyse_SAR.CWOSL")



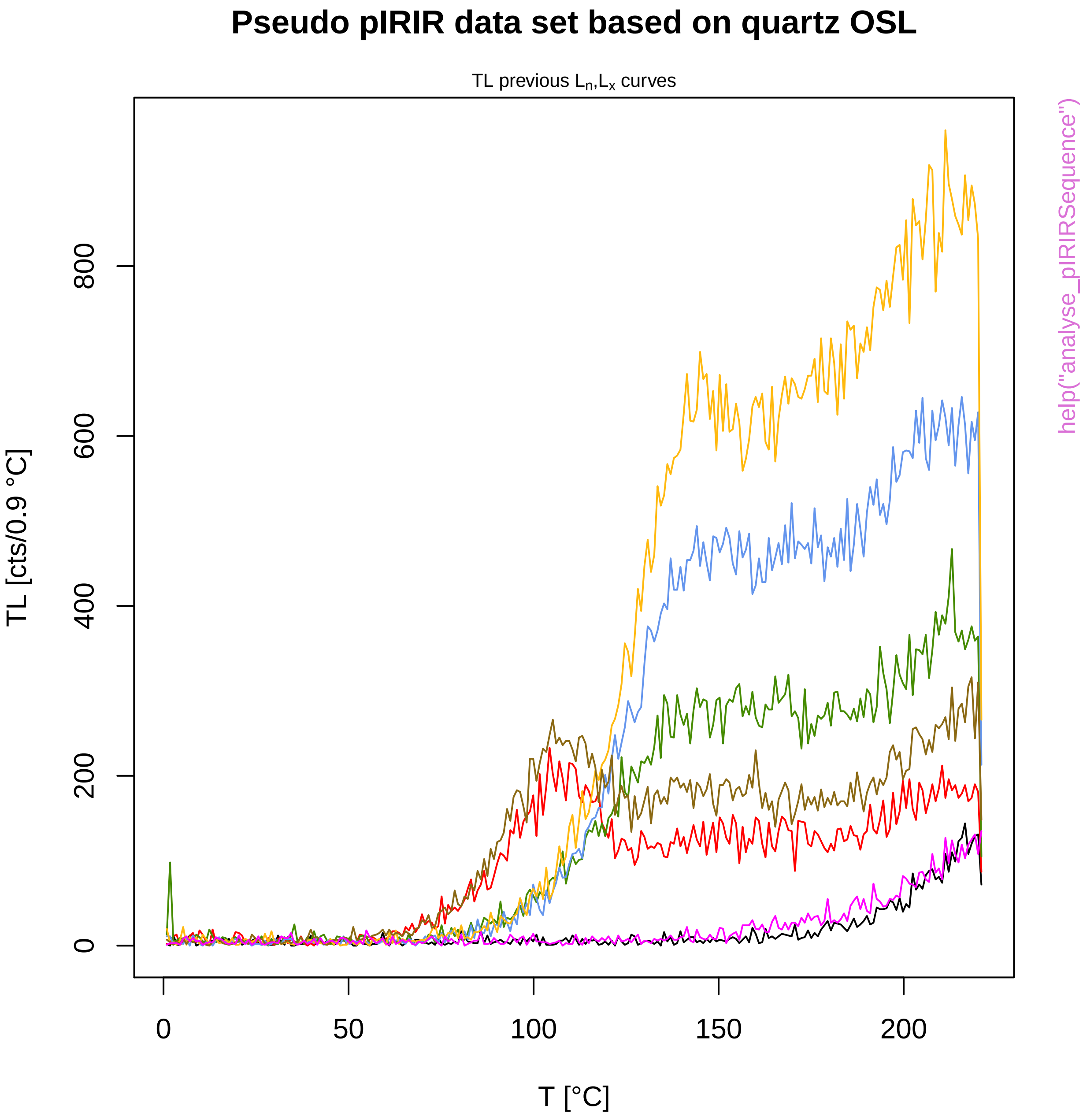
Ln,Lx curves
Tn,Tx curves
Plateau test Ln,Lx curves
plateau Test Tn,Tx curves
TL [a.u.]
Temp. [°C]
Natural (0)
R1 (136)
R2 (317)
R3 (544)
R4 (815)
R0 (0)
R6 (317)


Growth curve
$D_e = 406.85 \pm 42.81$ | fit: LIN
REG points
REG point repeated
REG point 0
L_x/T_x
Dose [s]
D_e from MC simulation
$D_{e_{MC}} = 402.95 \pm 42.81$ | quality = 99 %
Frequency
Dose [s]
Test dose response
T_n/T_x
SAR cycle

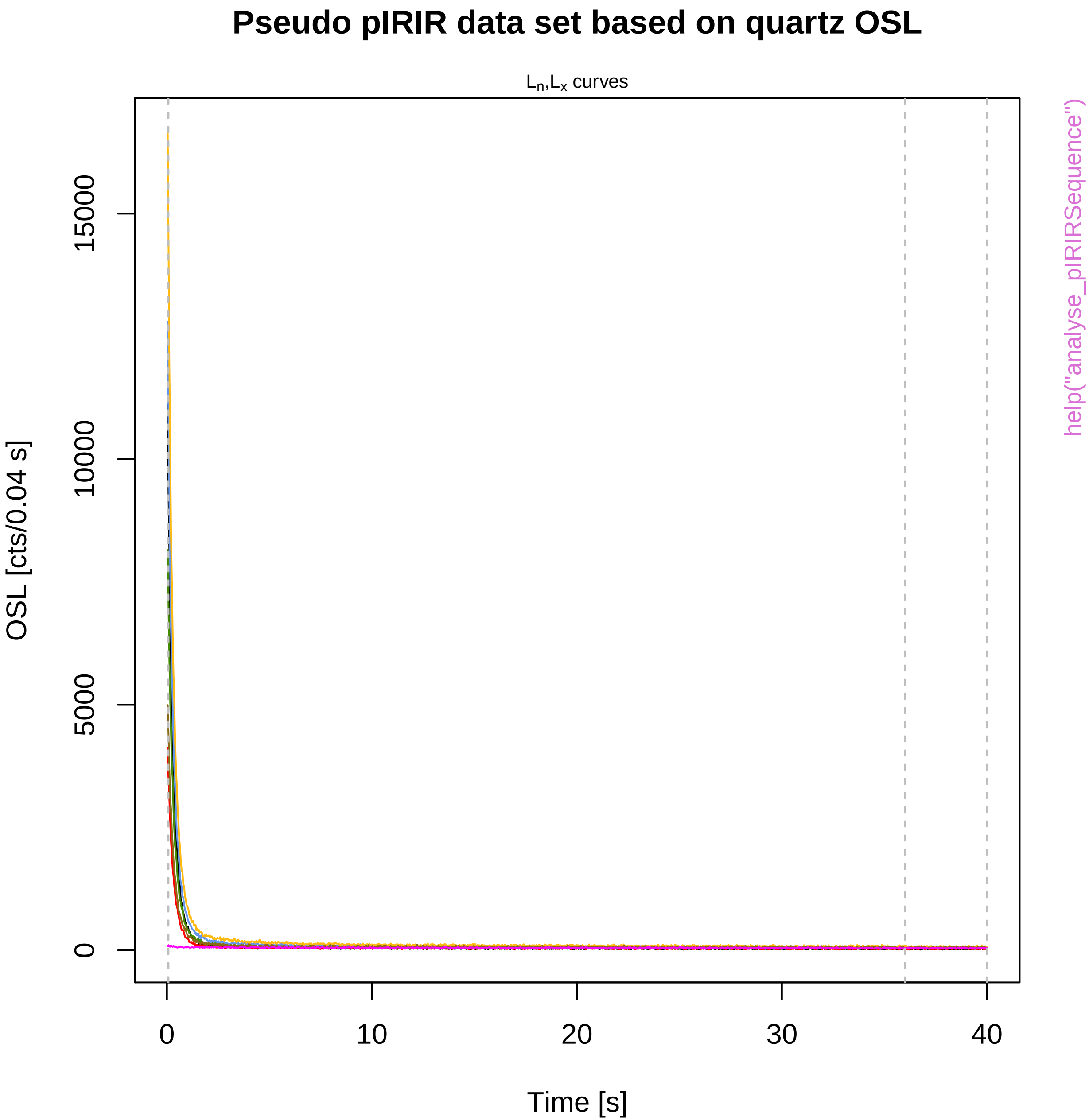
Pseudo pIRIR data set based on quartz OSL

help("analyse_pIRIRSequence")

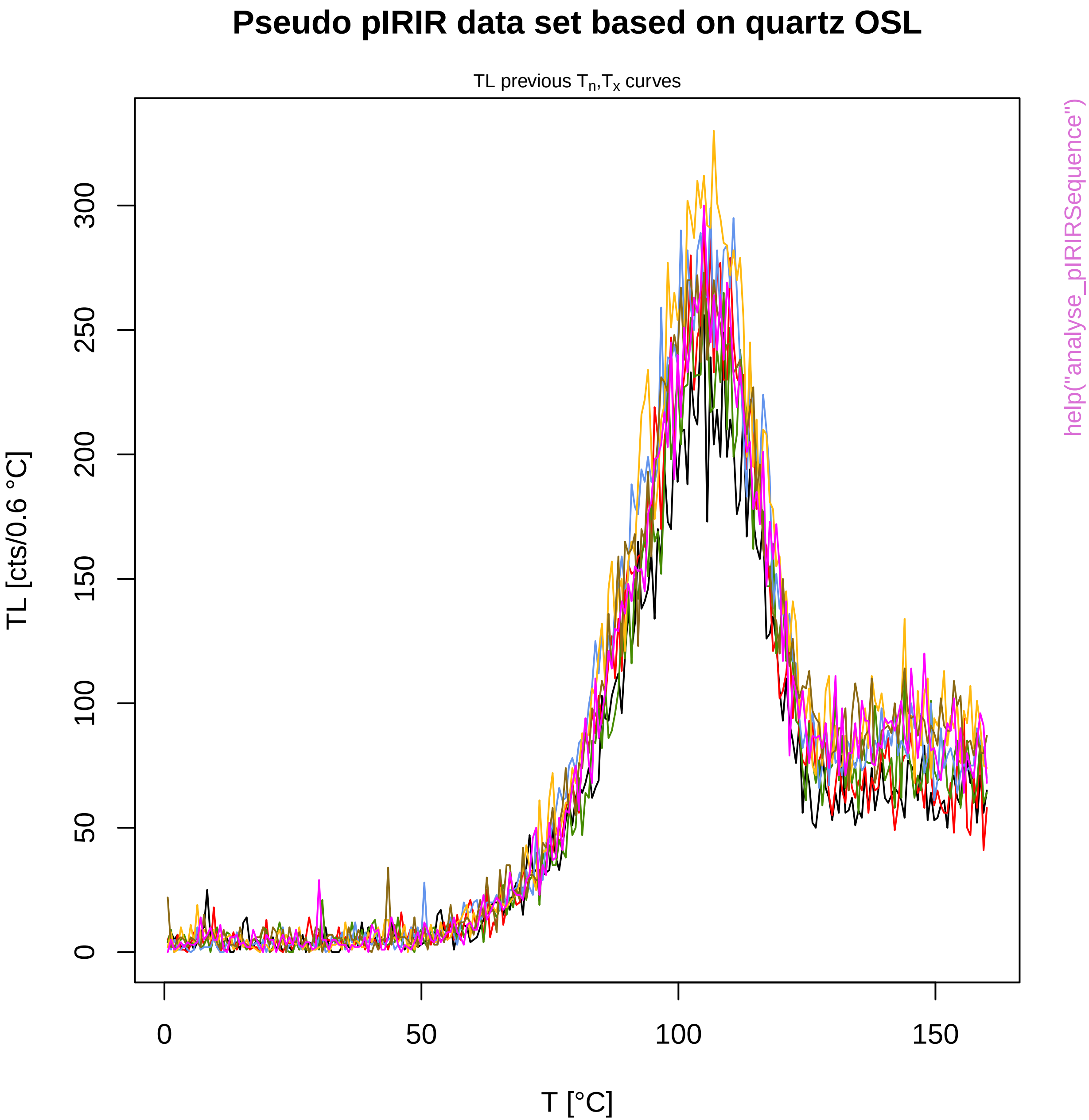
TL
pseudoIRSL1
pseudoIRSL2



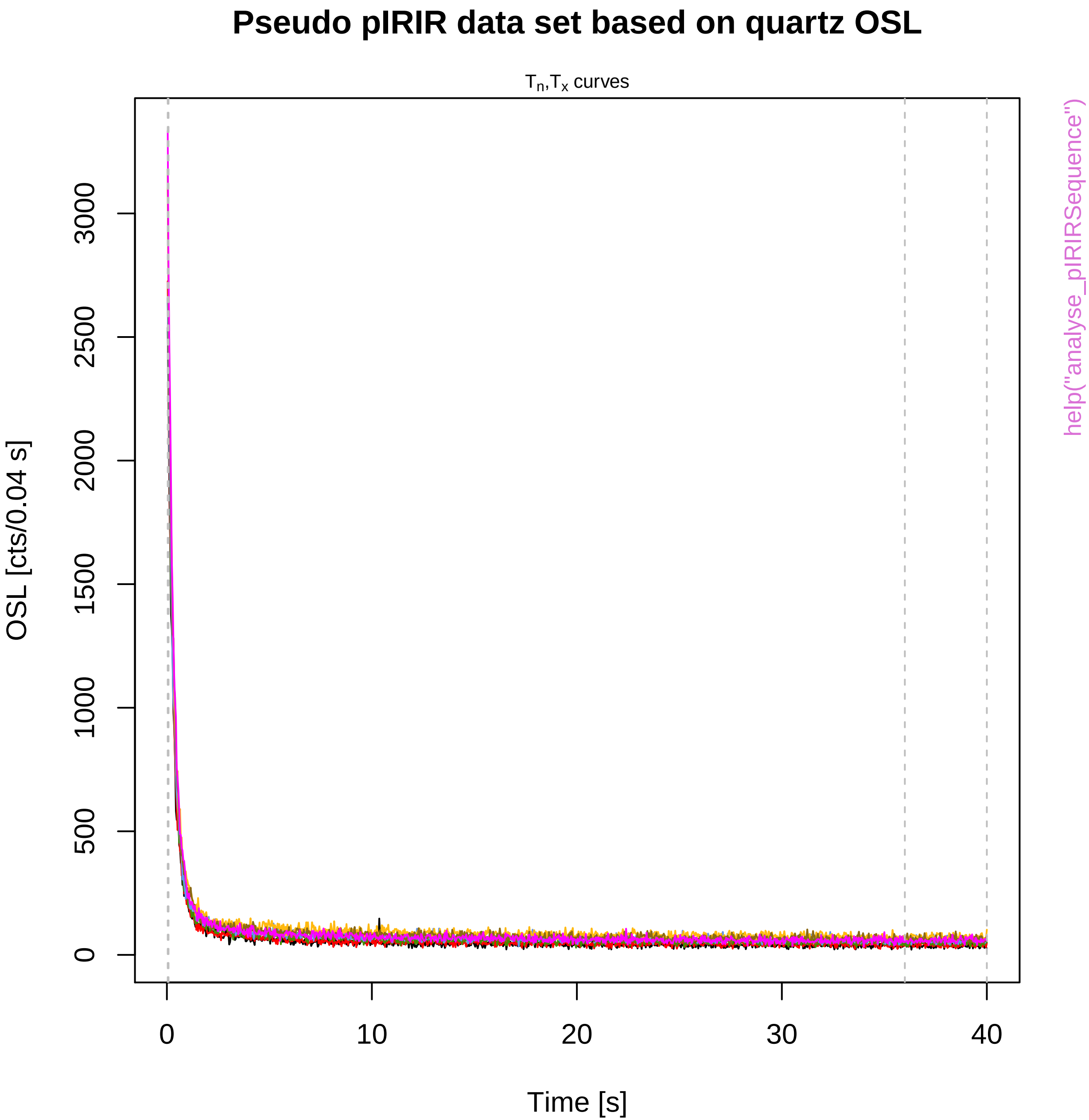
Pseudo pIRIR data set based on quartz OSL
TL previous L_n,L_x curves
TL [cts/0.9 °C]
T [°C]
0
200
400
600
800
0
50
100
150
200
help("analyse_pIRIRSequence")

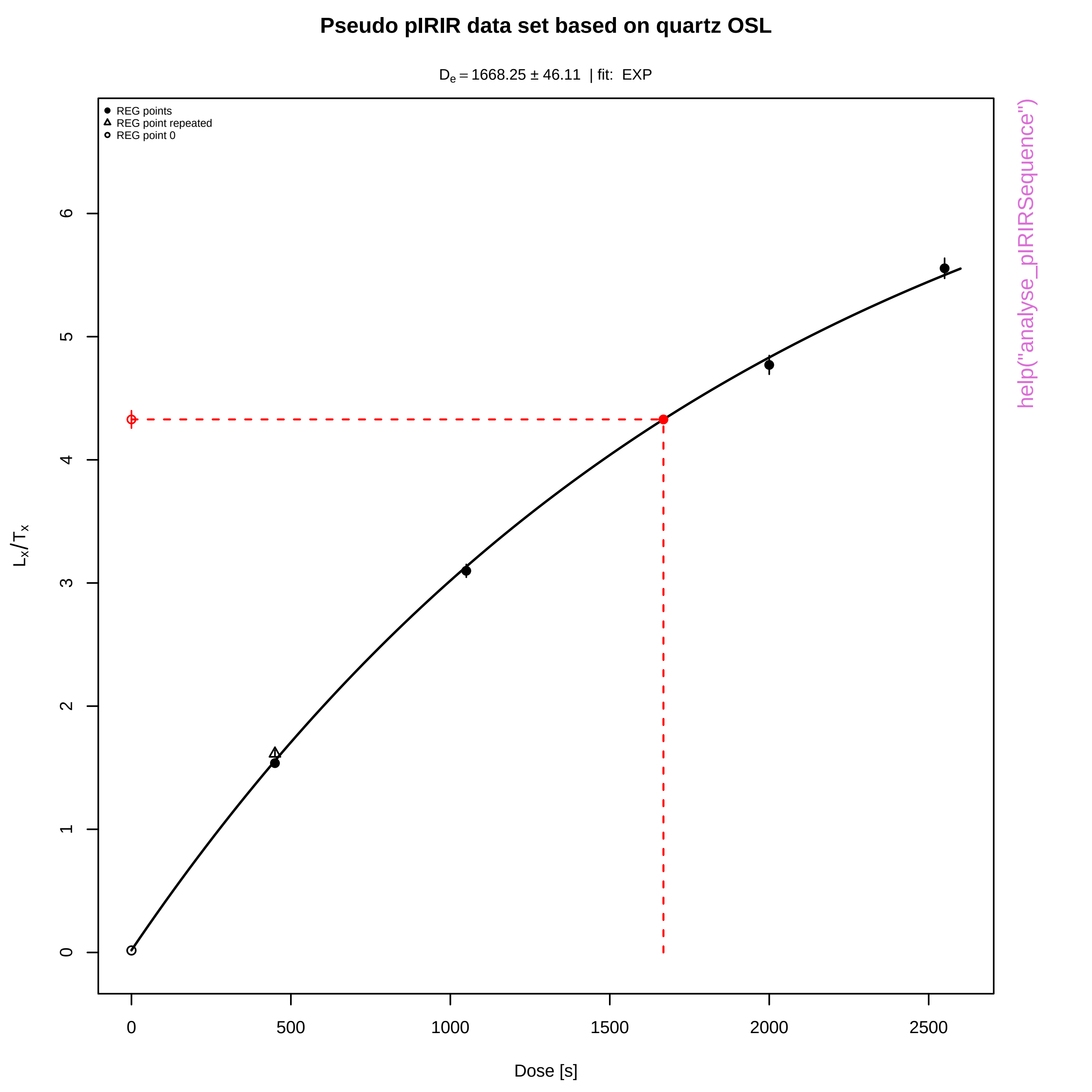


Pseudo pIRIR data set based on quartz OSL
L_n,L_x curves
OSL [cts/0.04 s]
0
5000
10000
15000
0
10
20
30
40
Time [s]
help("analyse_pIRIRSequence")

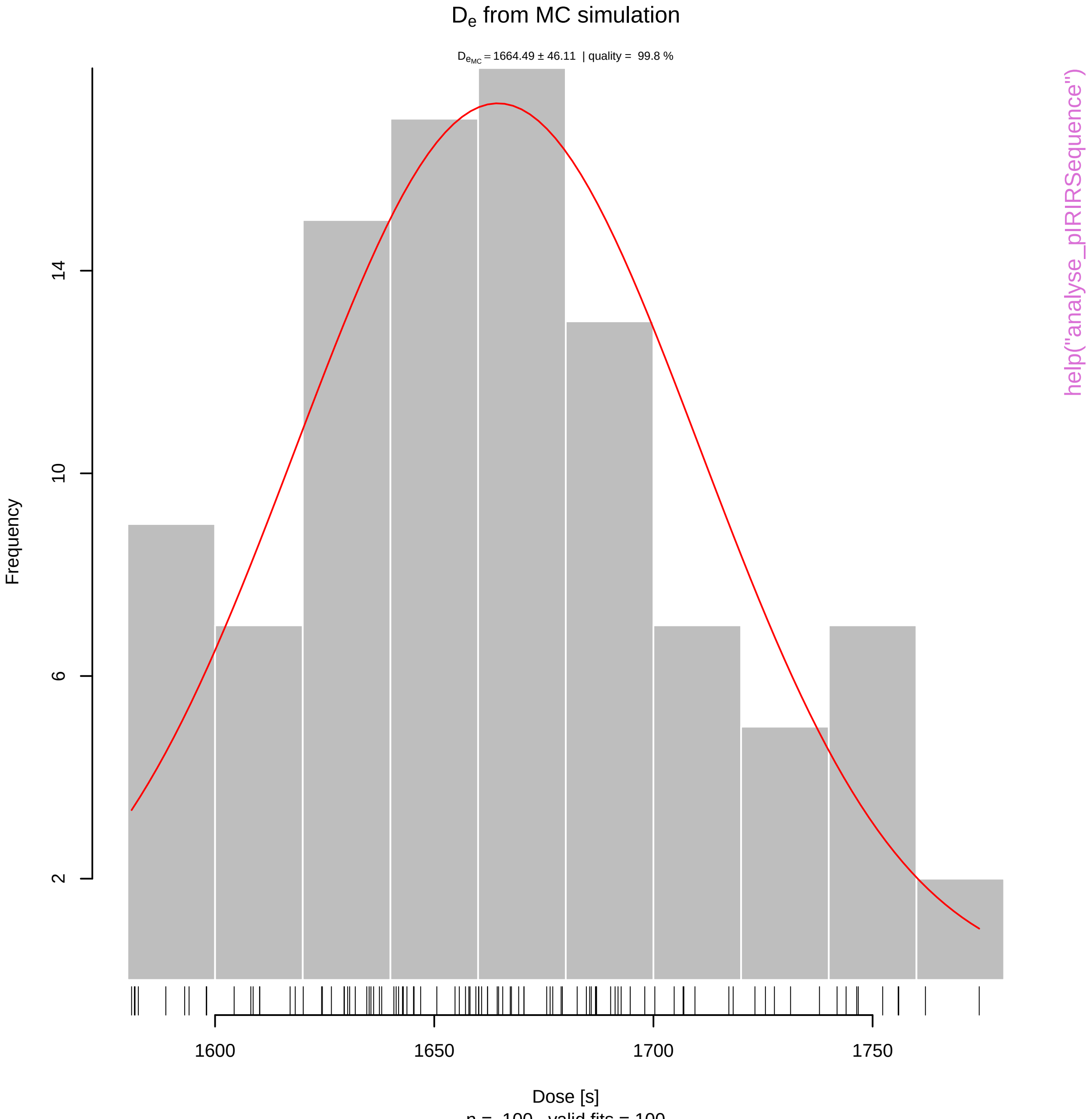


Pseudo pIRIR data set based on quartz OSL
TL previous T_n,T_x curves
TL [cts/0.6 °C]
T [°C]
0
50
100
150
200
250
300
help("analyse_pIRIRSequence")

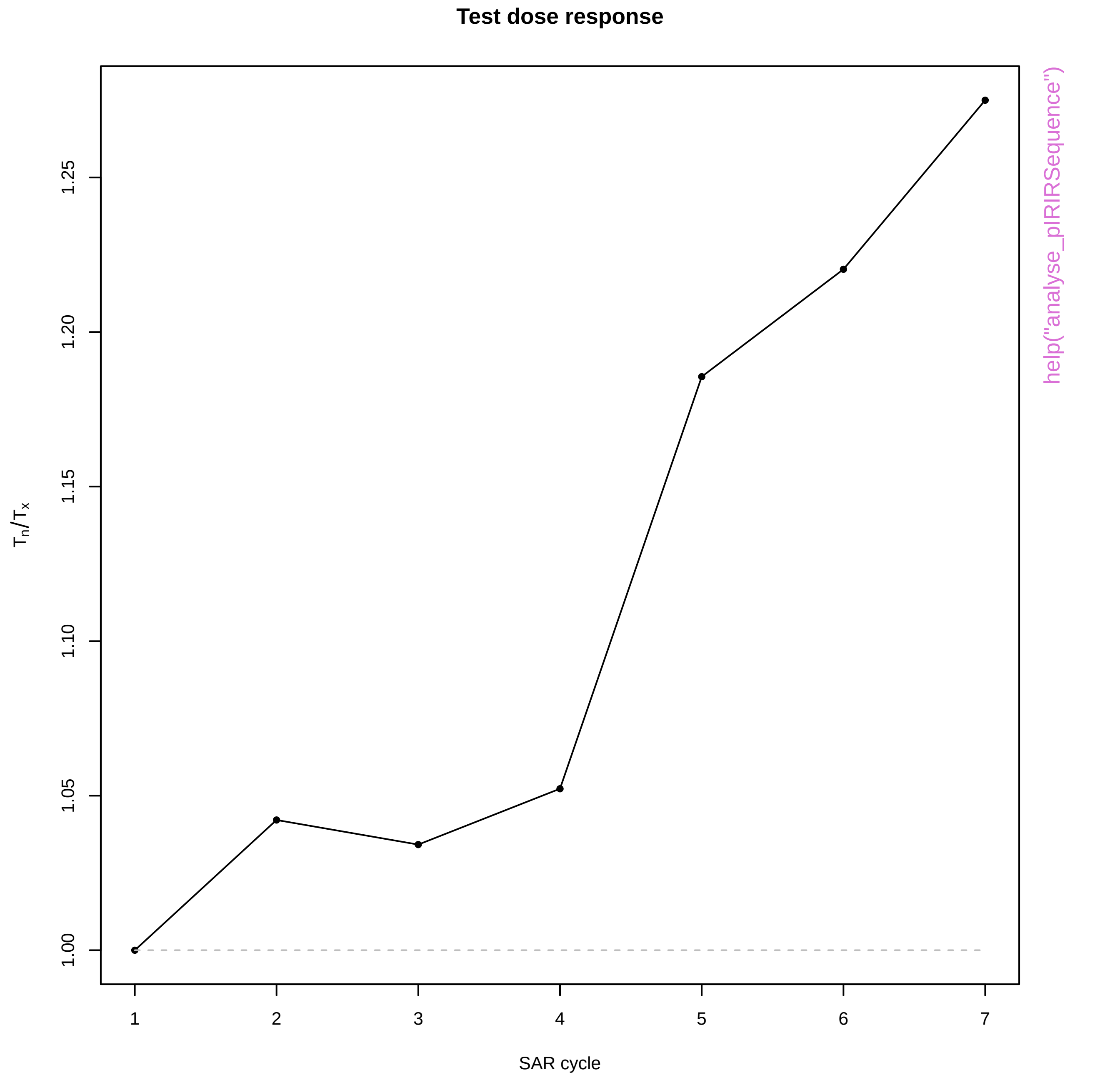

Pseudo pIRIR data set based on quartz OSL
T_n,T_x curves
OSL [cts/0.04 s]
0
500
1000
1500
2000
2500
3000
0
10
20
30
40
Time [s]
help("analyse_pIRIRSequence")



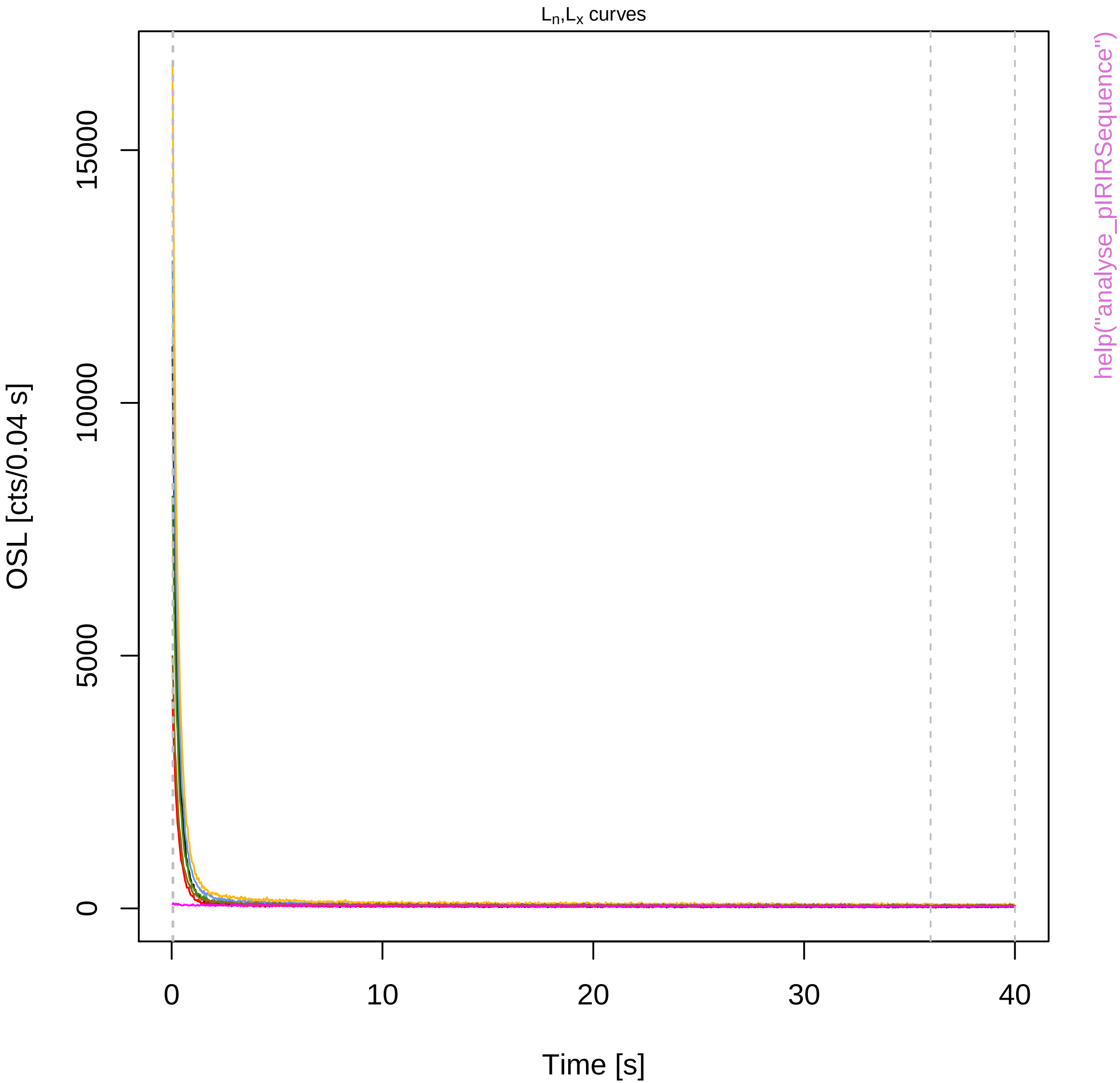
Pseudo pIRIR data set based on quartz OSL
D_e = 1668.25 ± 46.11 | fit: EXP
REG points
REG point repeated
REG point 0
help("analyse_pIRIRSequence")
L_x/T_x
Dose [s]
0
1
2
3
4
5
6
0
500
1000
1500
2000
2500

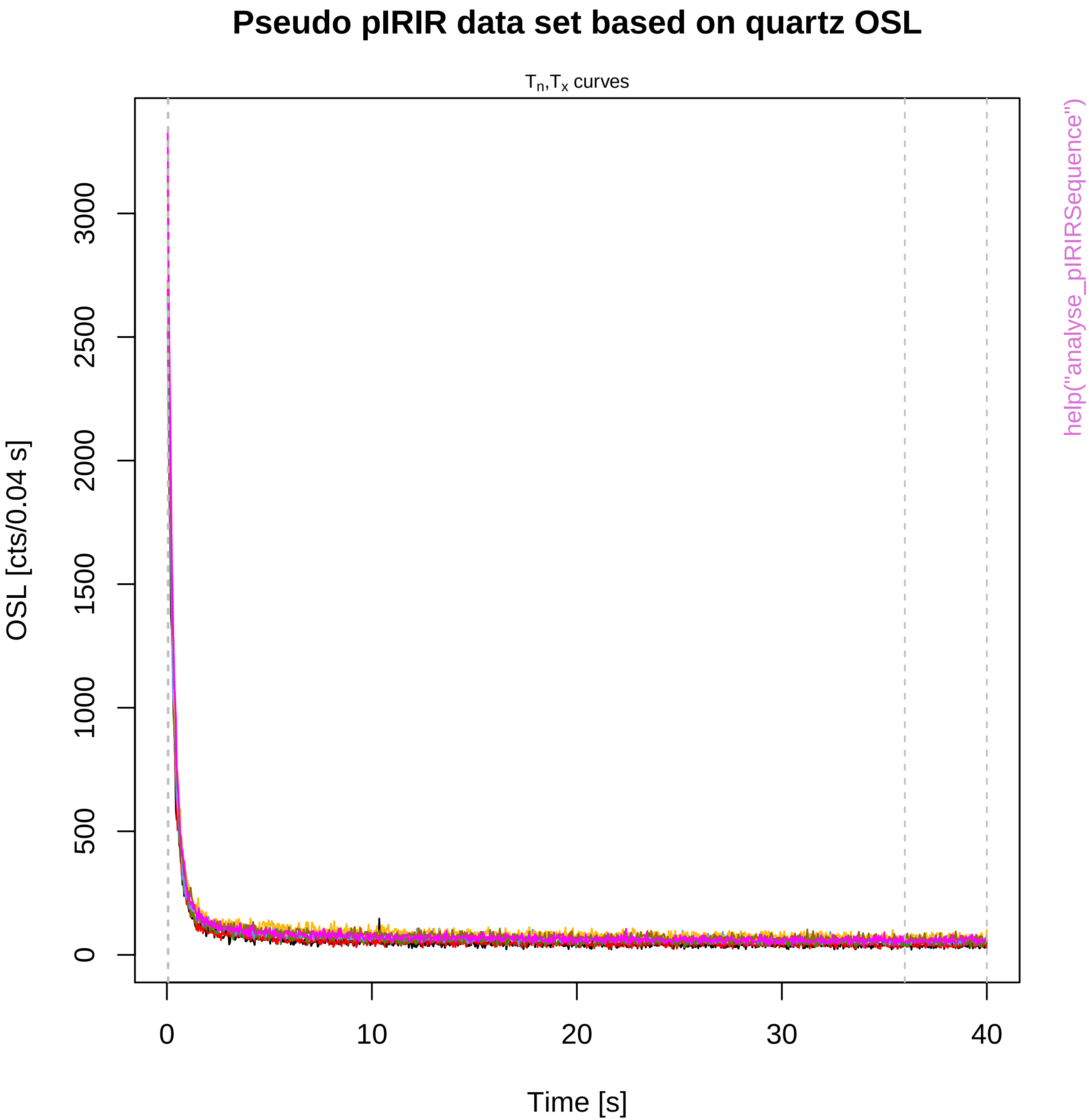


De from MC simulation
DeMC = 1664.49 ± 46.11 | quality = 99.8 %
help("analyse_pIRIRSequence")
Frequency
2
6
10
14
1600
1650
1700
1750
Dose [s]
n = 100 , valid fits = 100

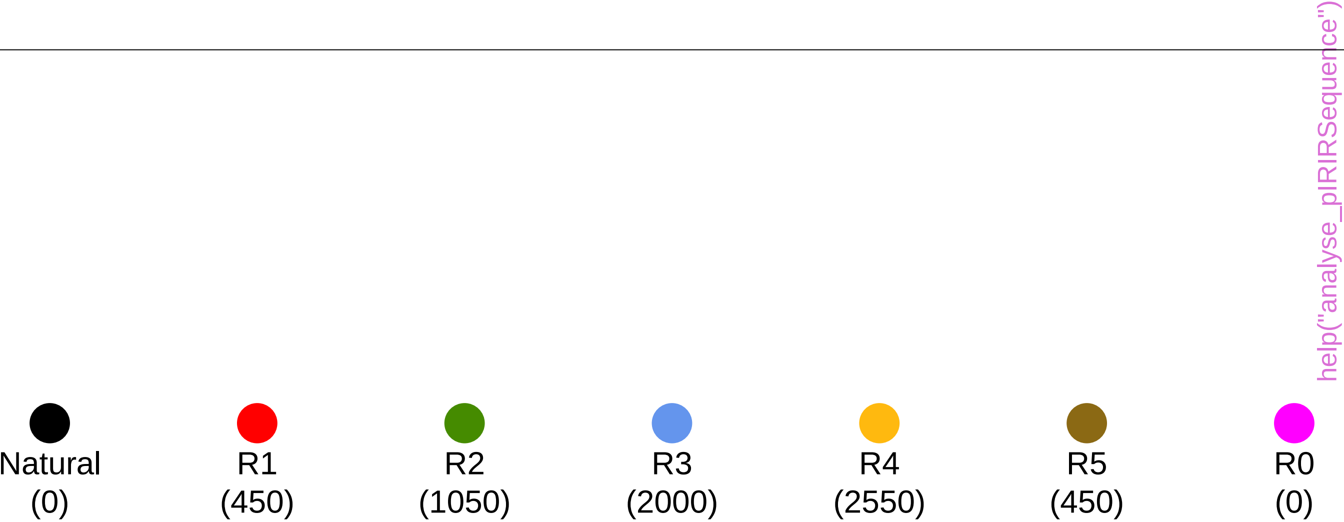

Test dose response
T_n/T_x
1.00
1.05
1.10
1.15
1.20
1.25
1
2
3
4
5
6
7
SAR cycle
help("analyse_pIRIRSequence")

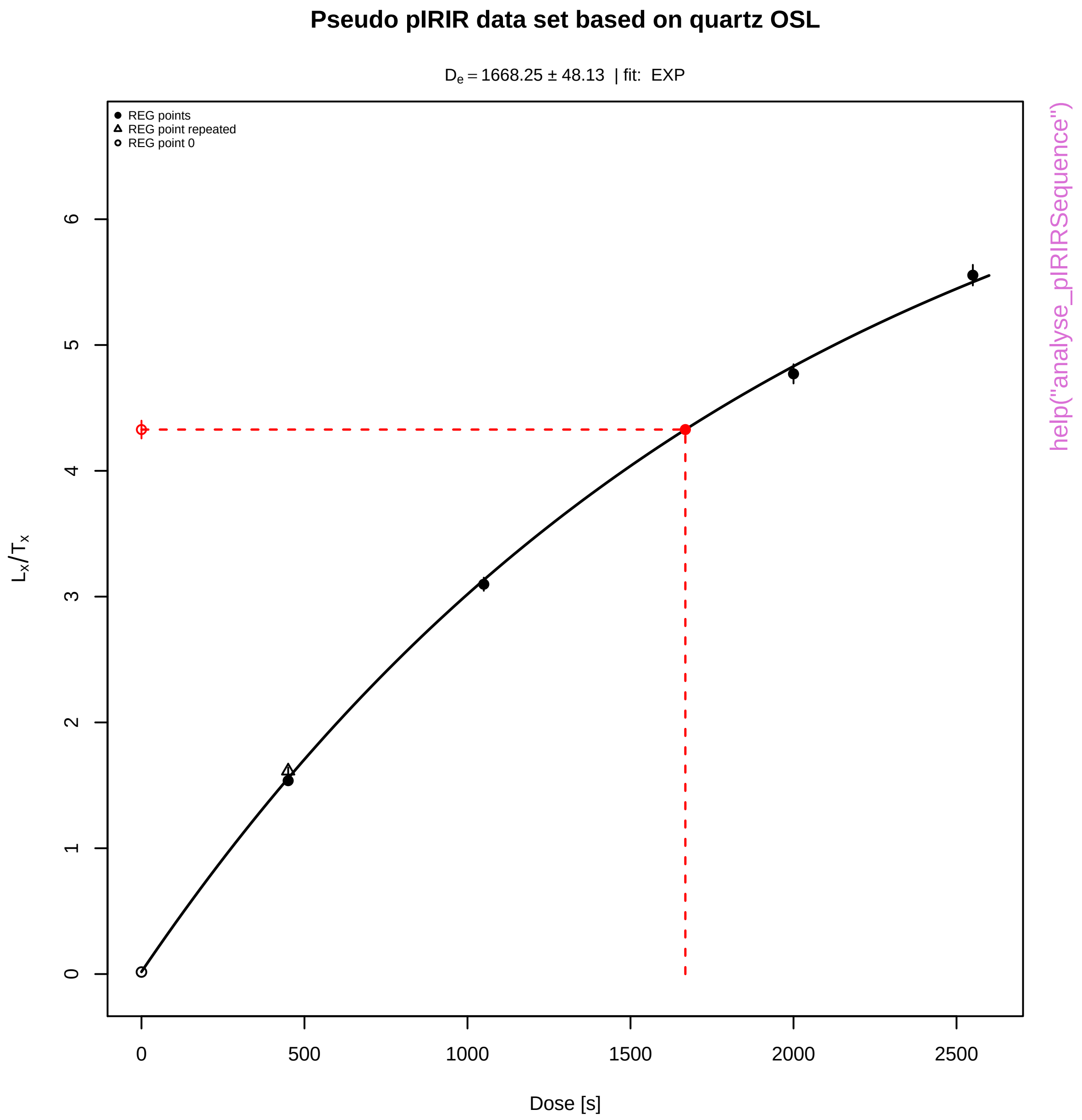
Pseudo pIRIR data set based on quartz OSL



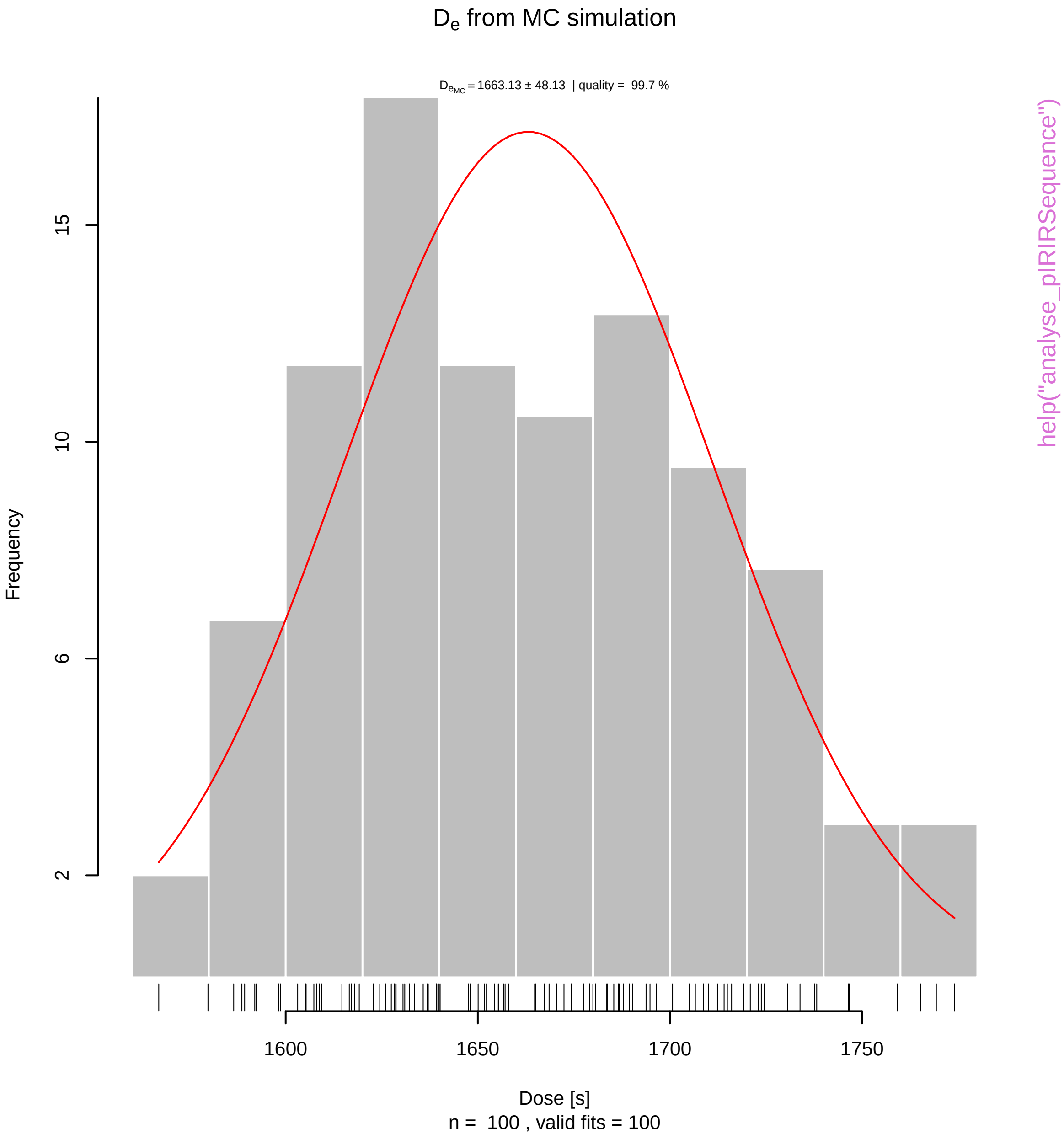


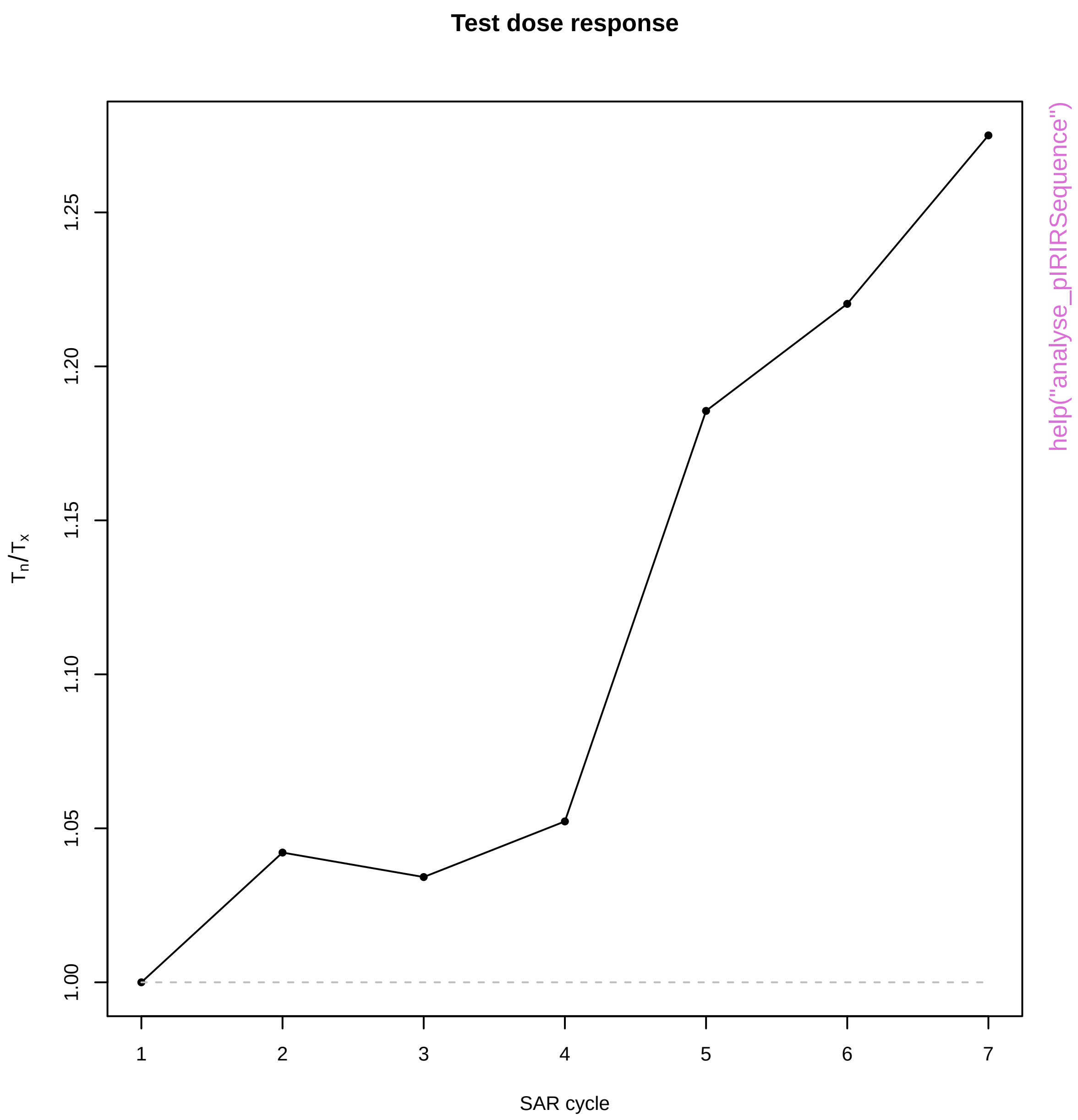
Pseudo pIRIR data set based on quartz OSL
T_n,T_x curves
OSL [cts/0.04 s]
0
500
1000
1500
2000
2500
3000
Time [s]
0
10
20
30
40
help("analyse_pIRIRSequence")


help("analyse_pIRIRSequence")
Natural
(0)
R1
(450)
R2
(1050)
R3
(2000)
R4
(2550)
R5
(450)
R0
(0)

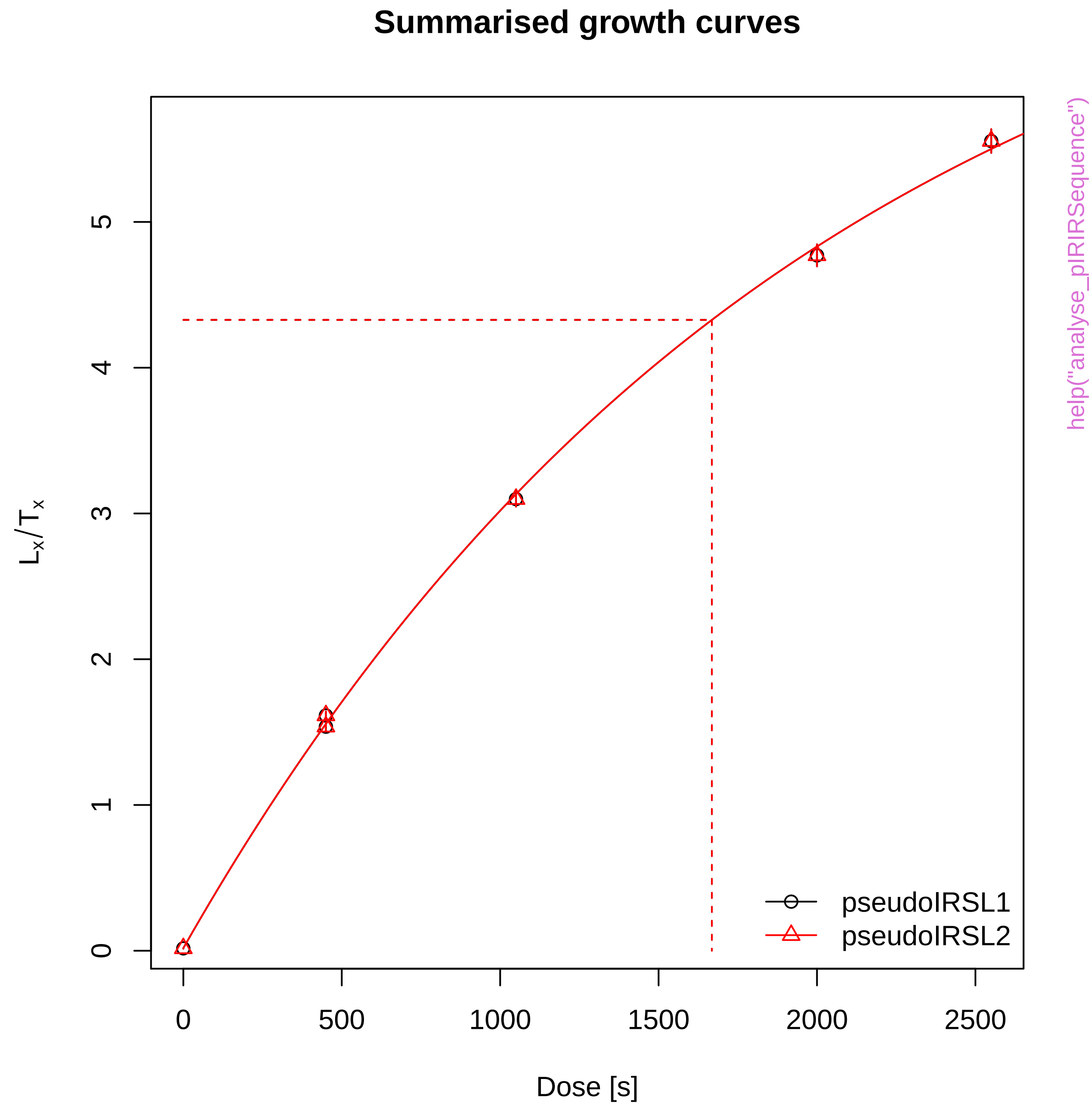


Pseudo pIRIR data set based on quartz OSL
$D_e = 1668.25 \pm 48.13$ | fit: EXP
REG points
REG point repeated
REG point 0
L_x/T_x
Dose [s]
0
1
2
3
4
5
6
0
500
1000
1500
2000
2500
help("analyse_pIRIRSequence")

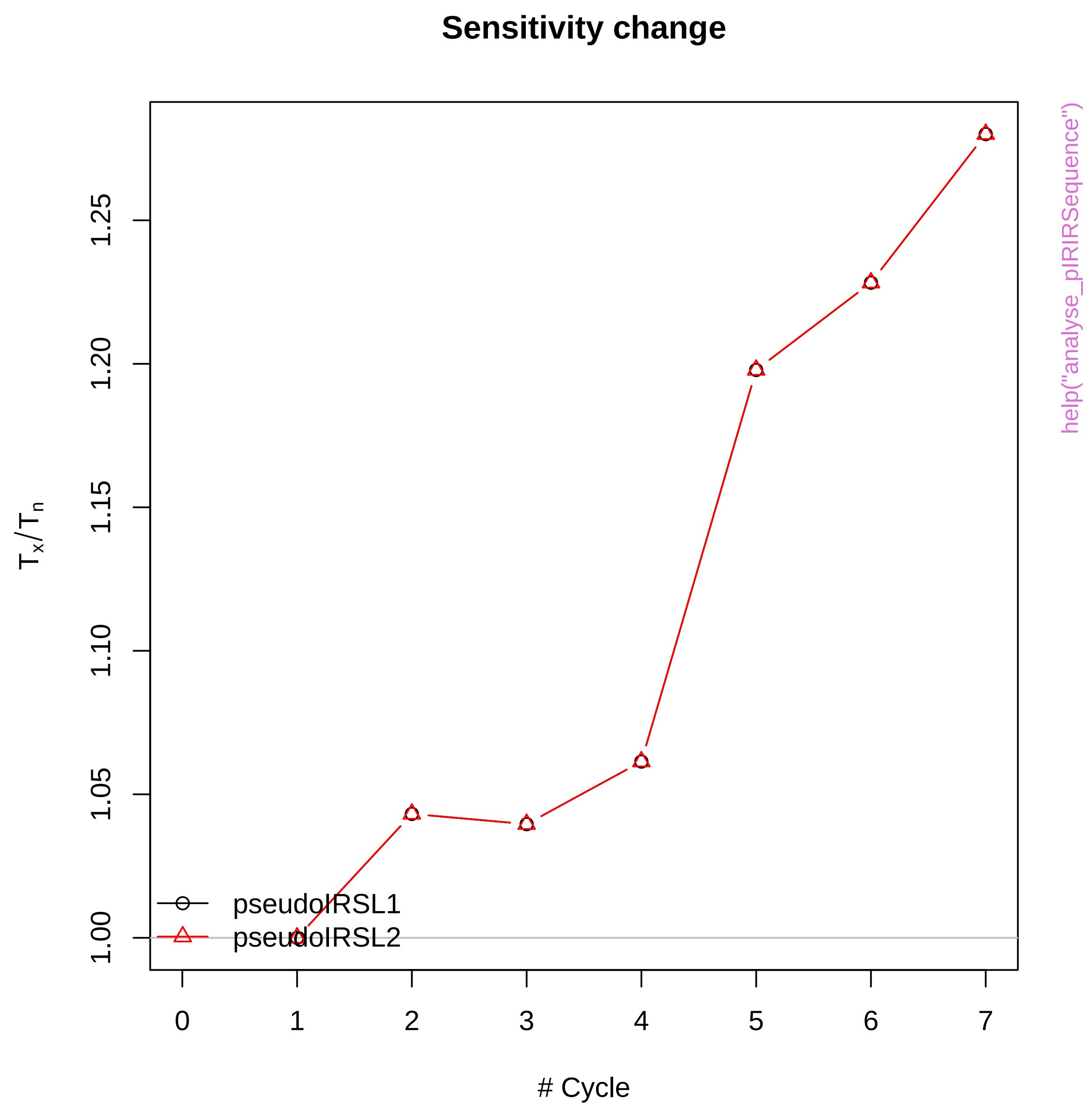

D_e from MC simulation
$D_{e_{MC}} = 1663.13 \pm 48.13$ | quality = 99.7 %
Frequency
2
6
10
15
1600
1650
1700
1750
Dose [s]
n = 100 , valid fits = 100
help("analyse_pIRIRSequence")



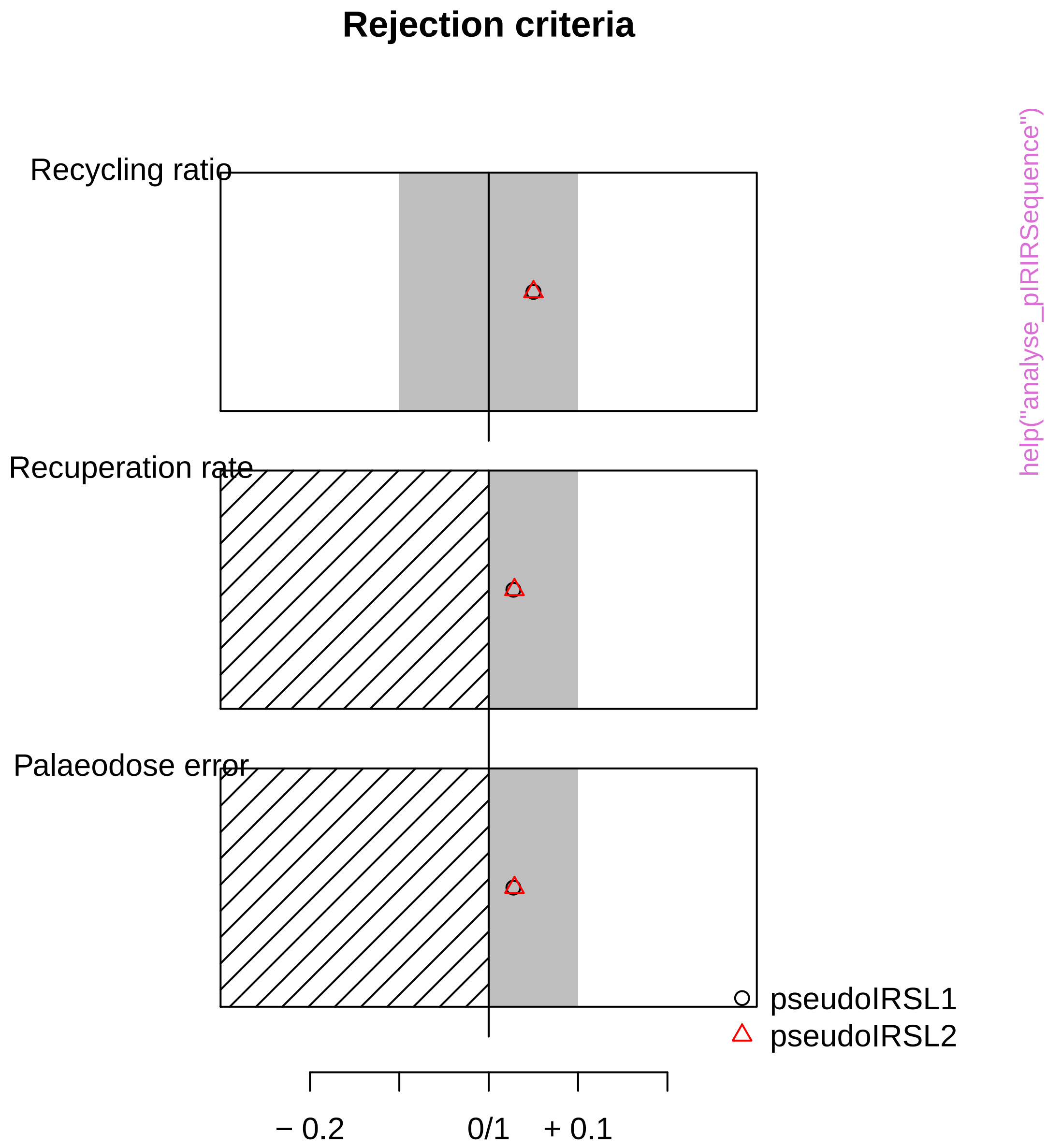
Test dose response
1.00
1.05
1.10
1.15
1.20
1.25
T_n/T_x
1
2
3
4
5
6
7
SAR cycle
help("analyse_pIRIRSequence")

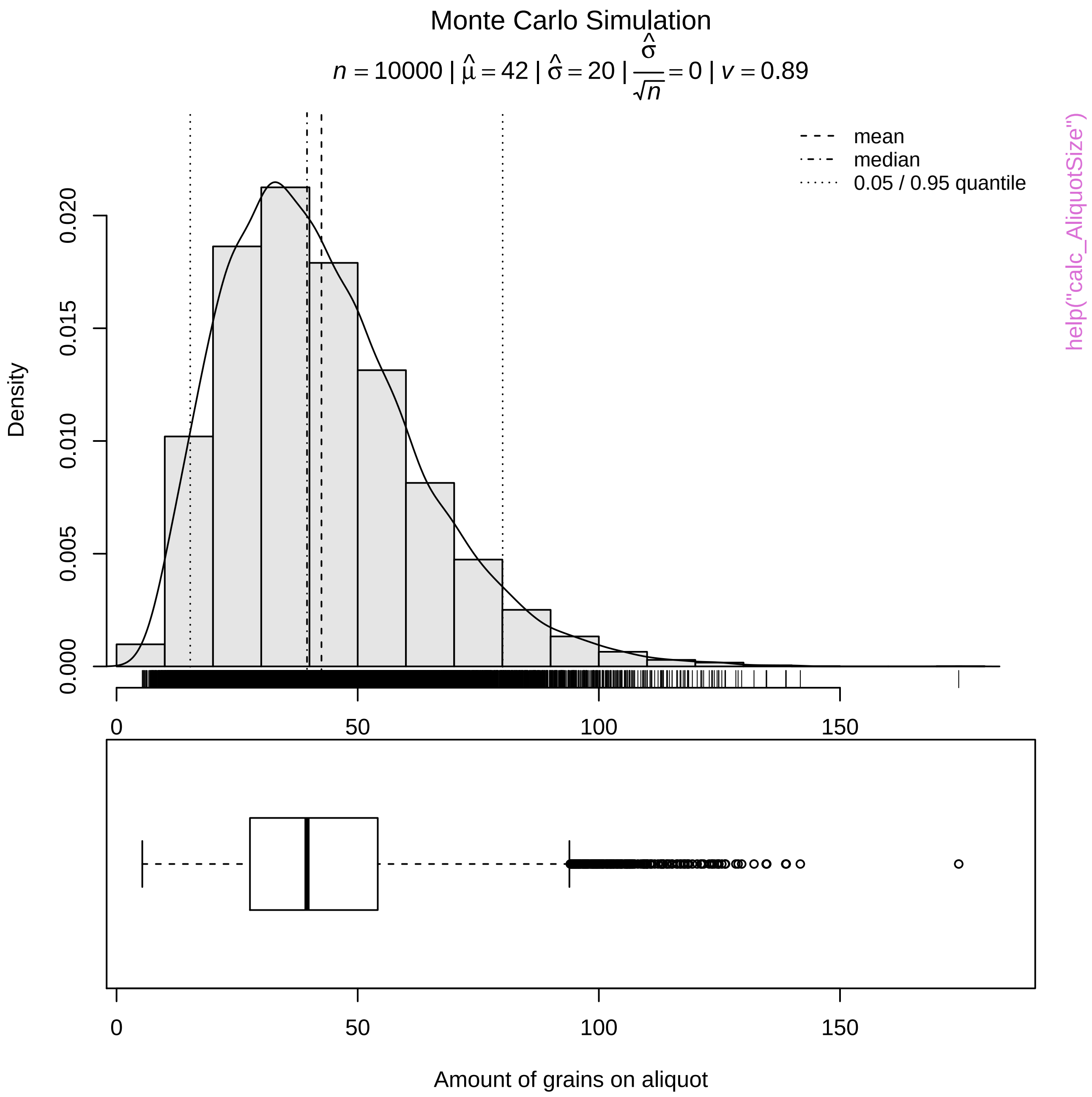


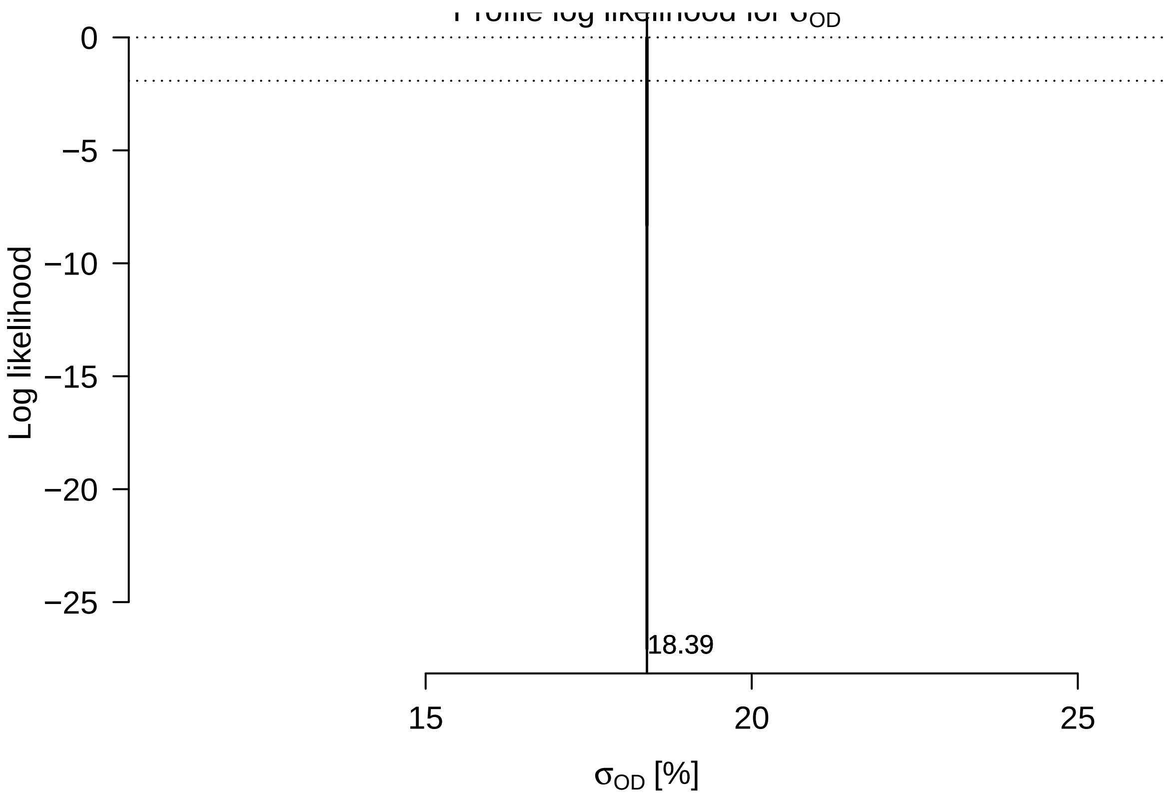
Summarised growth curves
help("analyse_pIRIRSequence")
L_x/T_x
0
1
2
3
4
5
0
500
1000
1500
2000
2500
Dose [s]
pseudoIRSL1
pseudoIRSL2



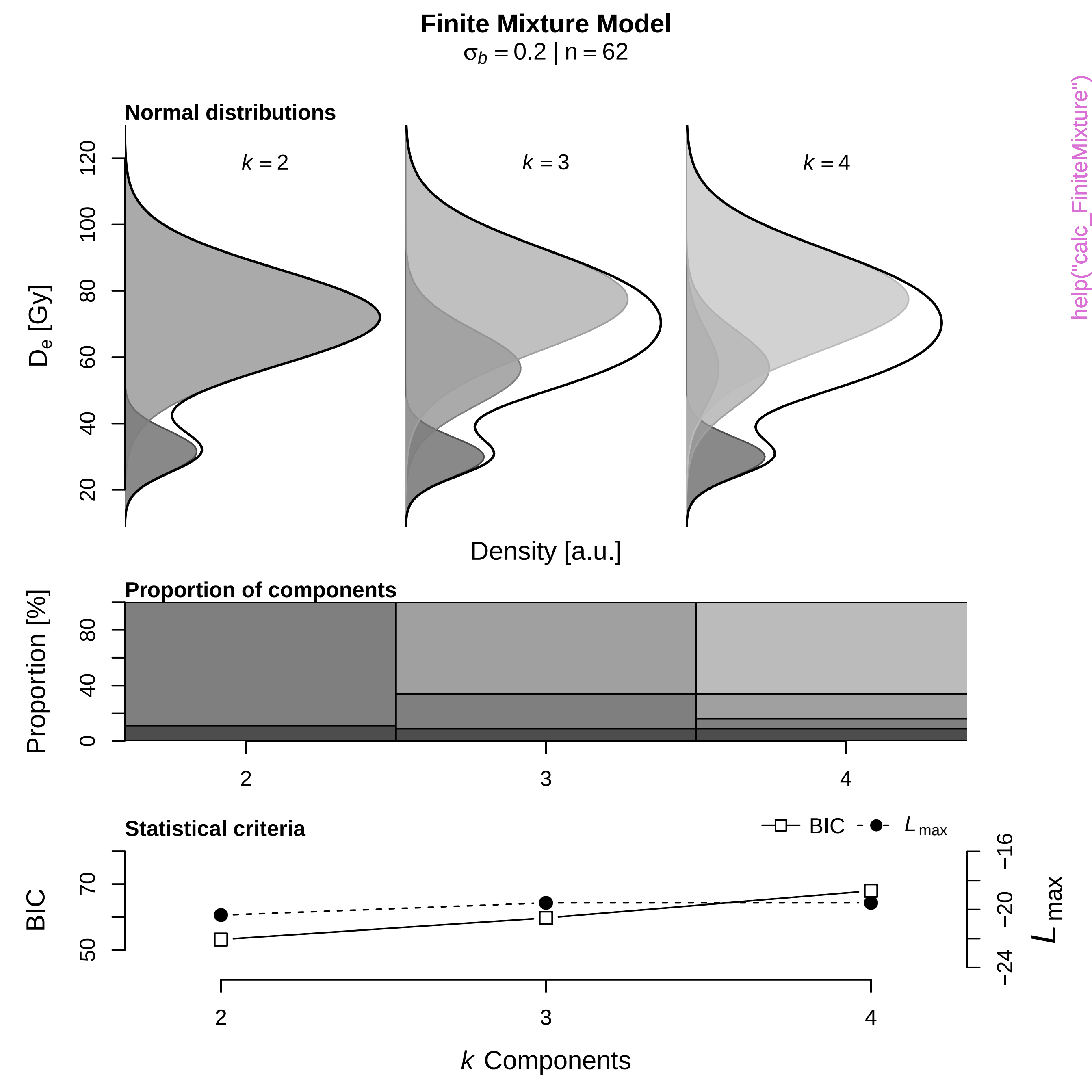
Sensitivity change
T_x/T_n
1.00
1.05
1.10
1.15
1.20
1.25
0
1
2
3
4
5
6
7
Cycle
pseudoIRSL1
pseudoIRSL2
help("analyse_pIRIRSequence")


Rejection criteria
Recycling ratio
Recuperation rate
Palaeodose error
pseudoIRSL1
pseudoIRSL2
− 0.2
0/1
+ 0.1
help("analyse_pIRIRSequence")

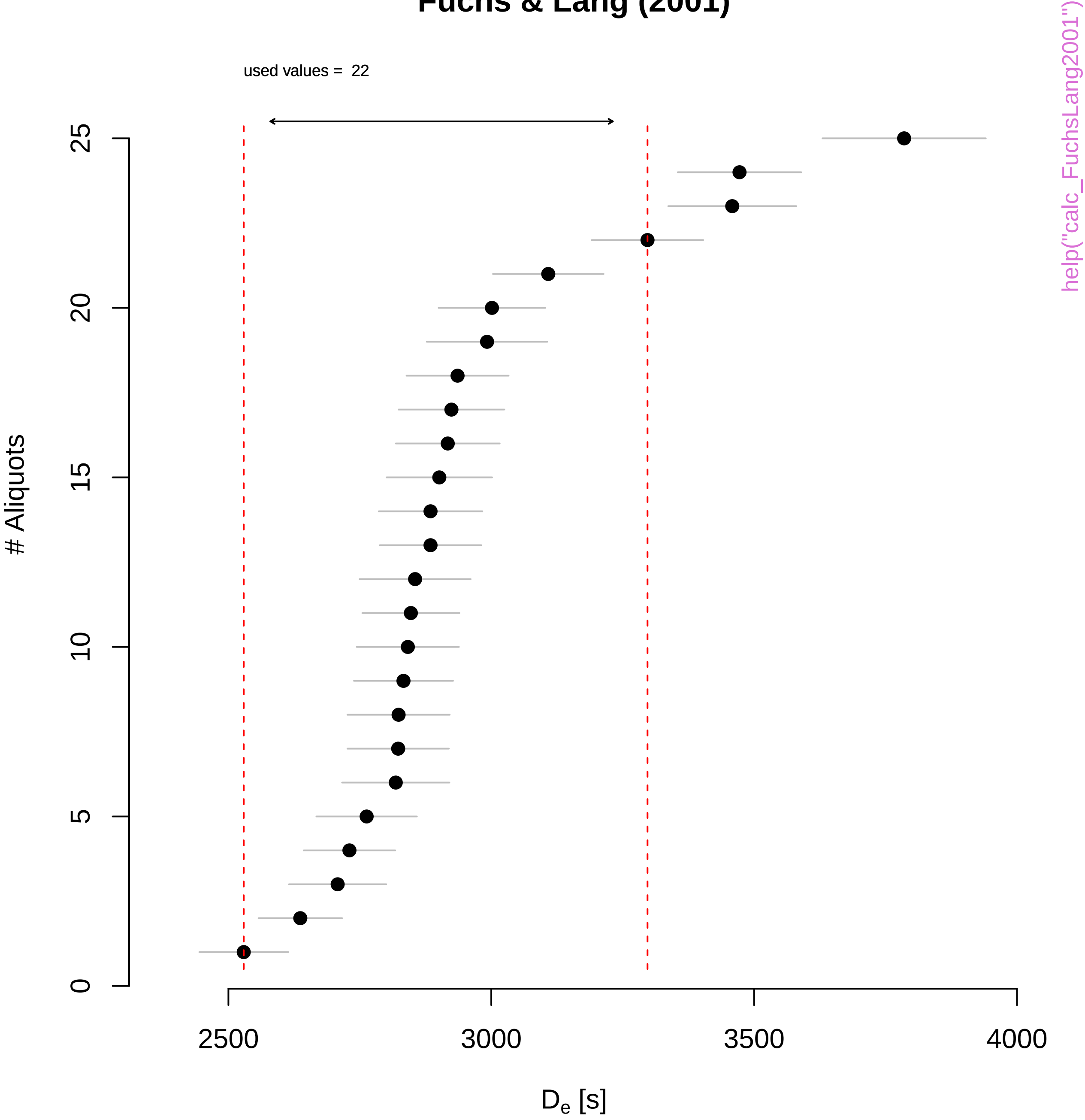

Monte Carlo Simulation
$n = 10000 \mid \hat{\mu} = 42 \mid \hat{\sigma} = 20 \mid \frac{\hat{\sigma}}{\sqrt{n}} = 0 \mid v = 0.89$
mean
median
0.05 / 0.95 quantile
help("calc_AliquotSize")
Density
0.000
0.005
0.010
0.015
0.020
0
50
100
150
Amount of grains on aliquot

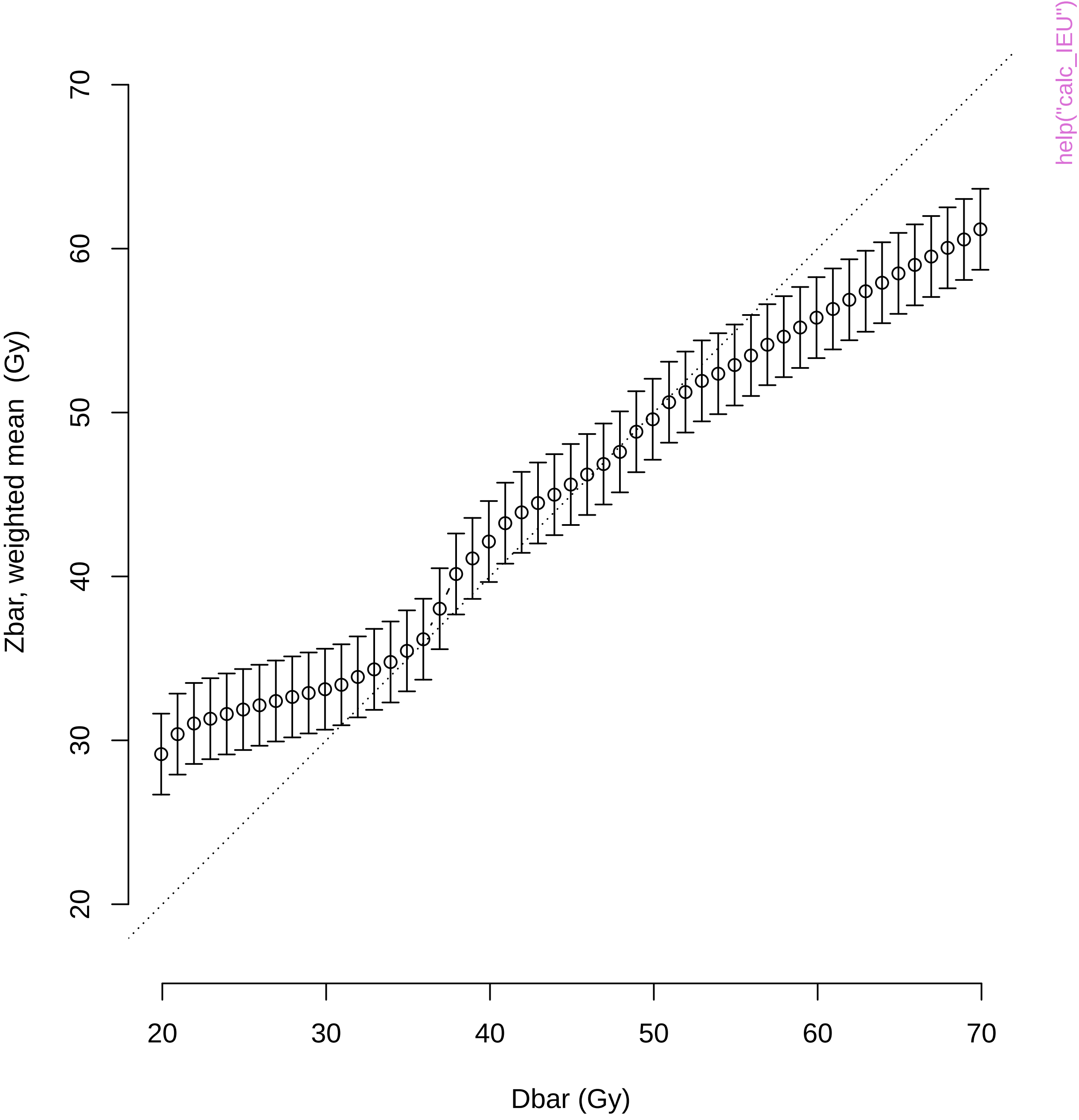


Profile log likelihood for σOD
0
−5
−10
−15
−20
−25
Log likelihood
18.39
15
20
25
σOD [%]

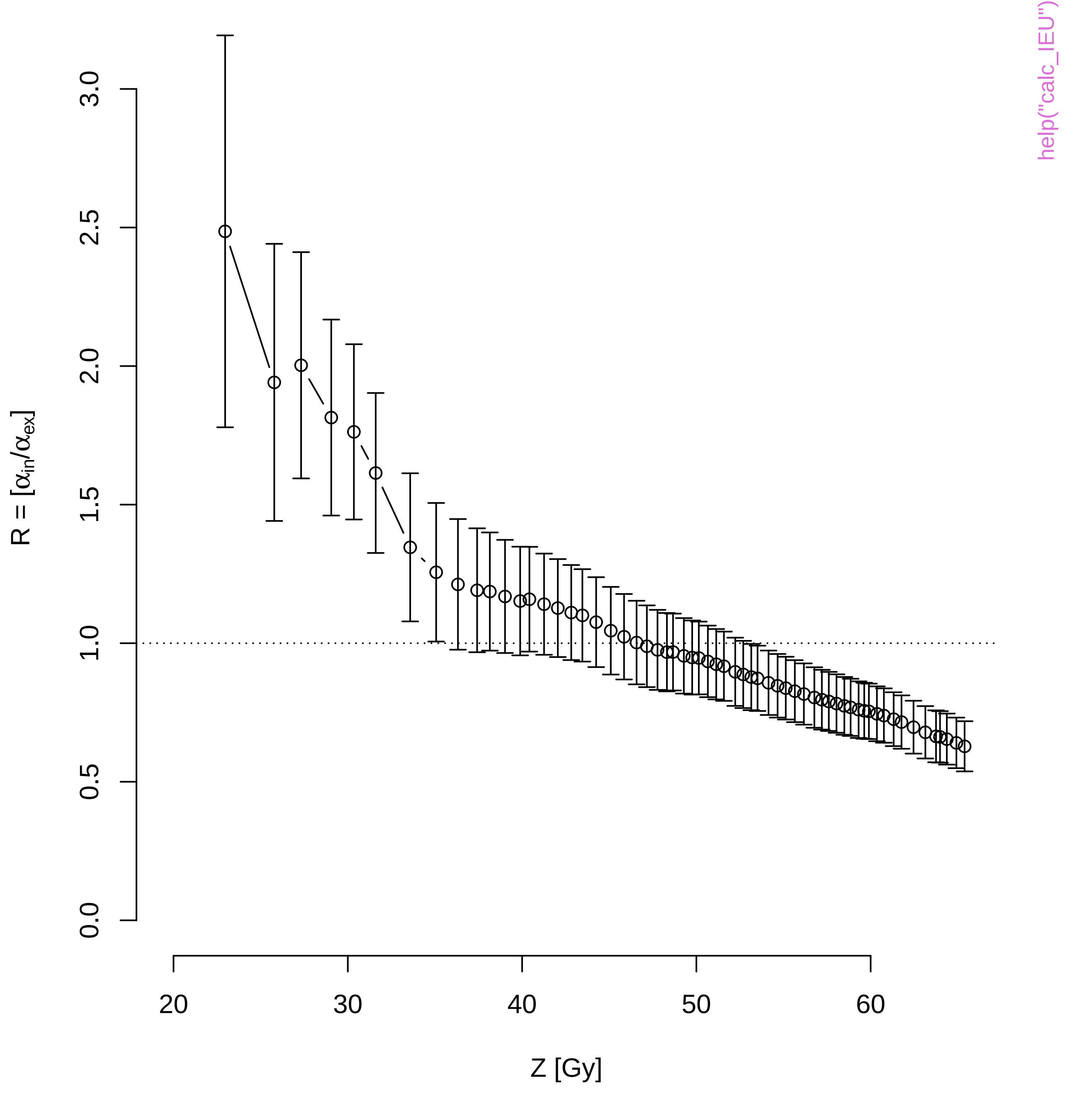


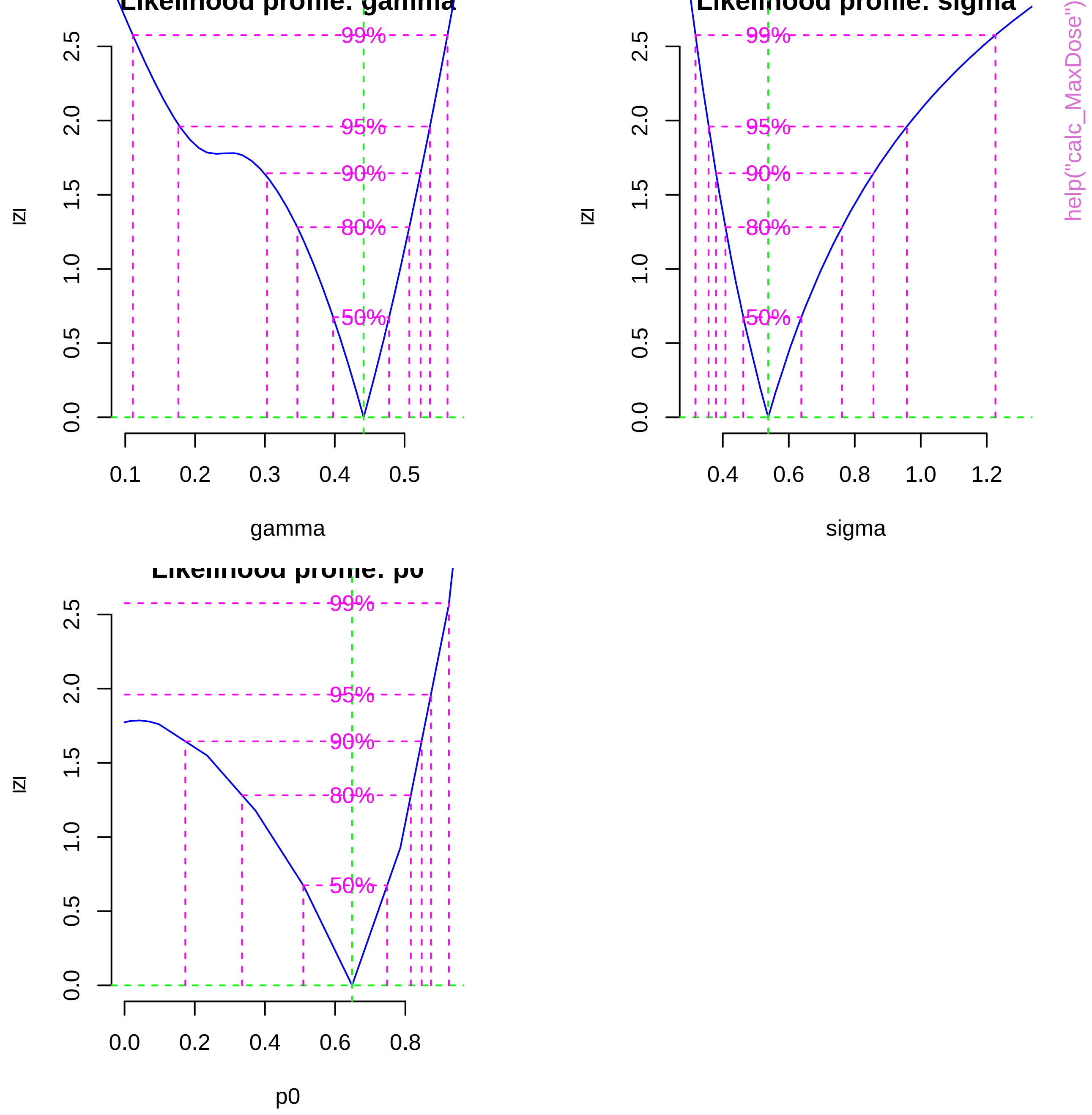
Finite Mixture Model
$\sigma_b = 0.2$ | n = 62
help("calc_FiniteMixture")
Normal distributions
$k = 2$
$k = 3$
$k = 4$
D_e [Gy]
120
100
80
60
40
20
Density [a.u.]
Proportion of components
Proportion [%]
80
40
0
2
3
4
Statistical criteria
BIC
L_{max}
70
50
−16
−20
−24
2
3
4
k Components

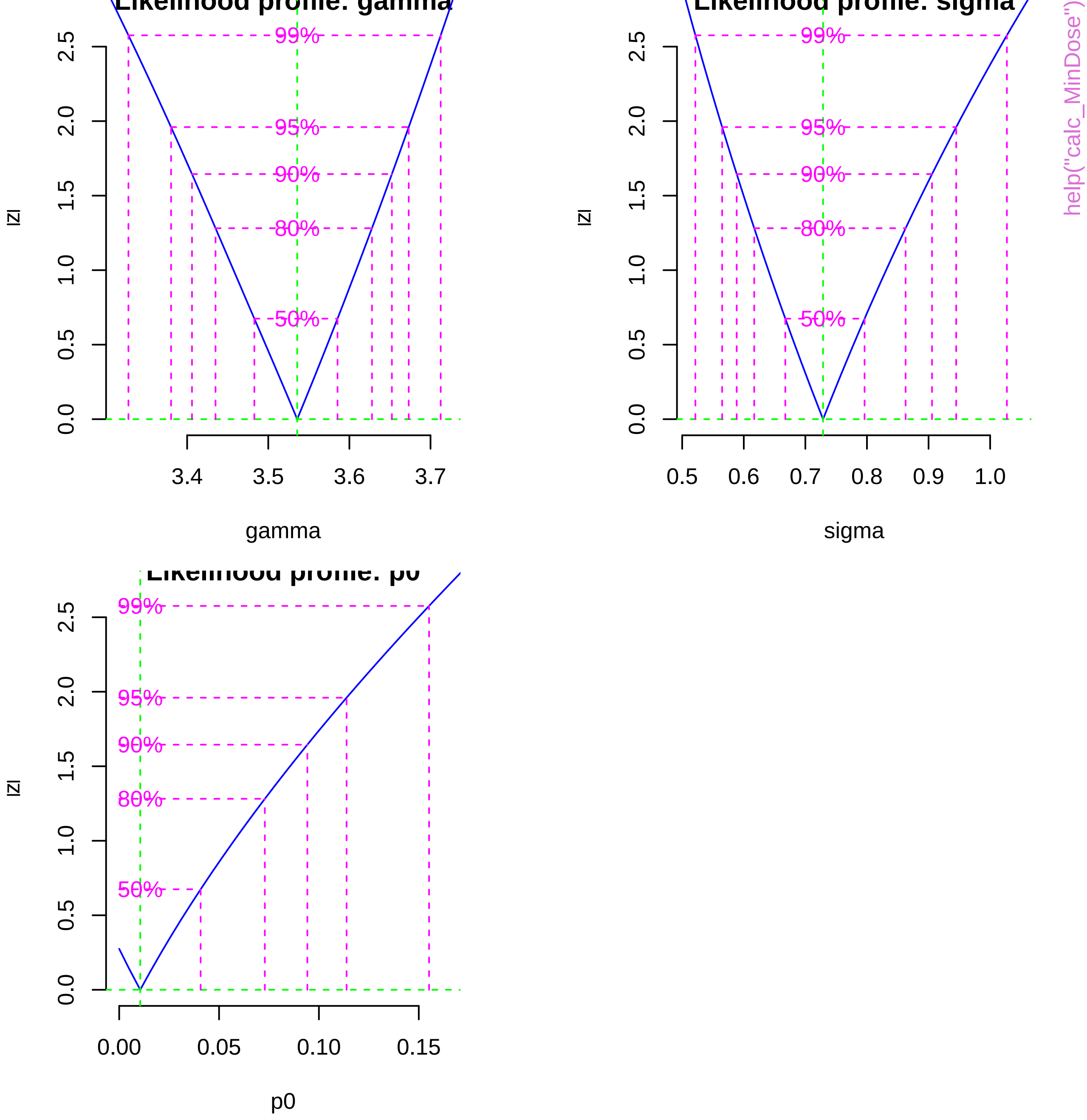

Fuchs & Lang (2001)
used values = 22
help("calc_FuchsLang2001")
# Aliquots
0
5
10
15
20
25
2500
3000
3500
4000
D_e [s]



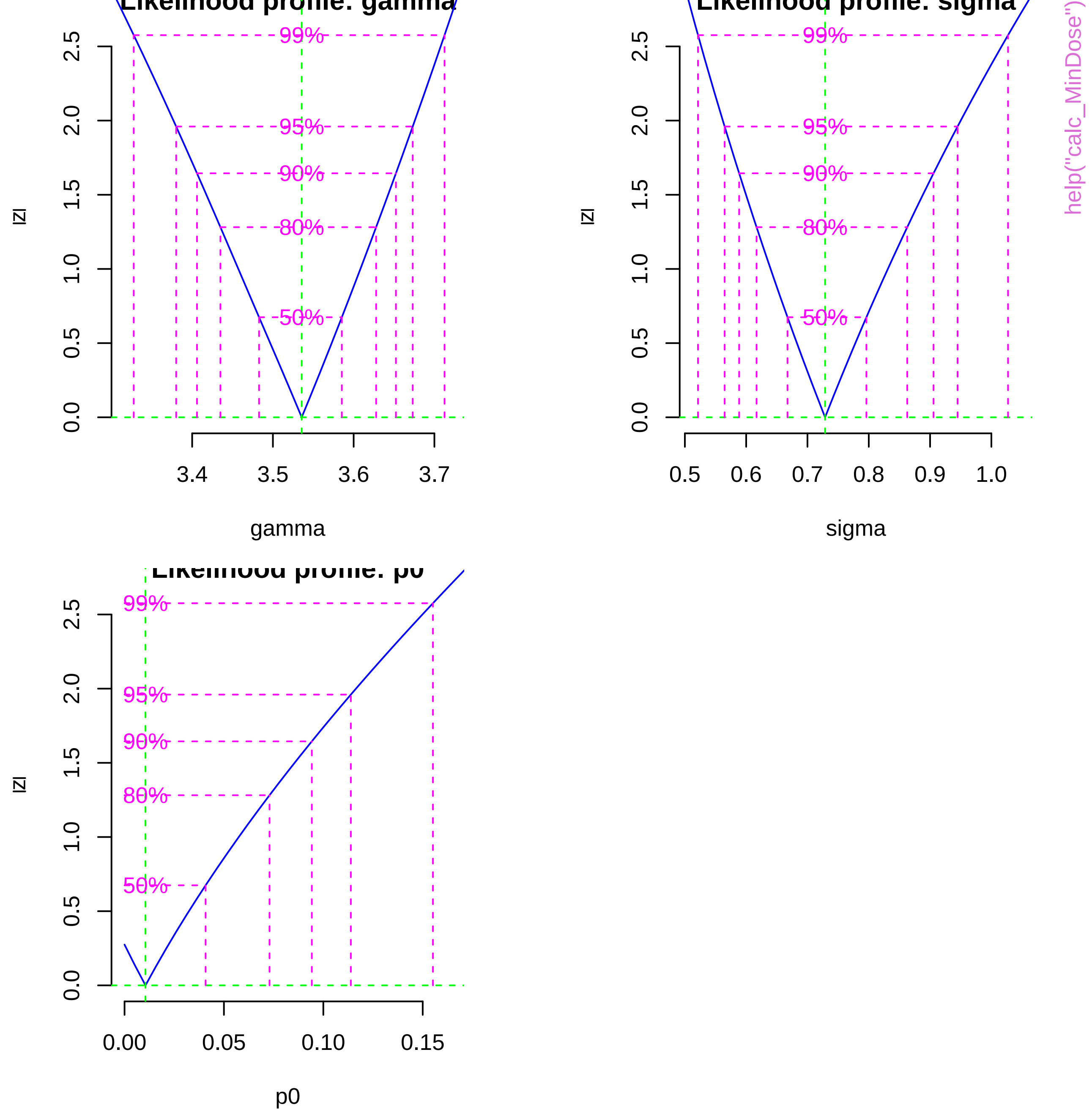
help("calc_IEU")
Zbar, weighted mean (Gy)
20
30
40
50
60
70
Dbar (Gy)
20
30
40
50
60
70

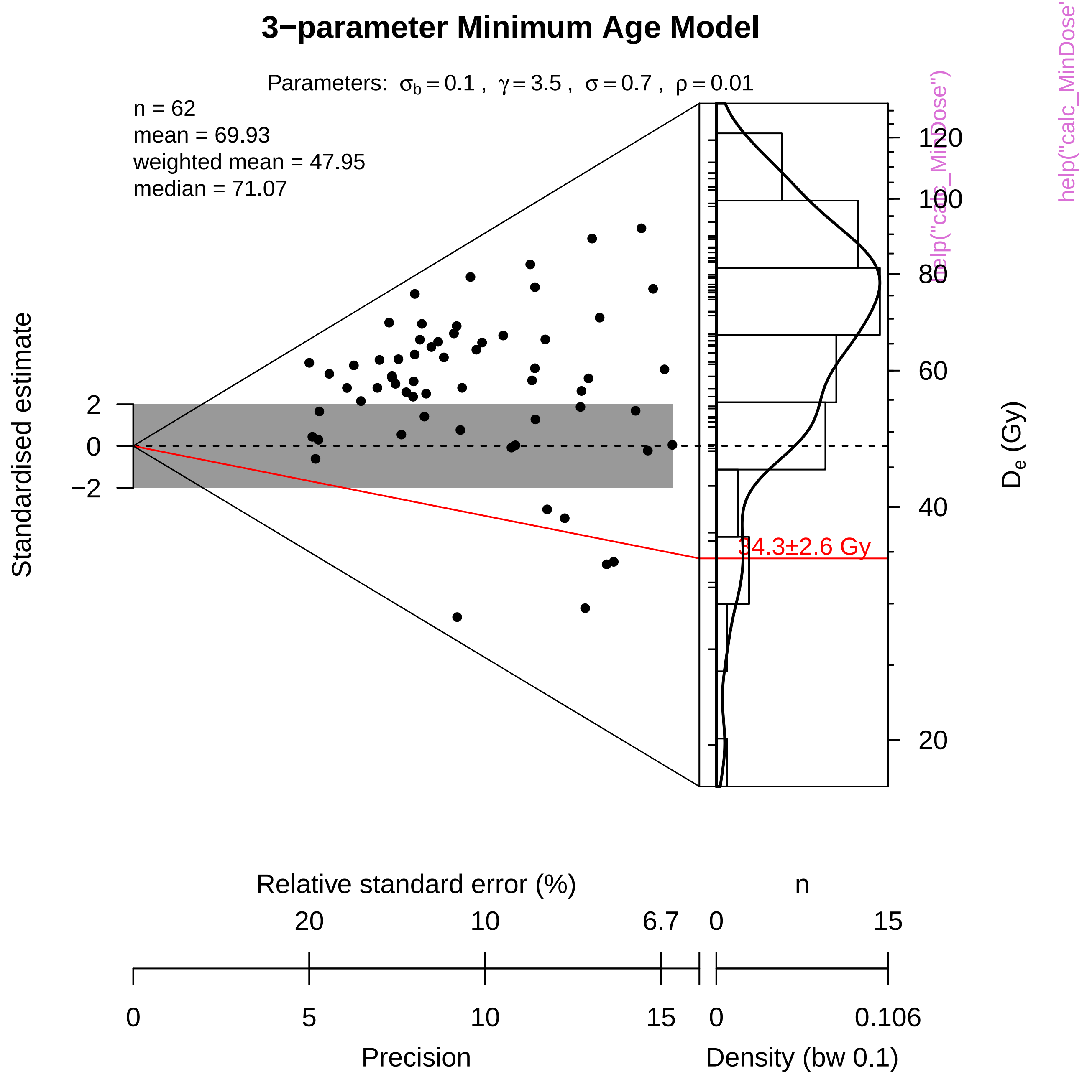

help("calc_IEU")
R = [α_in/α_ex]
Z [Gy]
0.0
0.5
1.0
1.5
2.0
2.5
3.0
20
30
40
50
60

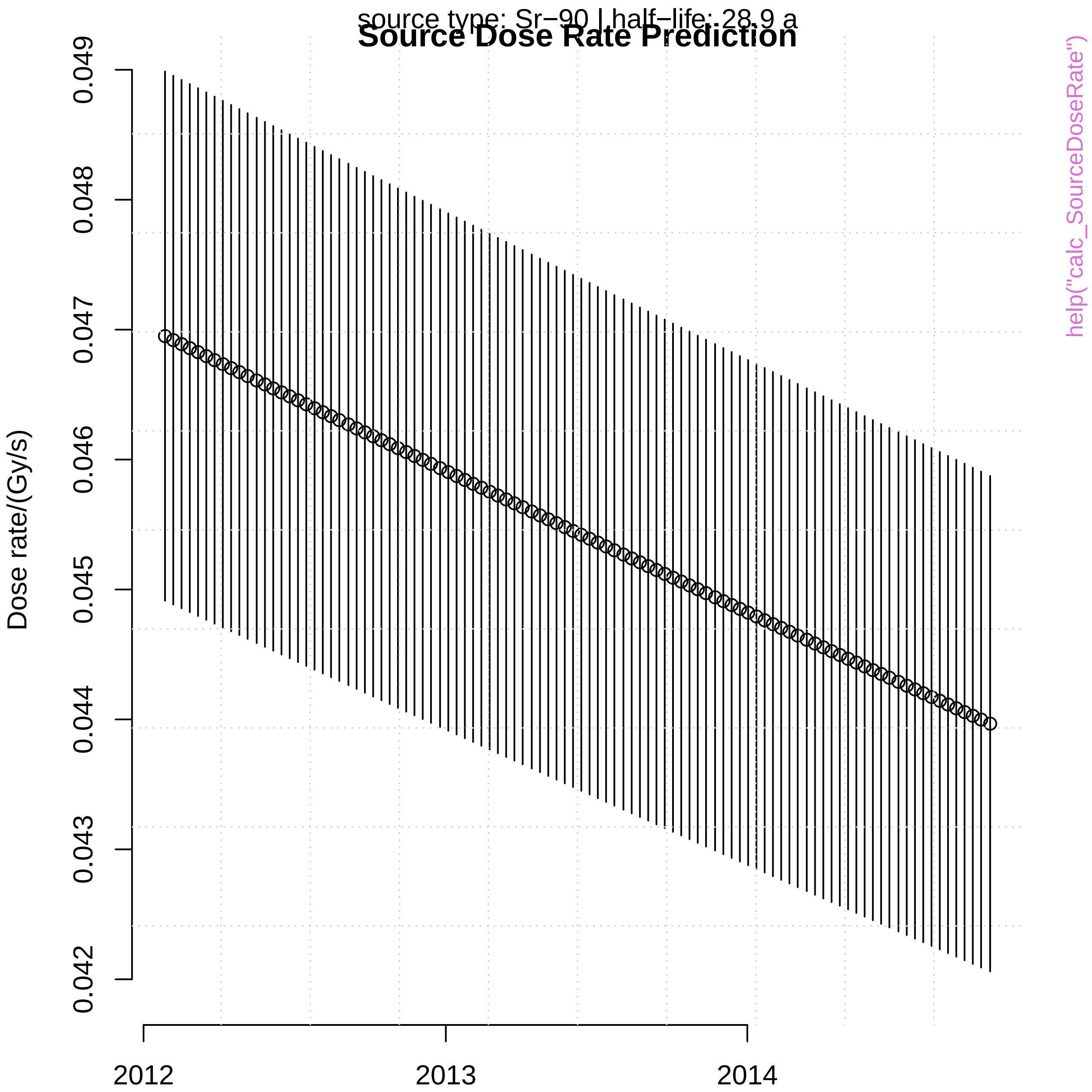

Likelihood profile: gamma
99%
95%
90%
80%
50%
|z|
0.0
0.5
1.0
1.5
2.0
2.5
0.1
0.2
0.3
0.4
0.5
gamma
Likelihood profile: sigma
99%
95%
90%
80%
50%
|z|
0.4
0.6
0.8
1.0
1.2
sigma
help("calc_MaxDose")
Likelihood profile: p0
99%
95%
90%
80%
50%
|z|
0.0
0.2
0.4
0.6
0.8
p0

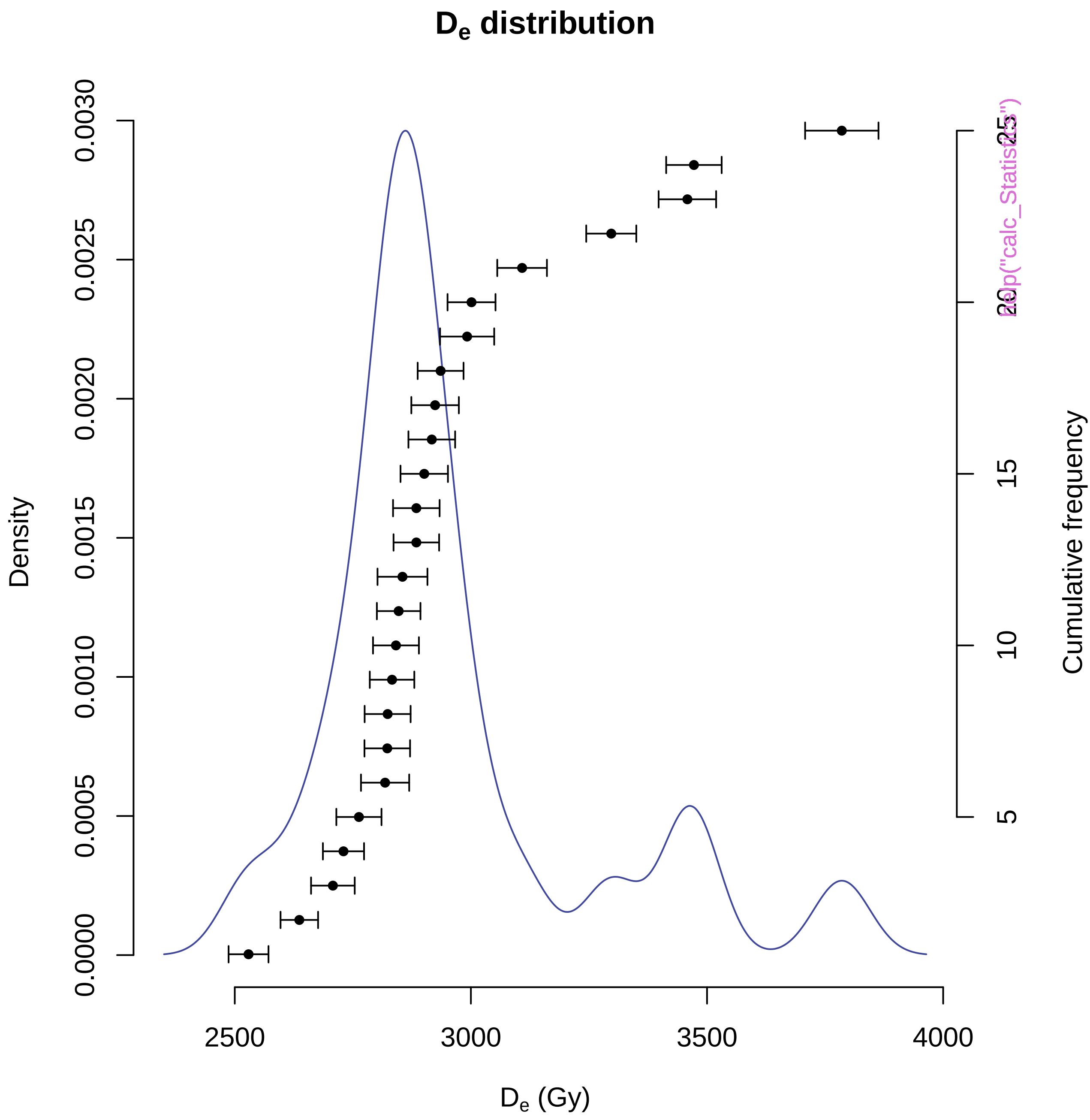


Likelihood profile: gamma
|z|
gamma
3.4
3.5
3.6
3.7
99%
95%
90%
80%
50%
Likelihood profile: sigma
sigma
0.5
0.6
0.7
0.8
0.9
1.0
Likelihood profile: p0
p0
0.00
0.05
0.10
0.15
help("calc_MinDose")

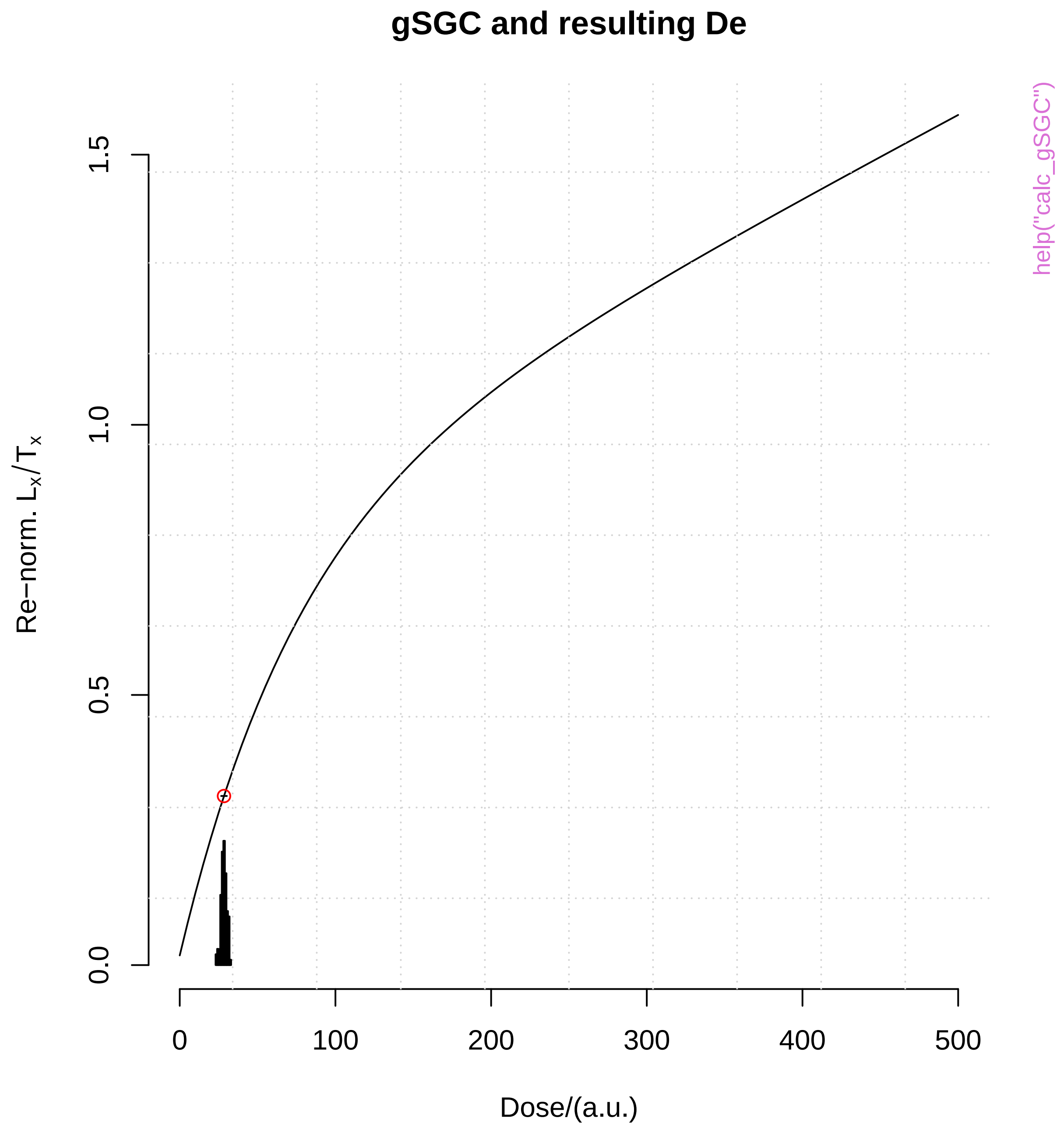

Likelihood profile: gamma
Likelihood profile: sigma
Likelihood profile: p0
99%
95%
90%
80%
50%
|z|
0.0
0.5
1.0
1.5
2.0
2.5
3.4
3.5
3.6
3.7
gamma
0.5
0.6
0.7
0.8
0.9
1.0
sigma
0.00
0.05
0.10
0.15
p0
help("calc_MinDose")


3−parameter Minimum Age Model
Parameters: σb = 0.1 , γ = 3.5 , σ = 0.7 , ρ = 0.01
n = 62
mean = 69.93
weighted mean = 47.95
median = 71.07
Standardised estimate
2
0
−2
34.3±2.6 Gy
120
100
80
60
40
20
De (Gy)
help("calc_MinDose")
help("calc_MinDose")
Relative standard error (%)
20
10
6.7
n
0
15
0
5
10
15
0
0.106
Precision
Density (bw 0.1)

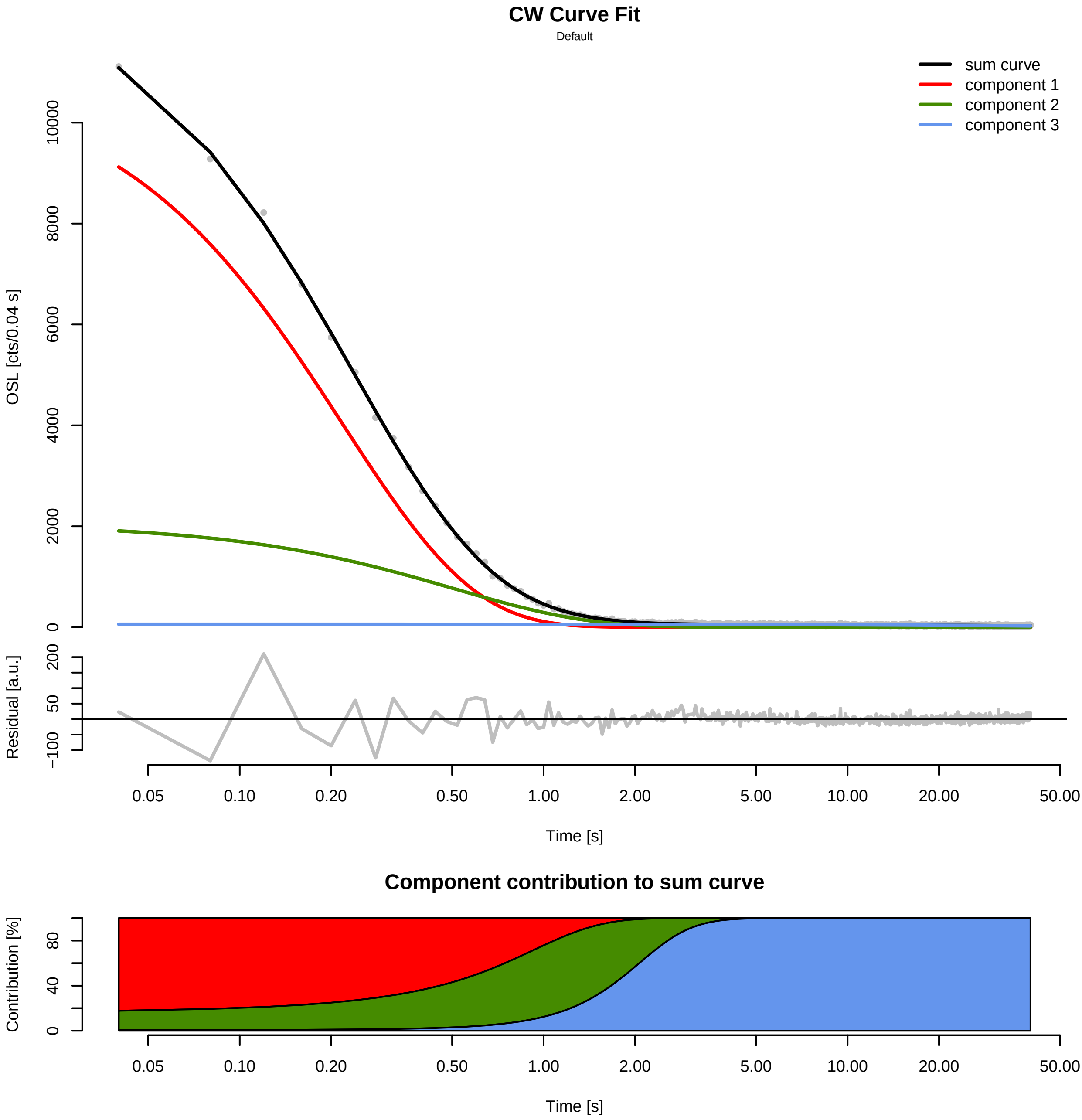

source type: Sr−90 | half−life: 28.9 a
Source Dose Rate Prediction
Dose rate/(Gy/s)
0.049
0.048
0.047
0.046
0.045
0.044
0.043
0.042
2012
2013
2014
help("calc_SourceDoseRate")

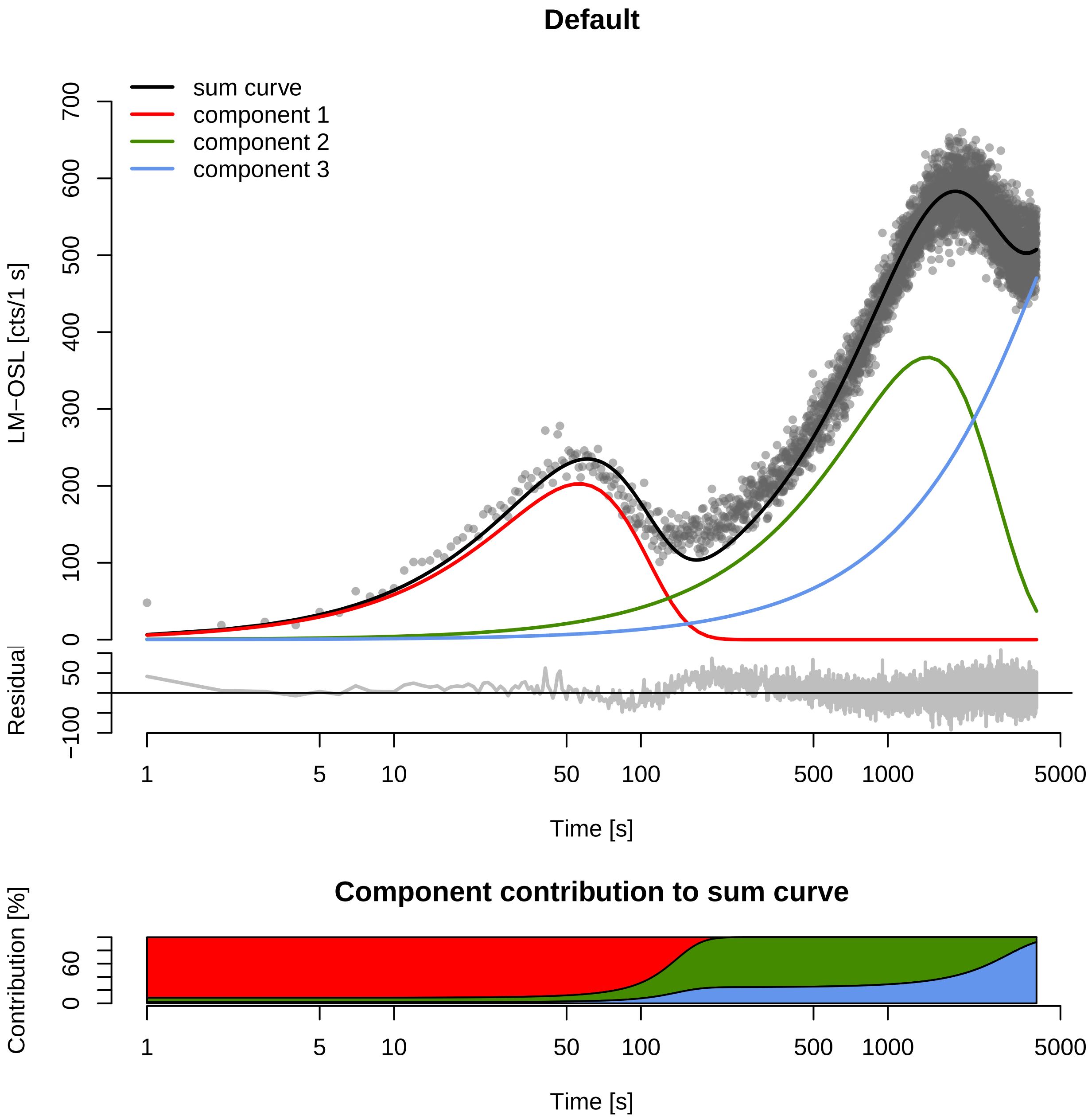


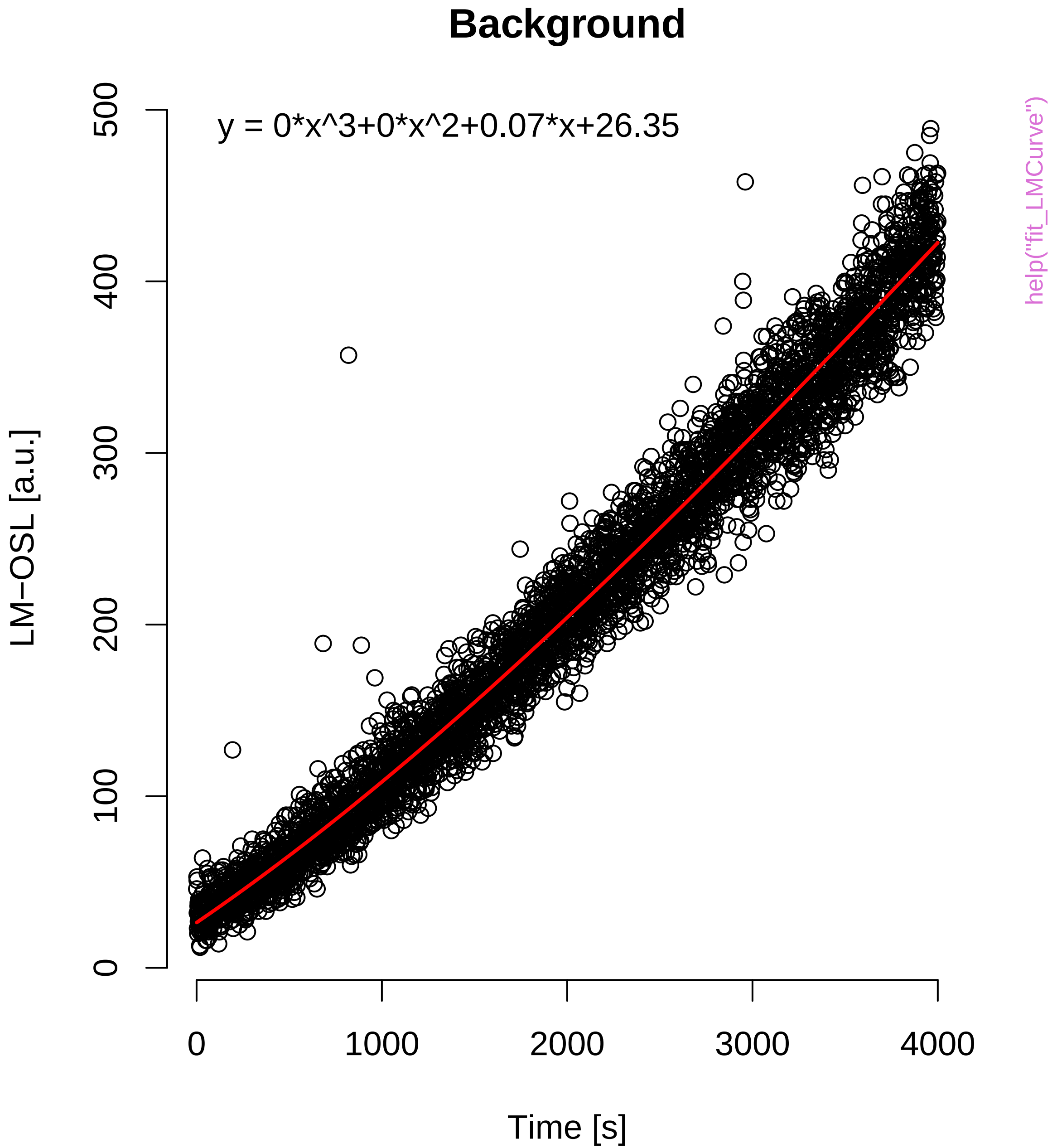
De distribution
Density
0.0000
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
Cumulative frequency
5
10
15
20
25
help("calc_Statistics")
2500
3000
3500
4000
De (Gy)



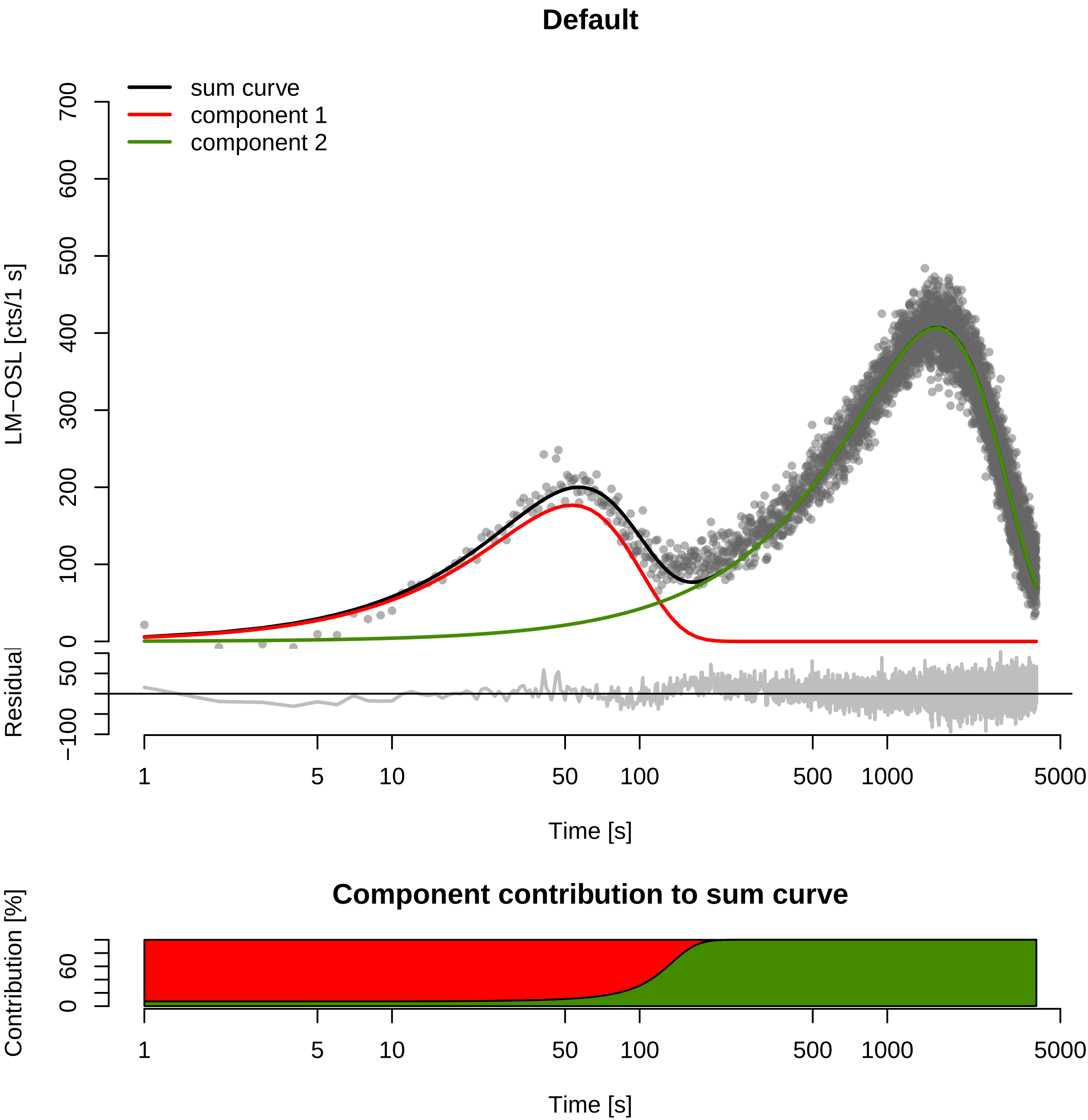
gSGC and resulting De
help("calc_gSGC")
Re−norm. Lx/Tx
0.0
0.5
1.0
1.5
0
100
200
300
400
500
Dose/(a.u.)

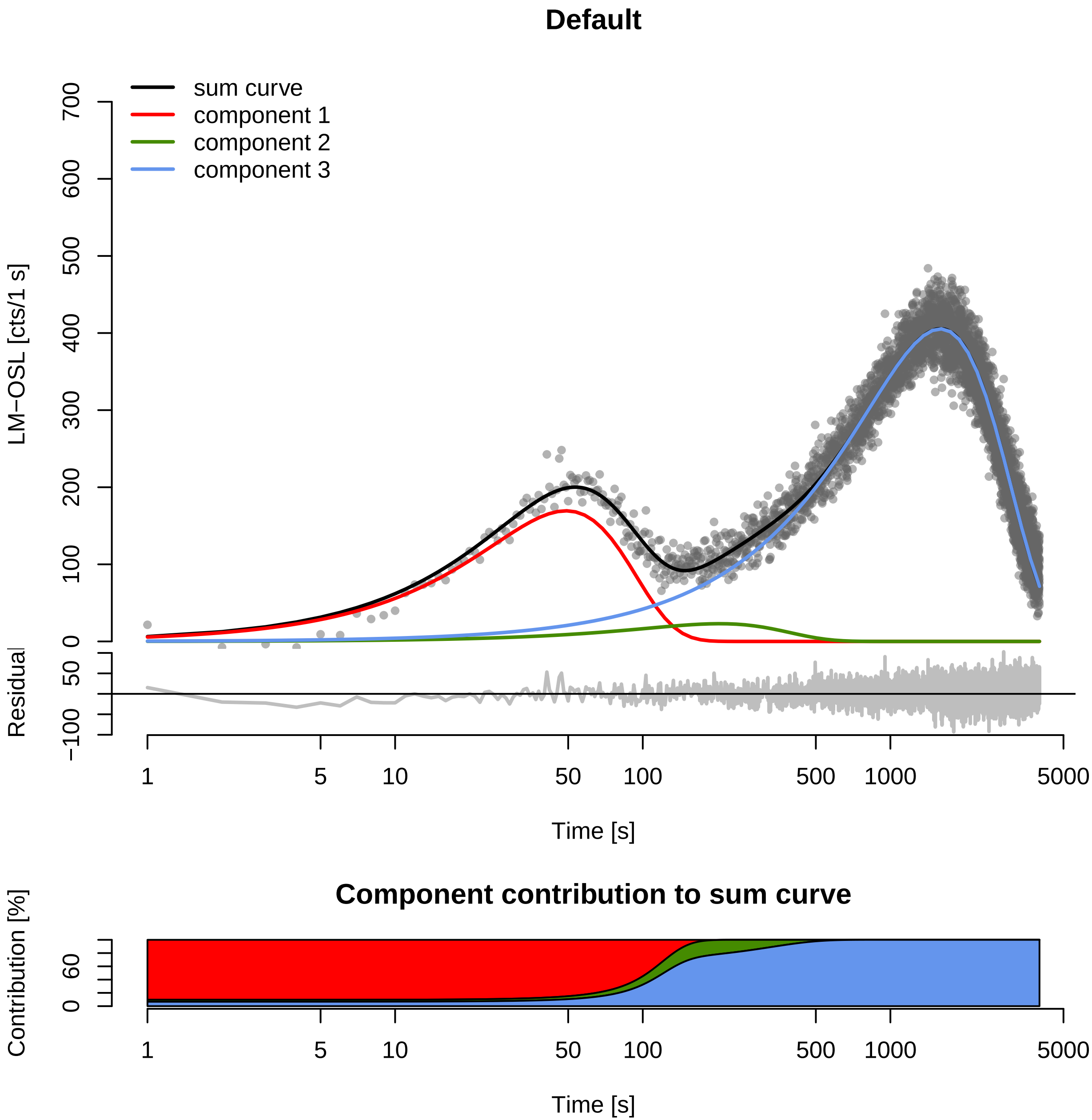

CW Curve Fit
Default
sum curve
component 1
component 2
component 3
OSL [cts/0.04 s]
0
2000
4000
6000
8000
10000
Residual [a.u.]
−100
50
200
0.05
0.10
0.20
0.50
1.00
2.00
5.00
10.00
20.00
50.00
Time [s]
Component contribution to sum curve
Contribution [%]
0
40
80
0.05
0.10
0.20
0.50
1.00
2.00
5.00
10.00
20.00
50.00
Time [s]


Default
sum curve
component 1
component 2
component 3
LM−OSL [cts/1 s]
700
600
500
400
300
200
100
0
Residual
50
−100
1
5
10
50
100
500
1000
5000
Time [s]
Component contribution to sum curve
Contribution [%]
60
0
1
5
10
50
100
500
1000
5000
Time [s]

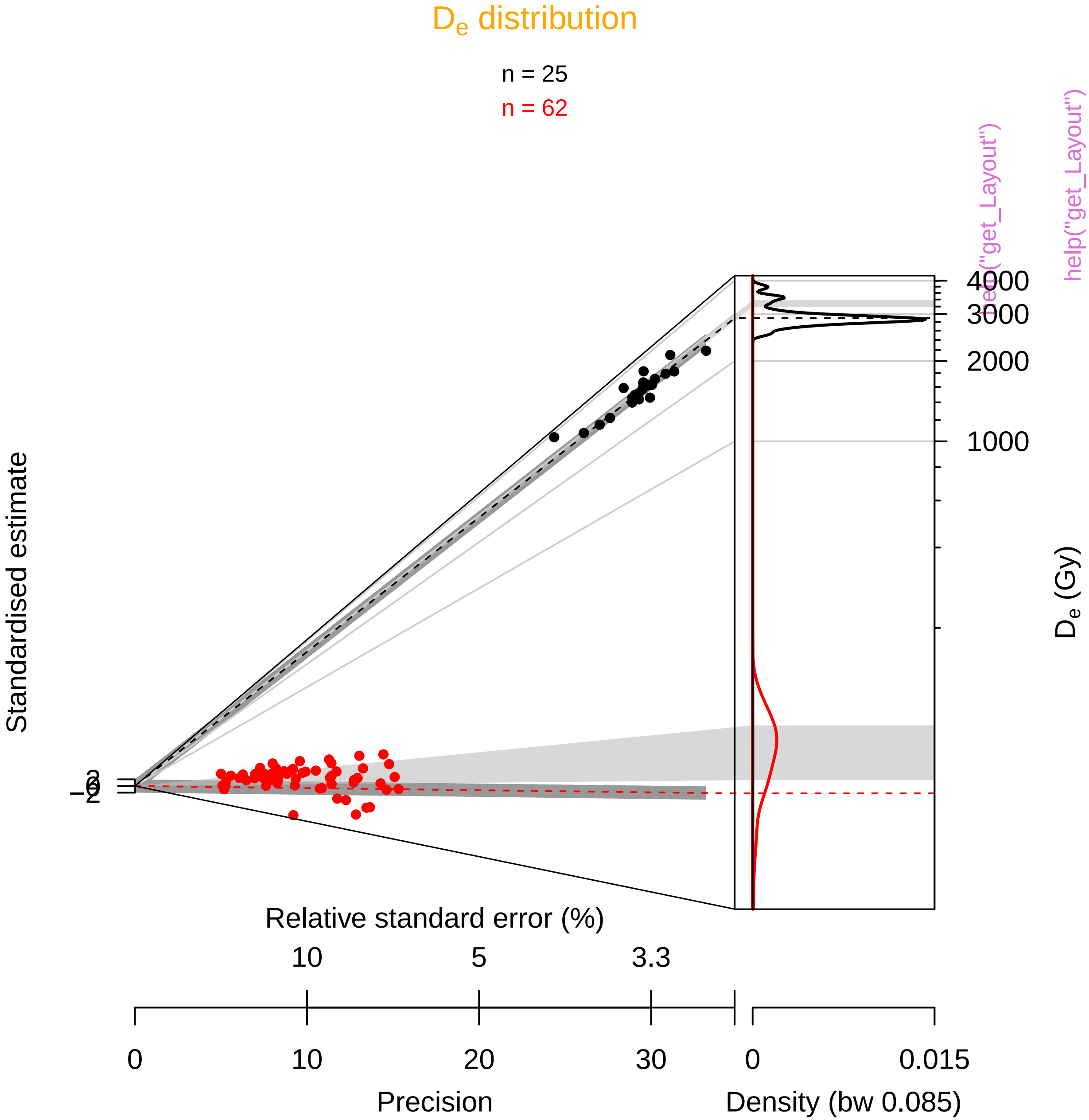


Background
y = 0*x^3+0*x^2+0.07*x+26.35
LM−OSL [a.u.]
0
100
200
300
400
500
0
1000
2000
3000
4000
Time [s]
help("fit_LMCurve")

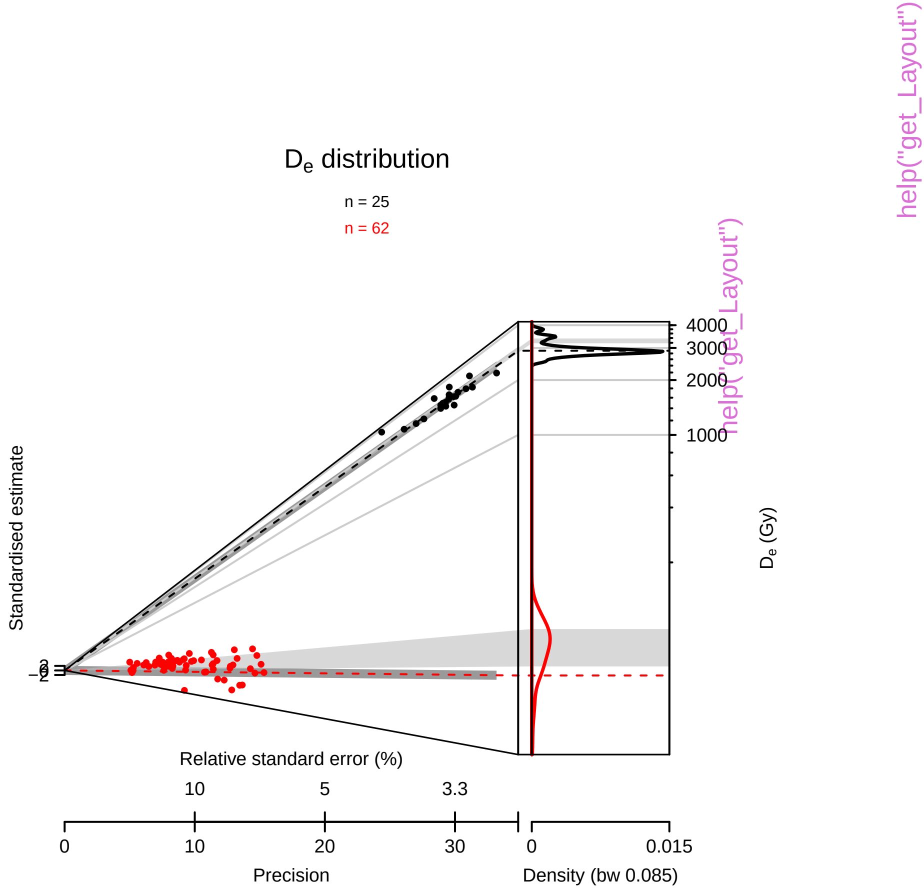

Default
sum curve
component 1
component 2
LM−OSL [cts/1 s]
0
100
200
300
400
500
600
700
Residual
−100
50
1
5
10
50
100
500
1000
5000
Time [s]
Component contribution to sum curve
Contribution [%]
0
60
1
5
10
50
100
500
1000
5000
Time [s]



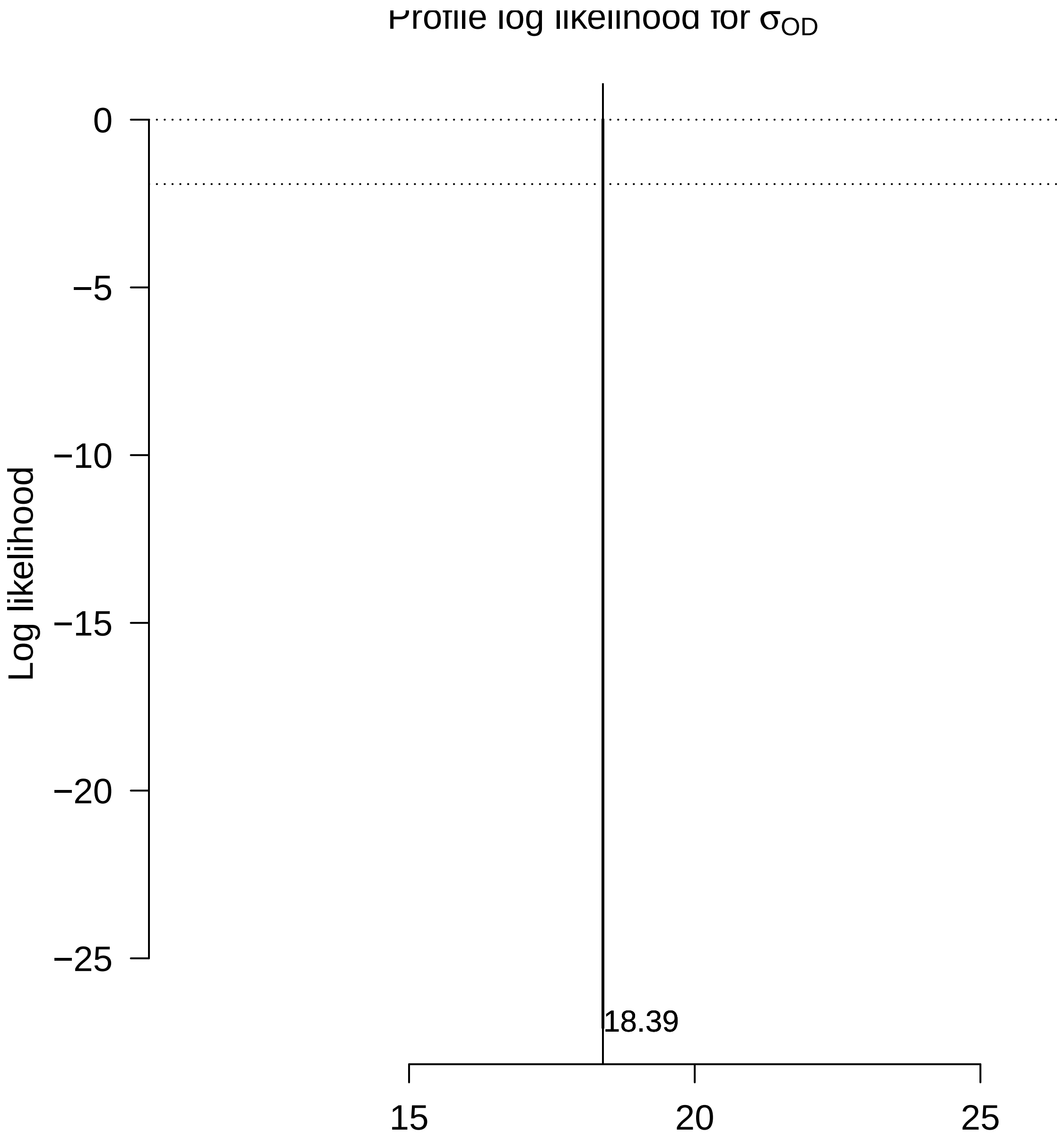
Default
sum curve
component 1
component 2
component 3
LM−OSL [cts/1 s]
0
100
200
300
400
500
600
700
Residual
−100
50
1
5
10
50
100
500
1000
5000
Time [s]
Component contribution to sum curve
Contribution [%]
0
60
1
5
10
50
100
500
1000
5000
Time [s]



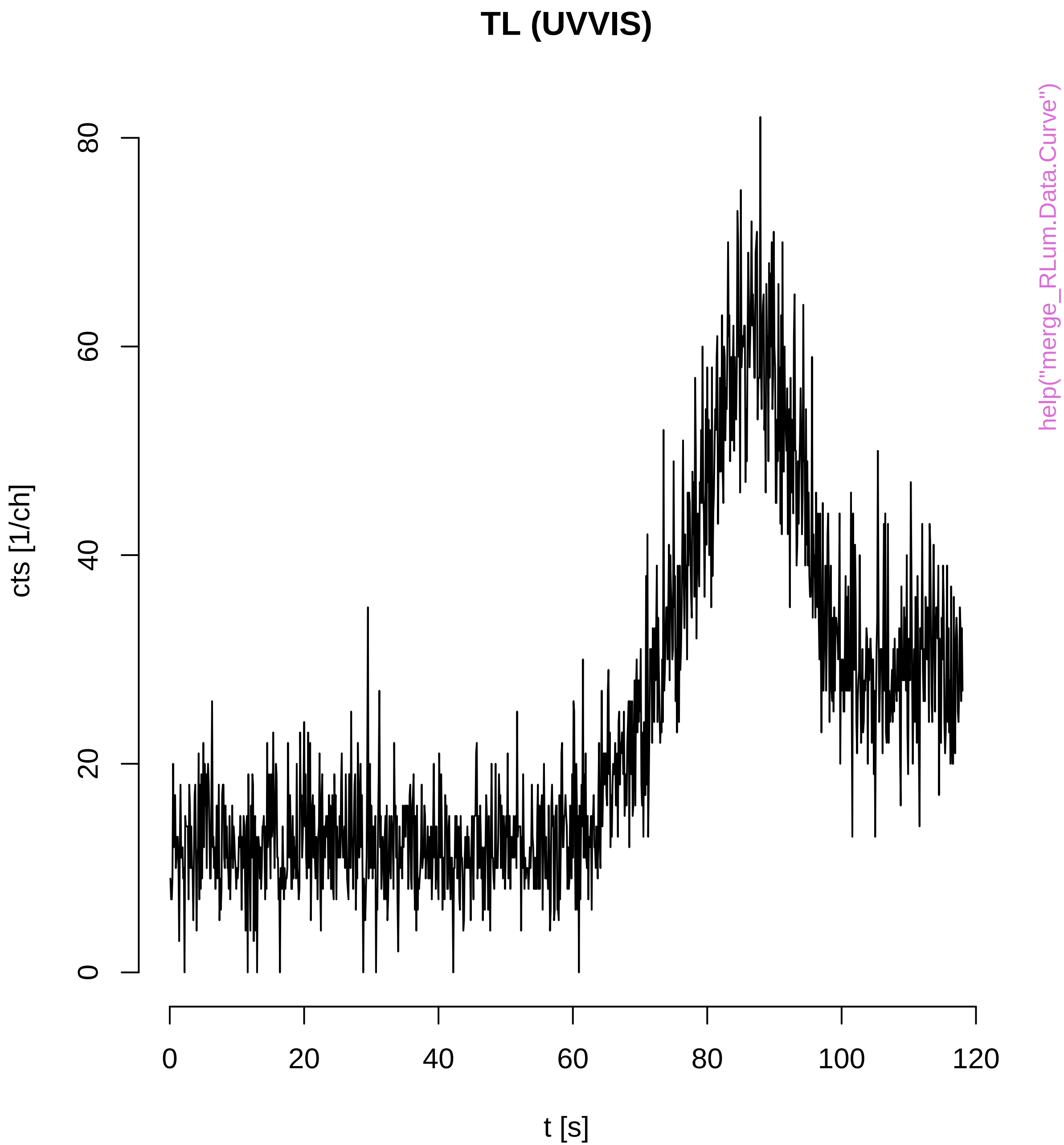
D$_e$ distribution
n = 25
n = 62
Standardised estimate
-2
0
2
Relative standard error (%)
10
5
3.3
0
10
20
30
Precision
0
0.015
Density (bw 0.085)
4000
3000
2000
1000
D$_e$ (Gy)
help("get_Layout")
help("get_Layout")



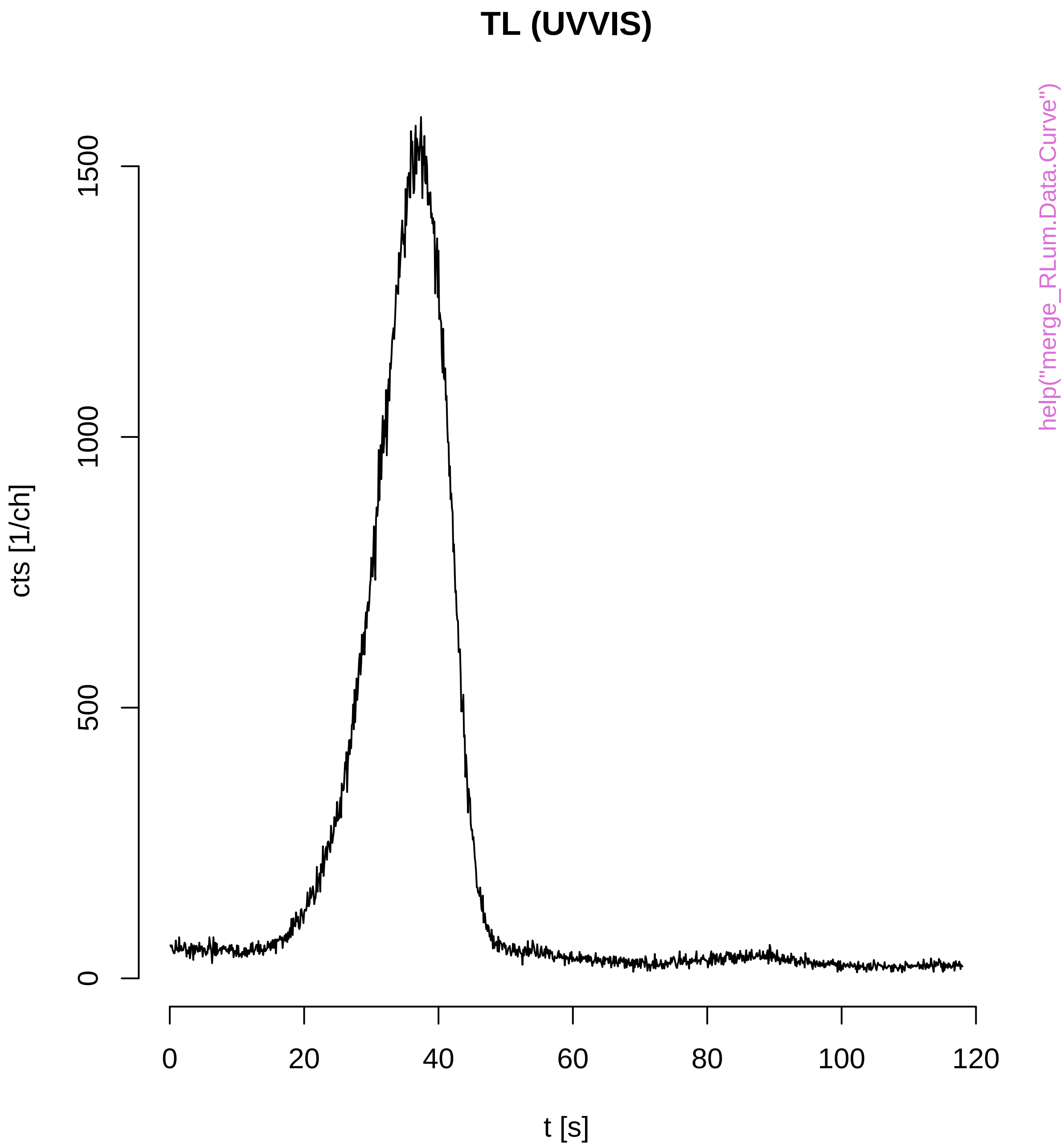
De distribution
n = 25
n = 62
Standardised estimate
2
0
-2
Relative standard error (%)
10
5
3.3
0
10
20
30
Precision
0
0.015
Density (bw 0.085)
4000
3000
2000
1000
De (Gy)
help("get_Layout")
help("get_Layout")



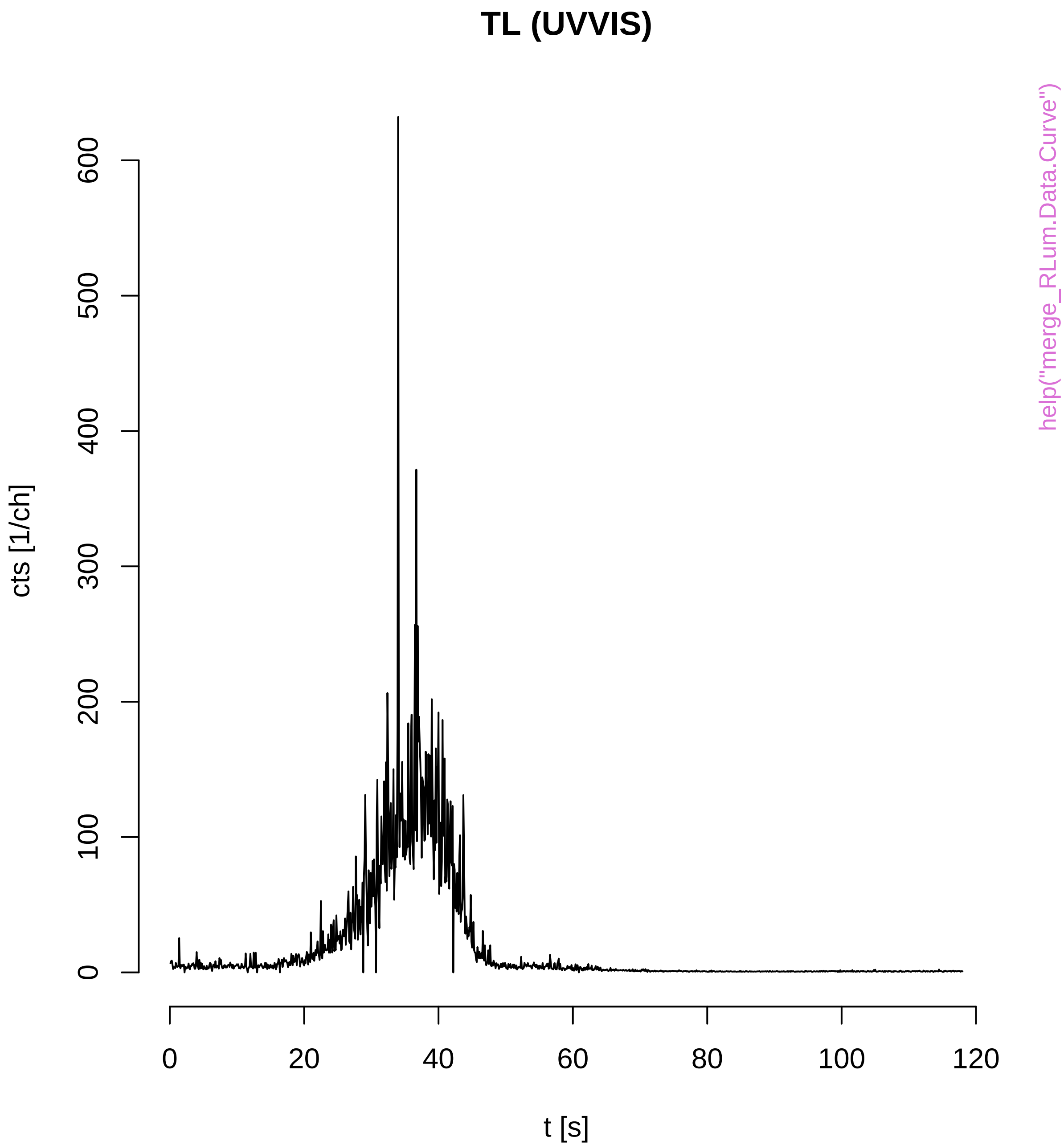
Profile log likelihood for σ_{OD}
Log likelihood
0
−5
−10
−15
−20
−25
18.39
15
20
25



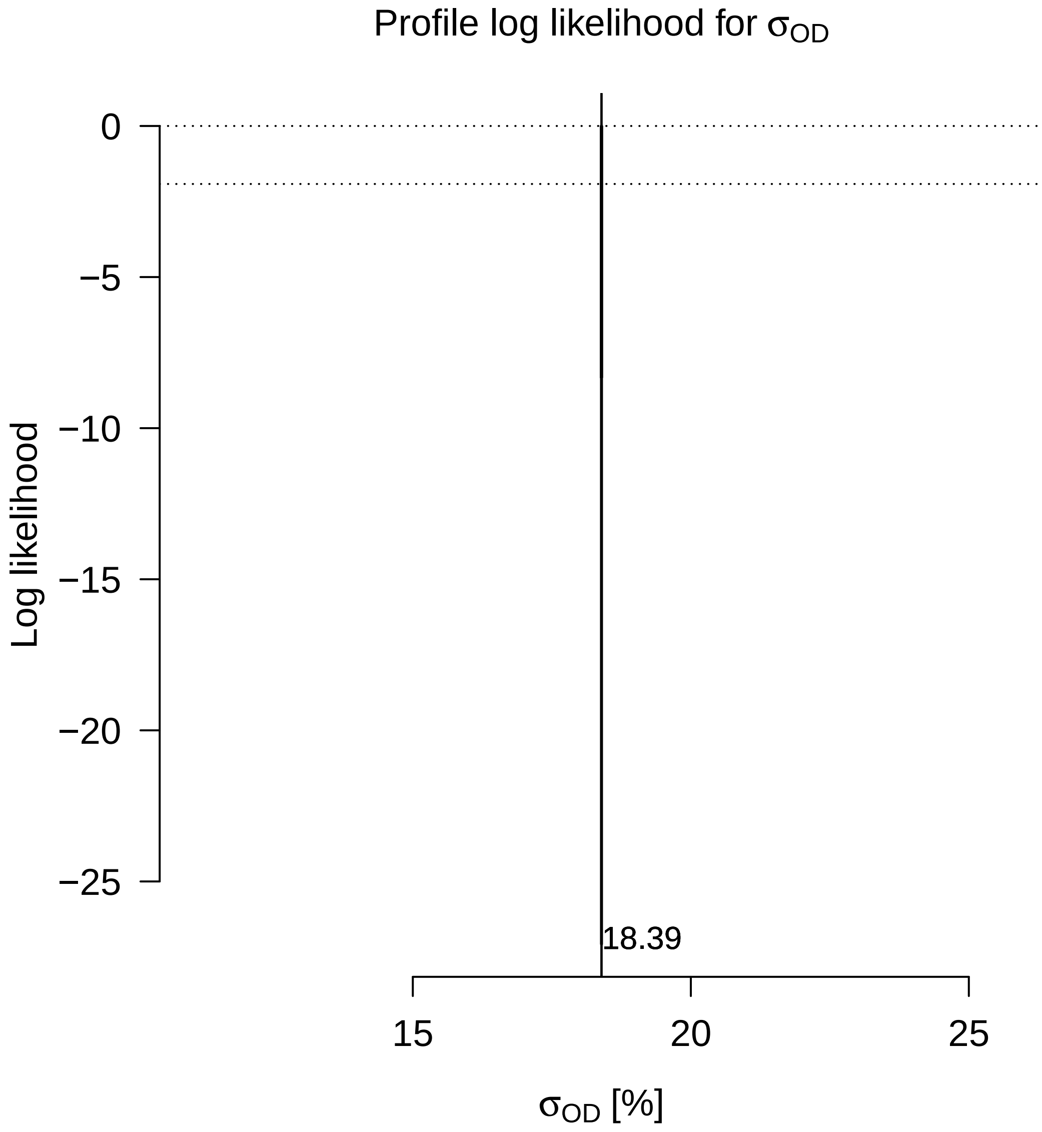
TL (UVVIS)
cts [1/ch]
t [s]
0
20
40
60
80
0
20
40
60
80
100
120
help("merge_RLum.Data.Curve")



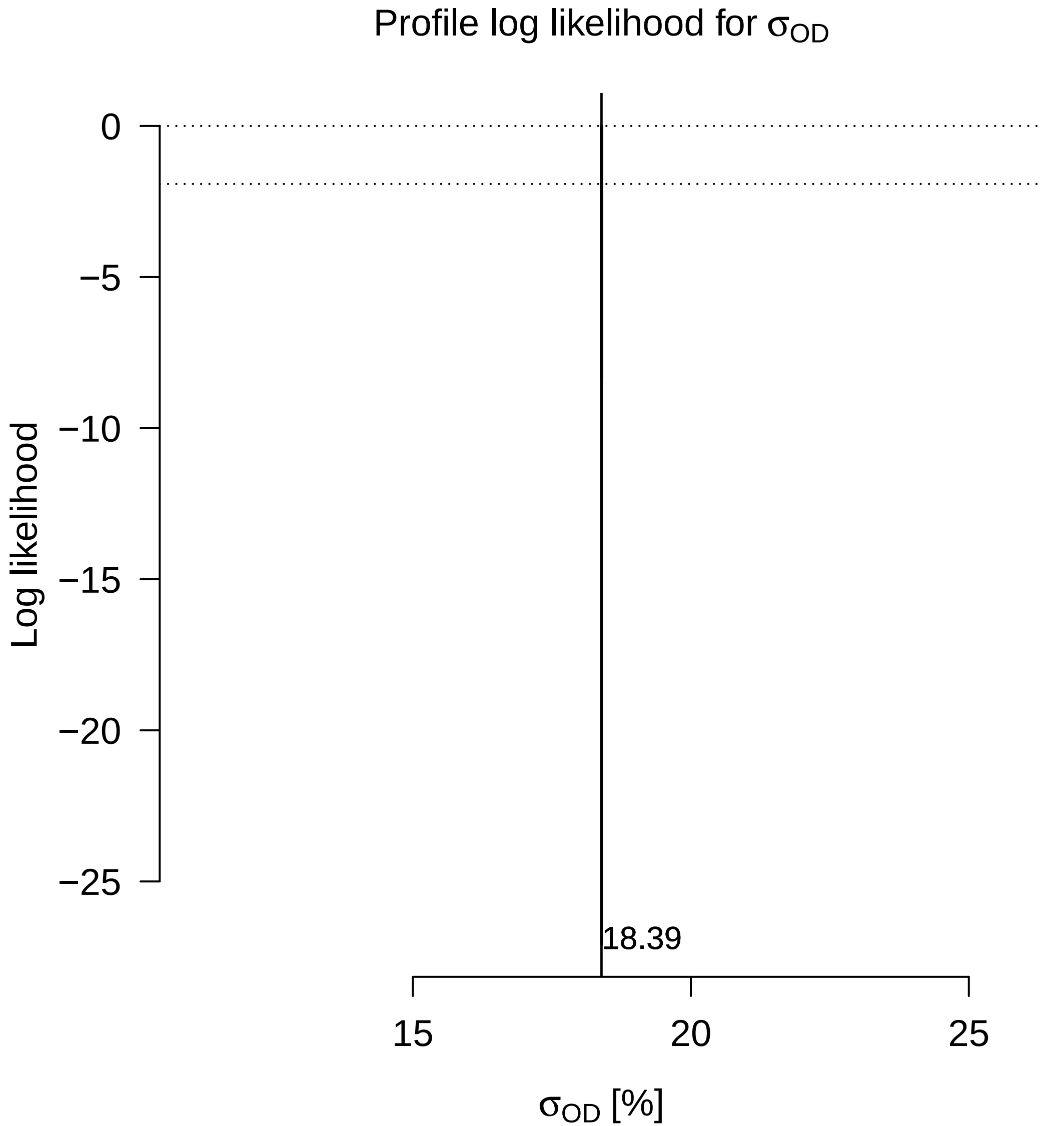
TL (UVVIS)
cts [1/ch]
0
500
1000
1500
0
20
40
60
80
100
120
t [s]
help("merge_RLum.Data.Curve")



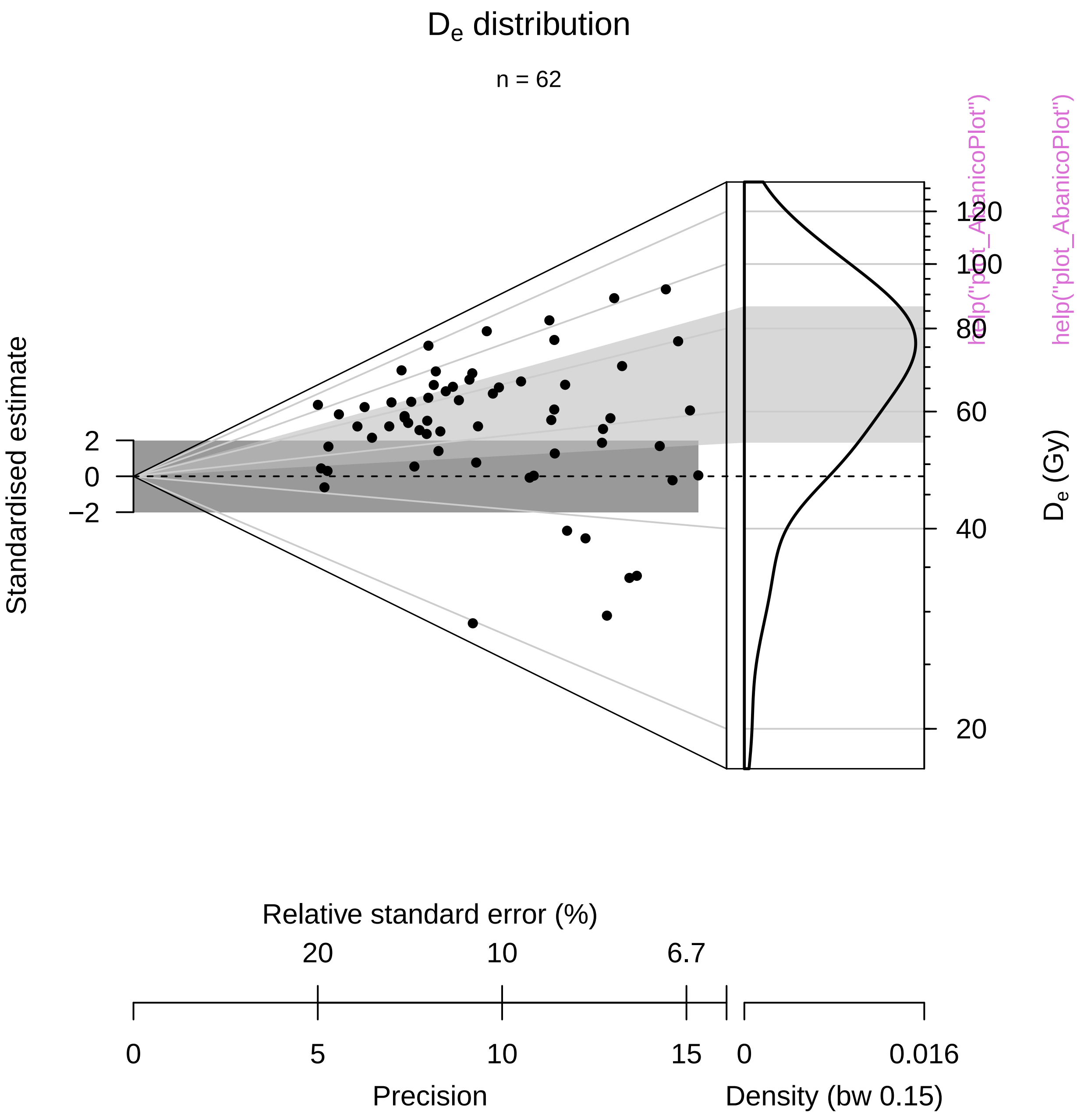
TL (UVVIS)
cts [1/ch]
0
100
200
300
400
500
600
0
20
40
60
80
100
120
t [s]
help("merge_RLum.Data.Curve")



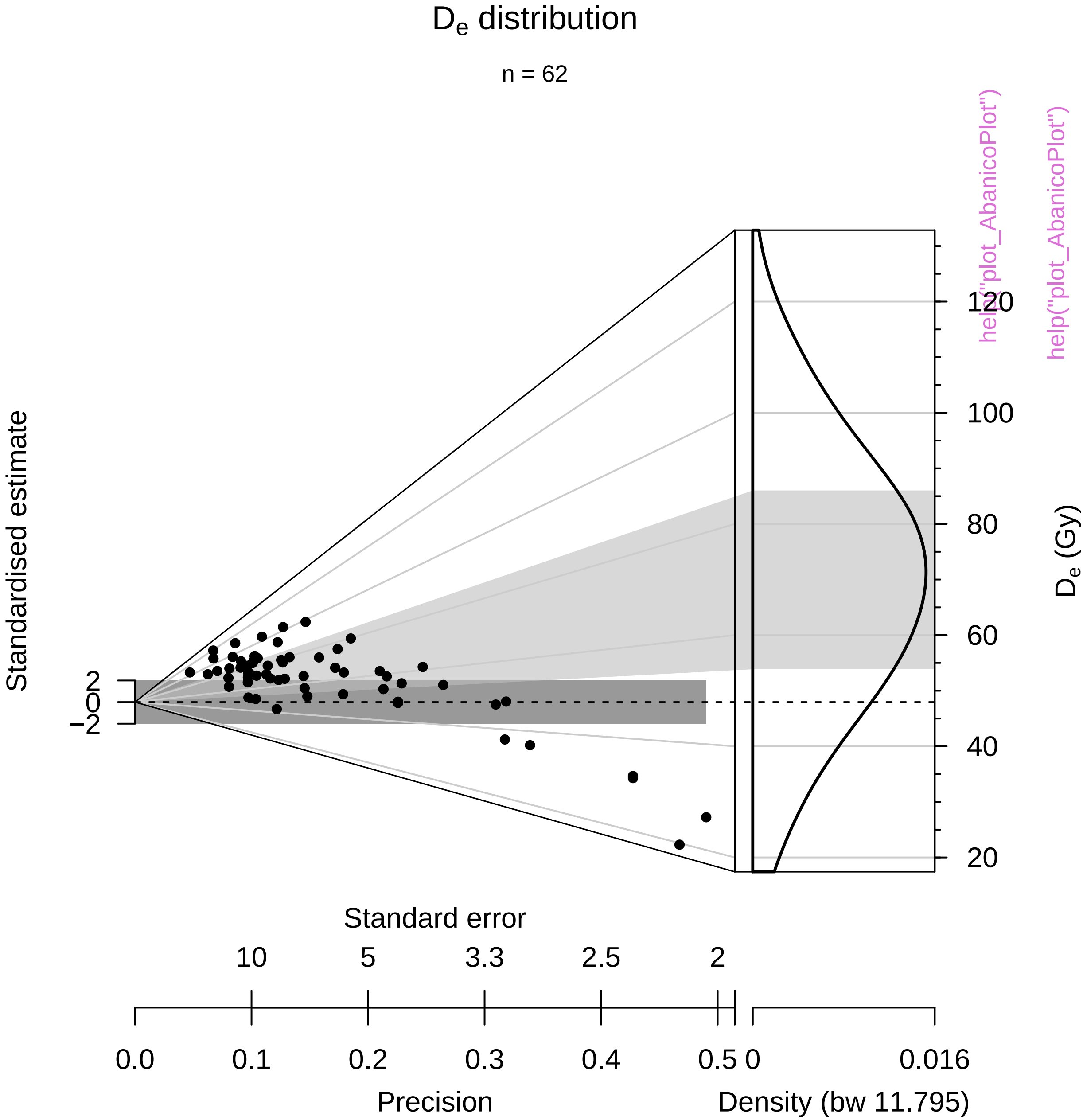
Profile log likelihood for σ_{OD}
0
−5
−10
−15
−20
−25
Log likelihood
18.39
15
20
25
σ_{OD} [%]



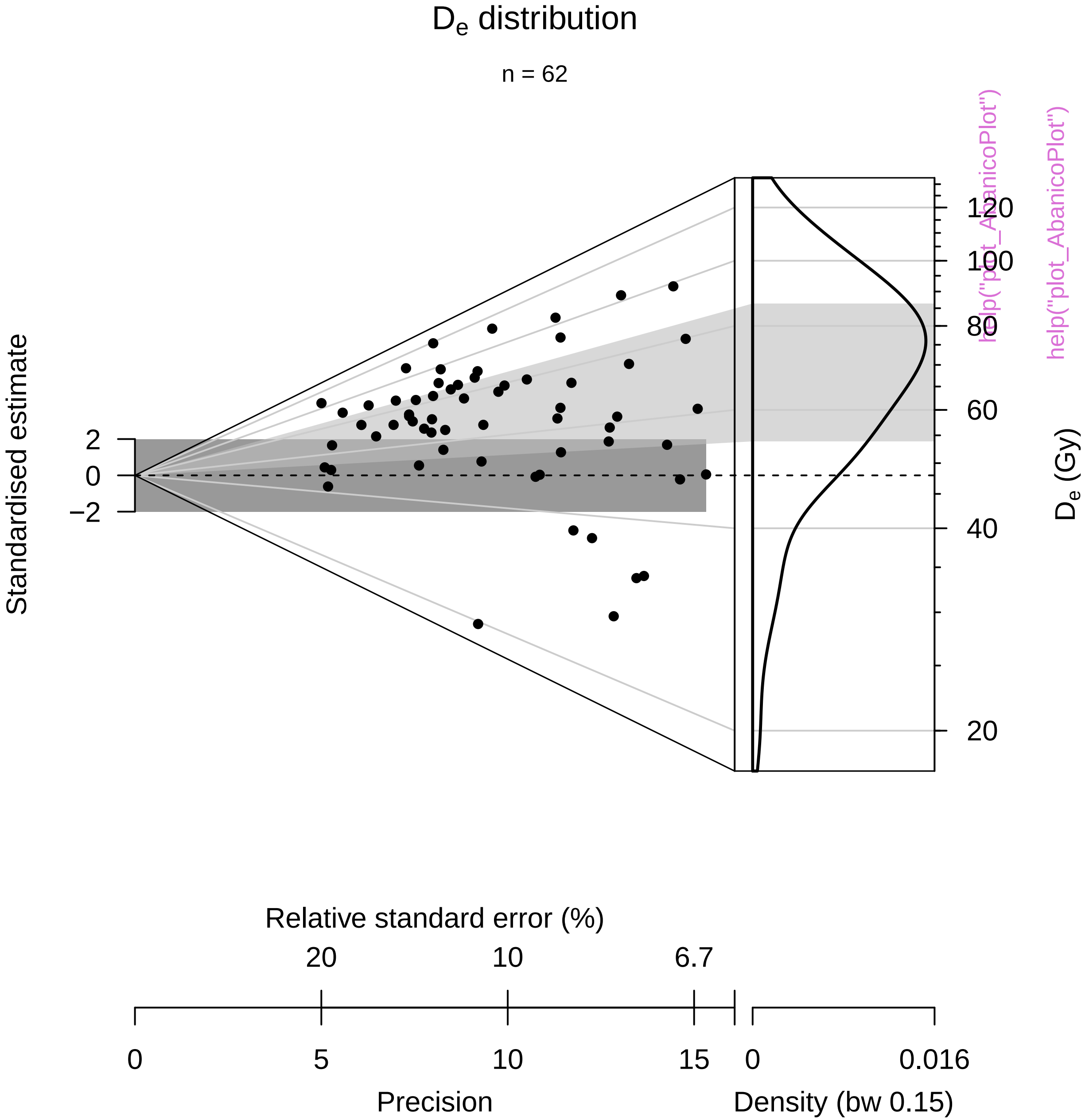
Profile log likelihood for σOD
Log likelihood
0
−5
−10
−15
−20
−25
18.39
15
20
25
σOD [%]



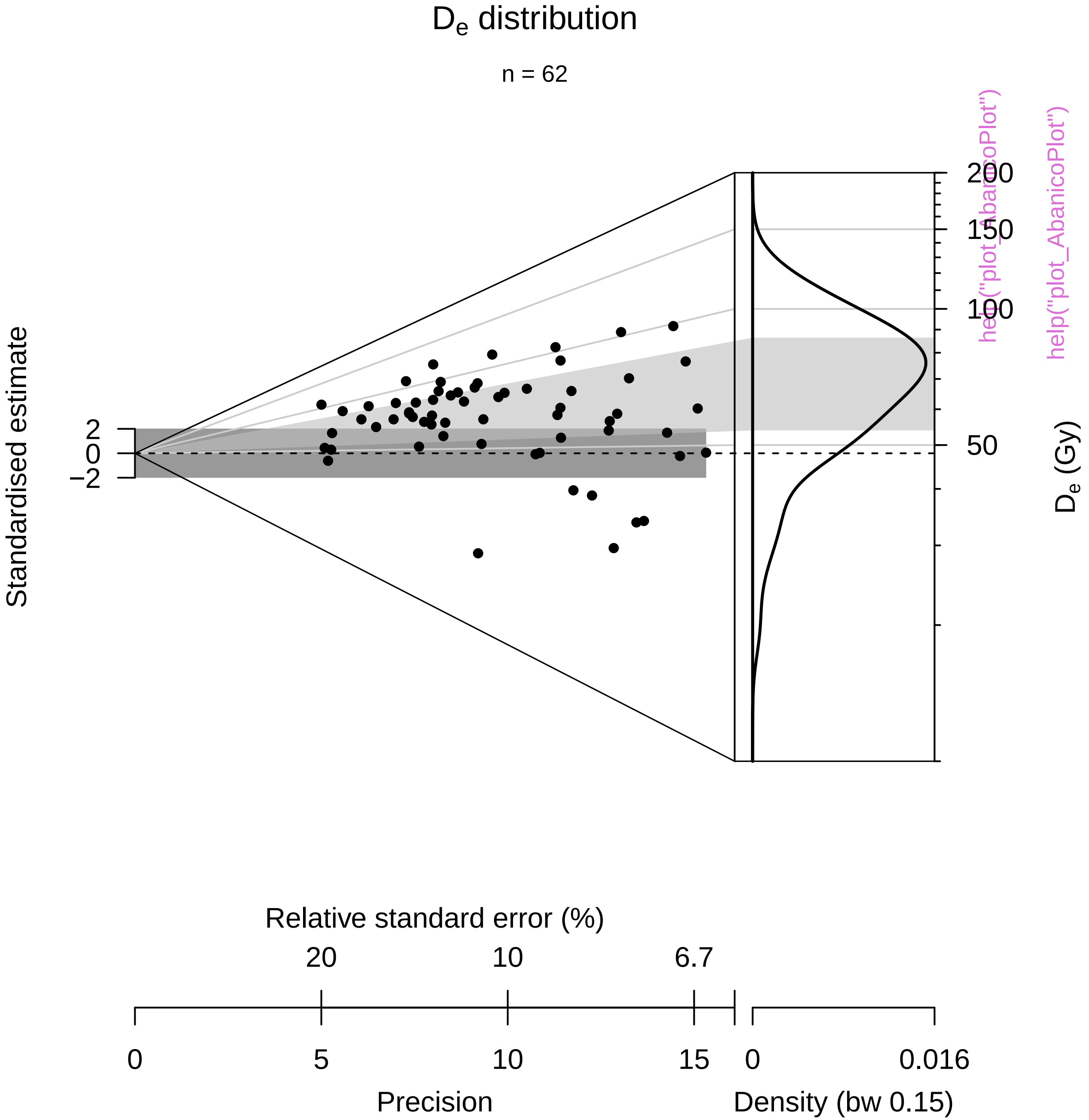
D_e distribution
n = 62
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Standardised estimate
2
0
−2
120
100
80
60
40
20
D_e (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)

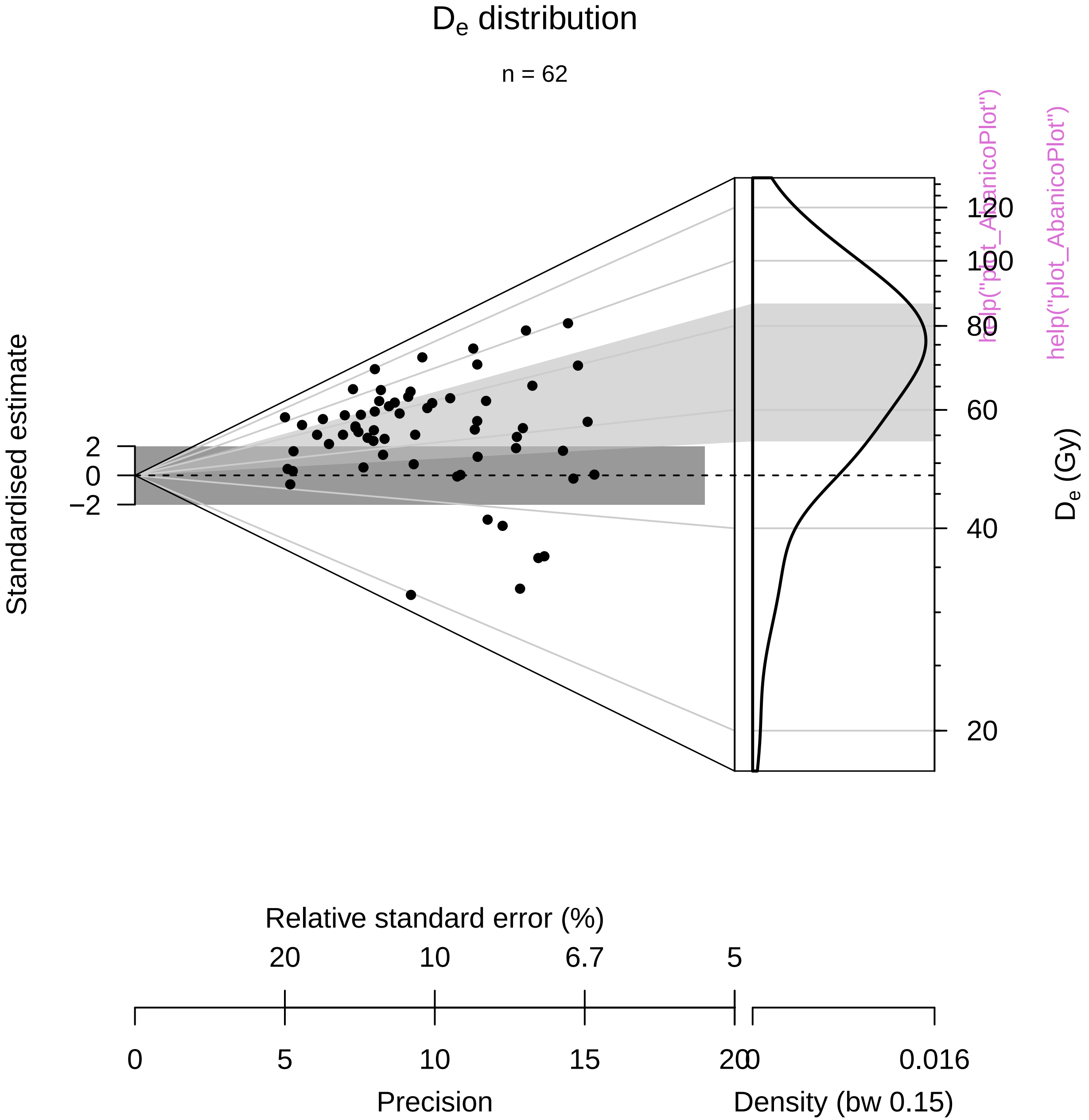


D_e distribution
n = 62
Standardised estimate
2
0
-2
Standard error
10
5
3.3
2.5
2
0.0
0.1
0.2
0.3
0.4
0.5
Precision
0
0.016
Density (bw 11.795)
120
100
80
60
40
20
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")

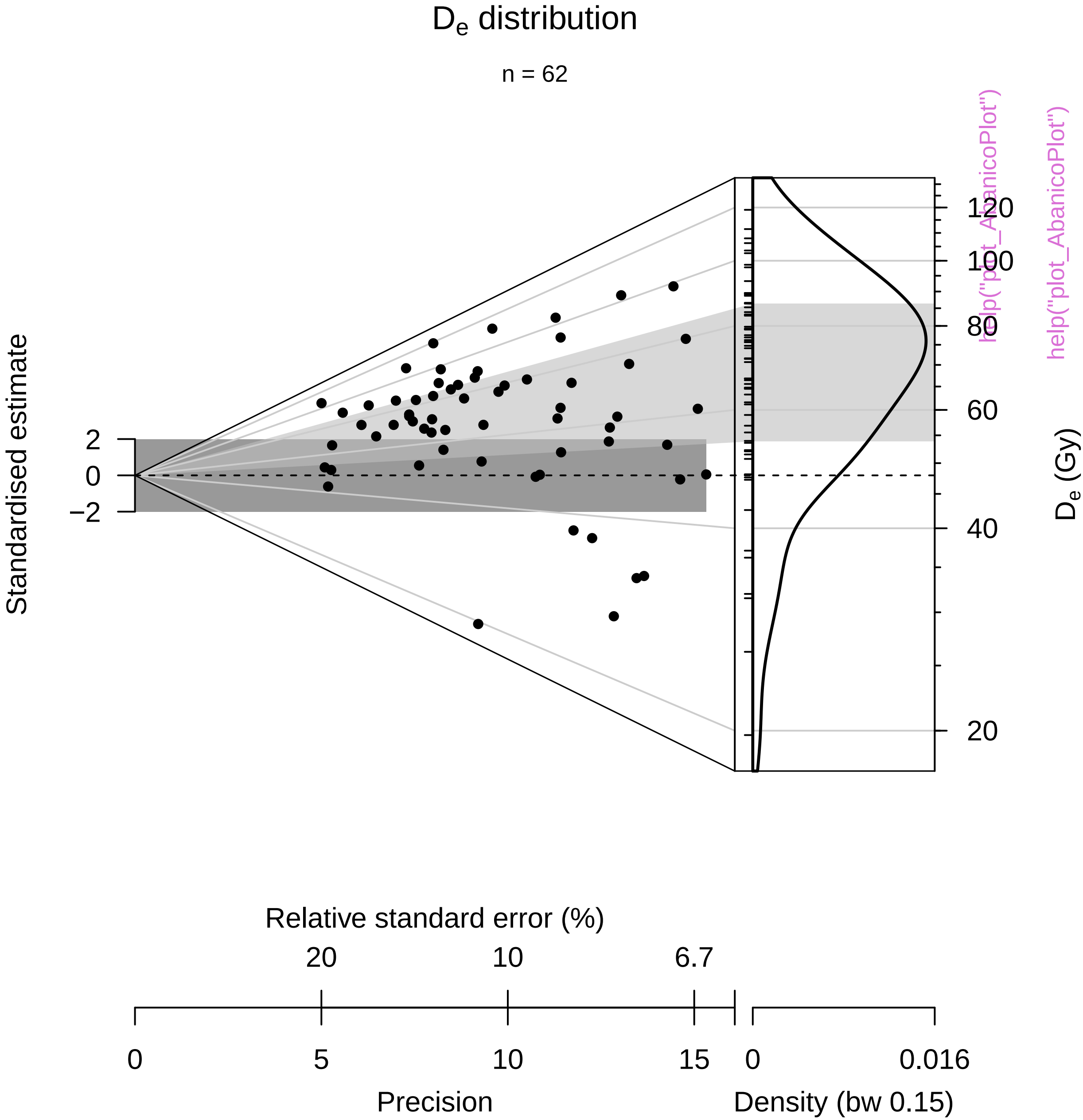


D_e distribution
n = 62
Standardised estimate
2
0
−2
120
100
80
60
40
20
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.016
Density (bw 0.15)

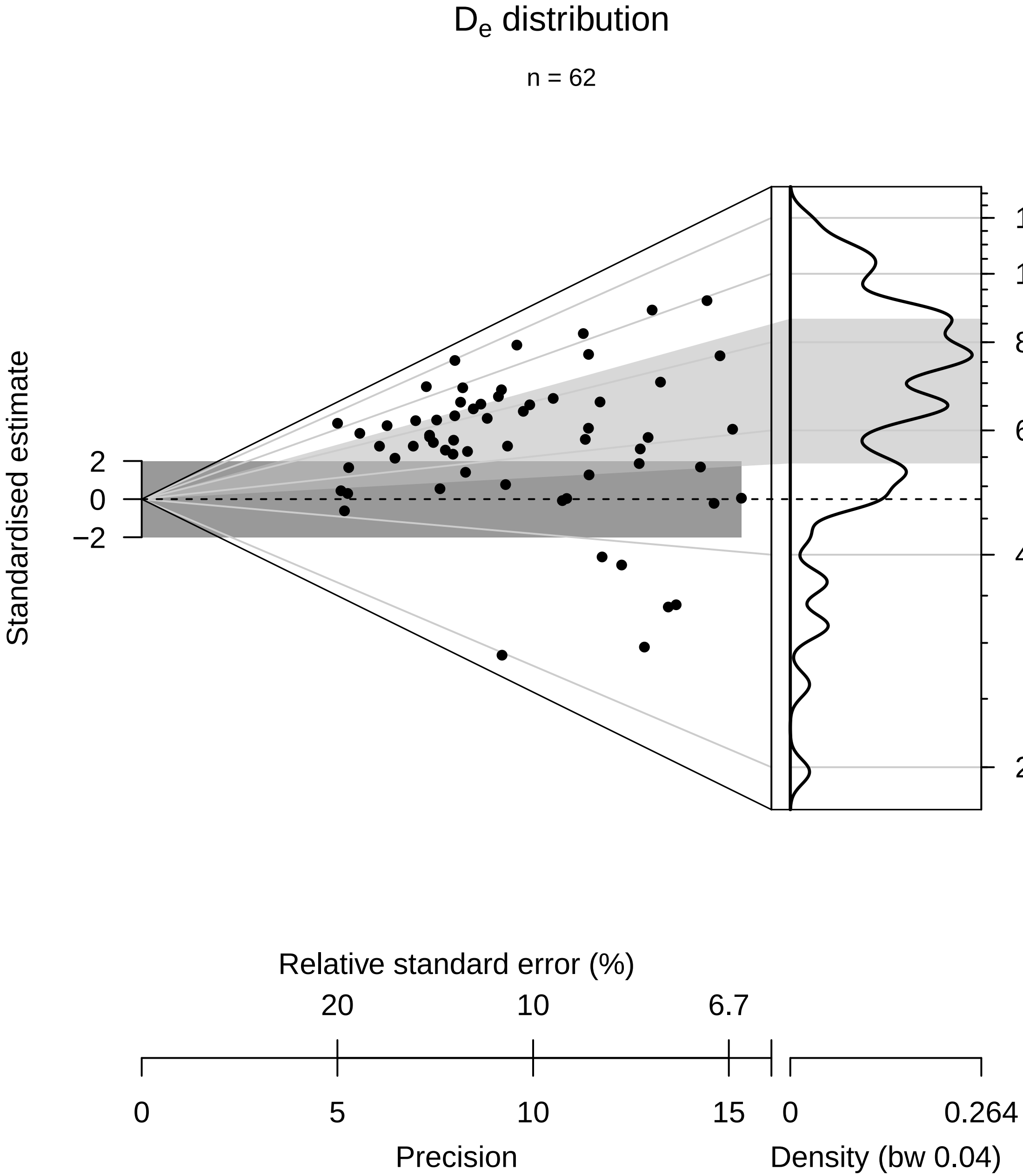

D_e distribution
n = 62
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Standardised estimate
2
0
-2
200
150
100
50
D_e (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)



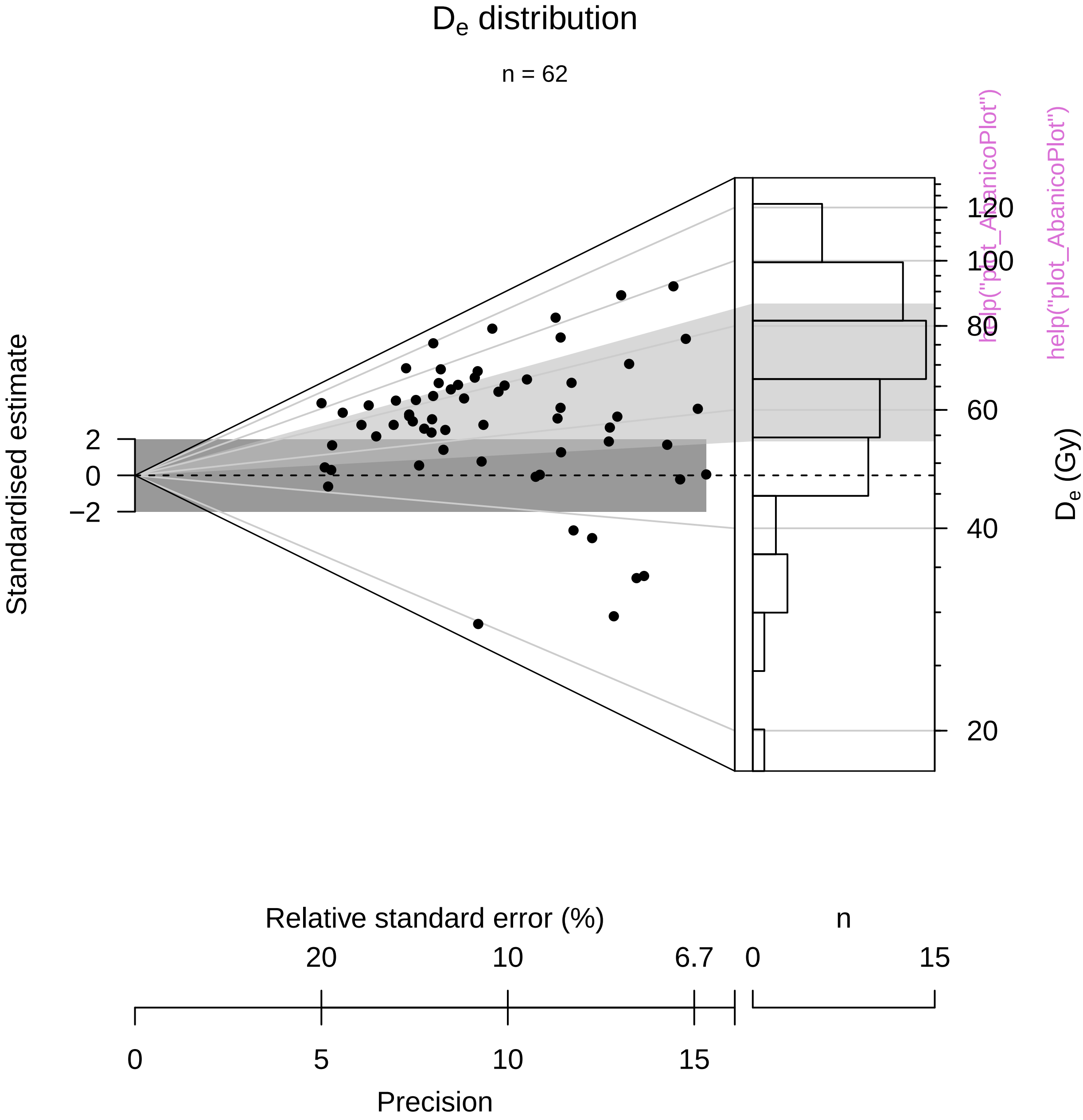
De distribution
n = 62
Standardised estimate
2
0
−2
120
100
80
60
40
20
De (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
5
0
5
10
15
20
0
0.016
Precision
Density (bw 0.15)



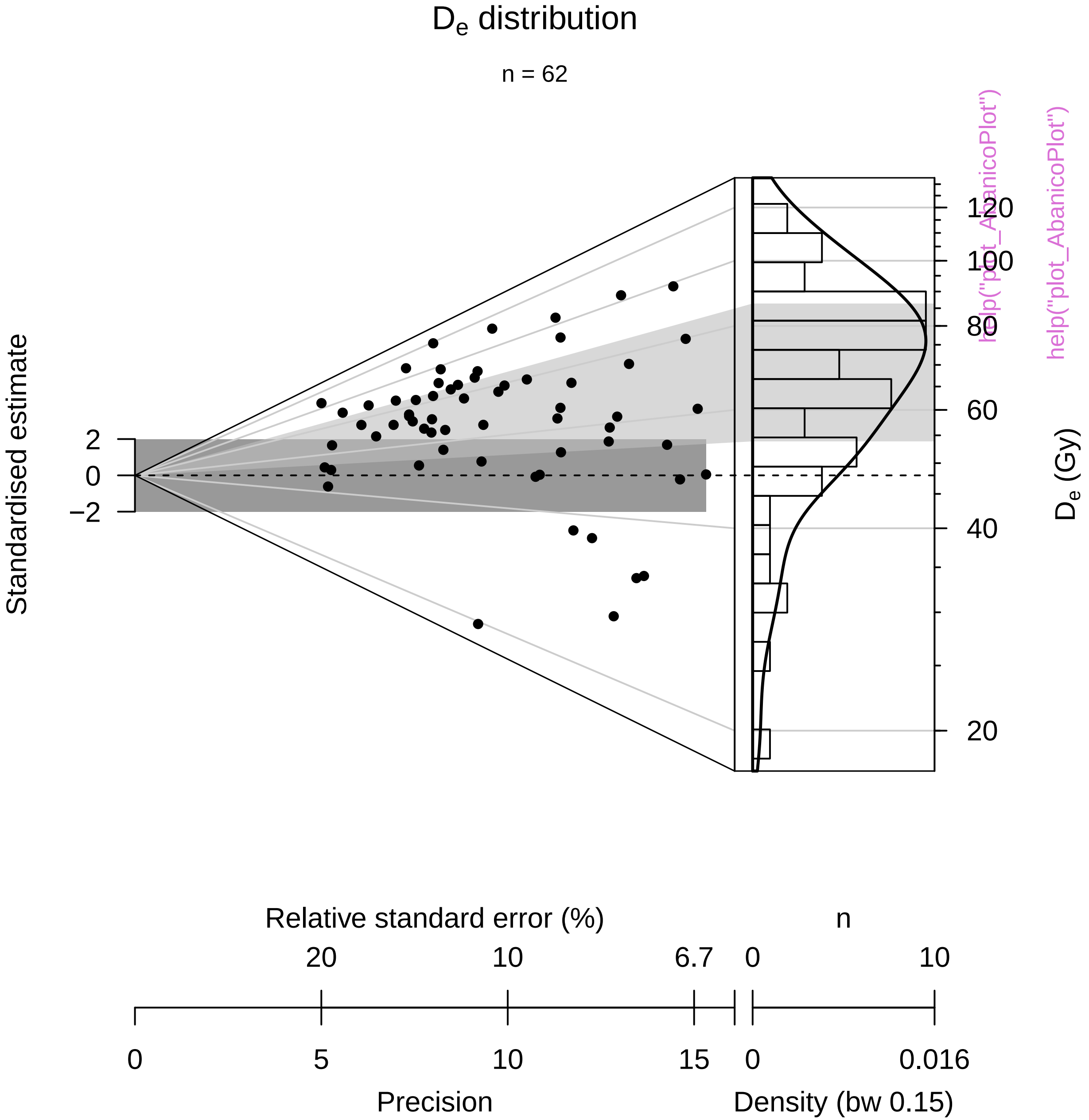
D_e distribution
n = 62
Standardised estimate
2
0
−2
120
100
80
60
40
20
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.016
Density (bw 0.15)



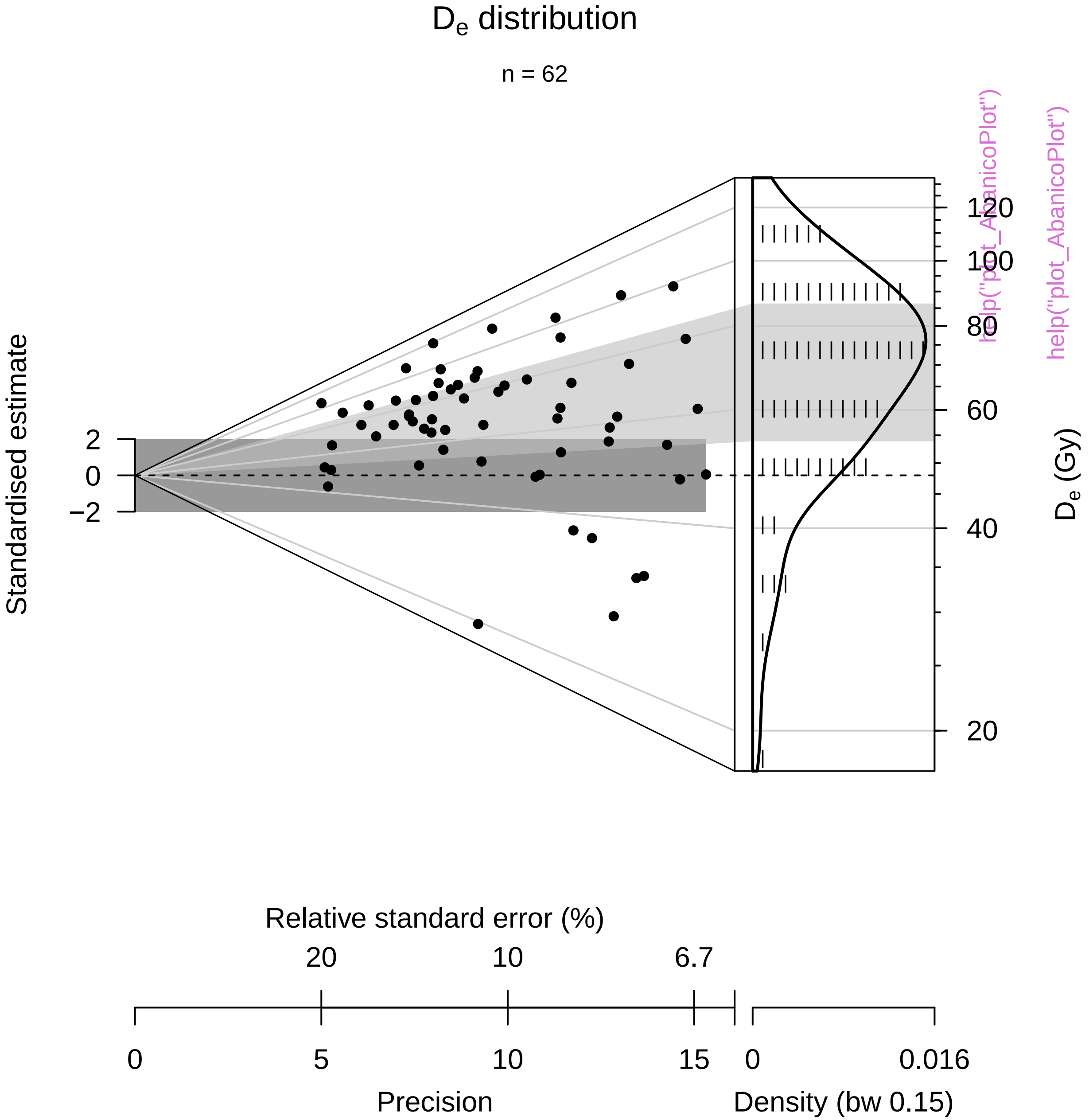
D_e distribution
n = 62
Standardised estimate
2
0
−2
120
100
80
60
40
20
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.264
Density (bw 0.04)



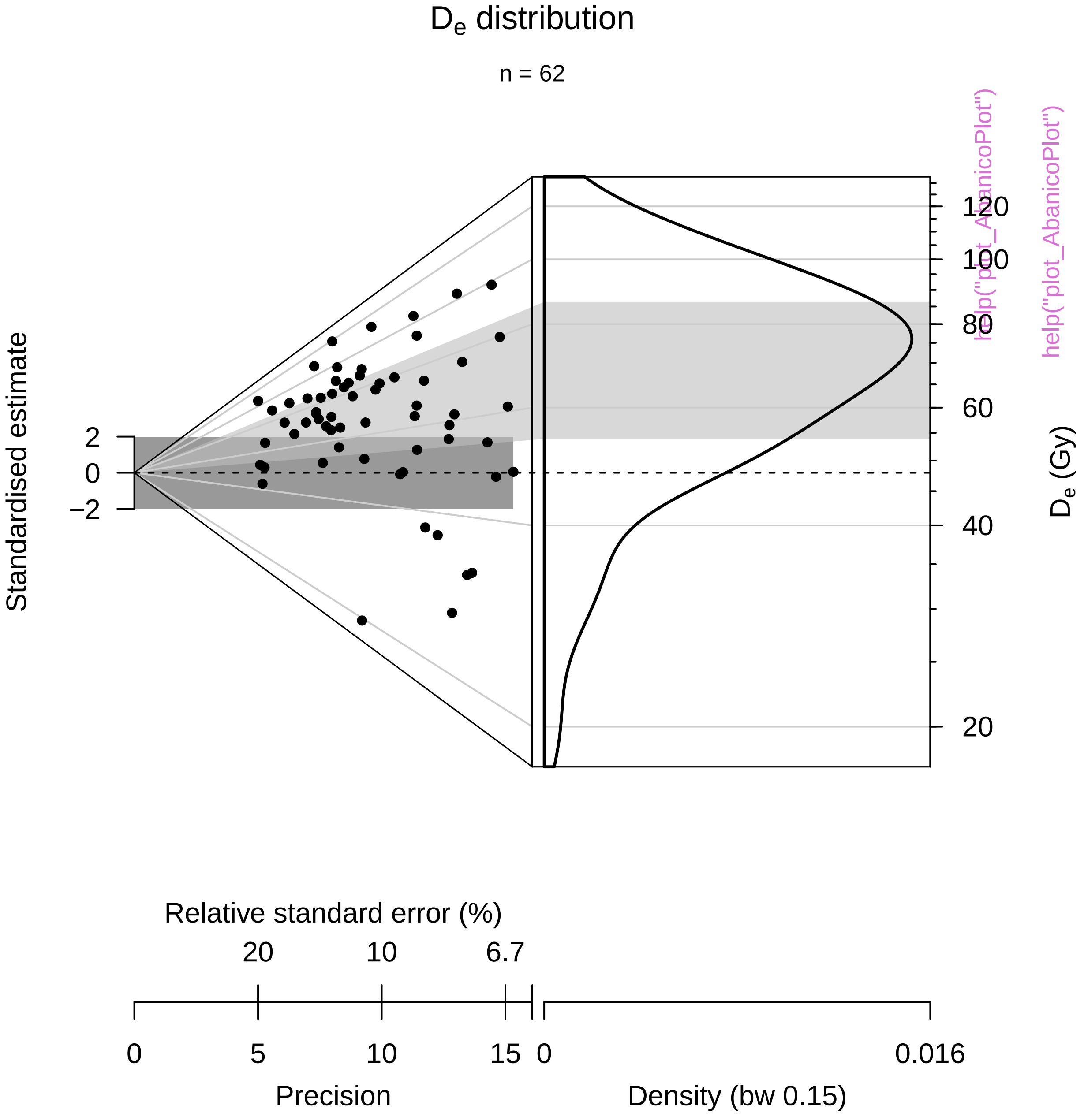
D_e distribution
n = 62
Standardised estimate
2
0
−2
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
120
100
80
60
40
20
D_e (Gy)
Relative standard error (%)
20
10
6.7
n
0
15
0
5
10
15
Precision



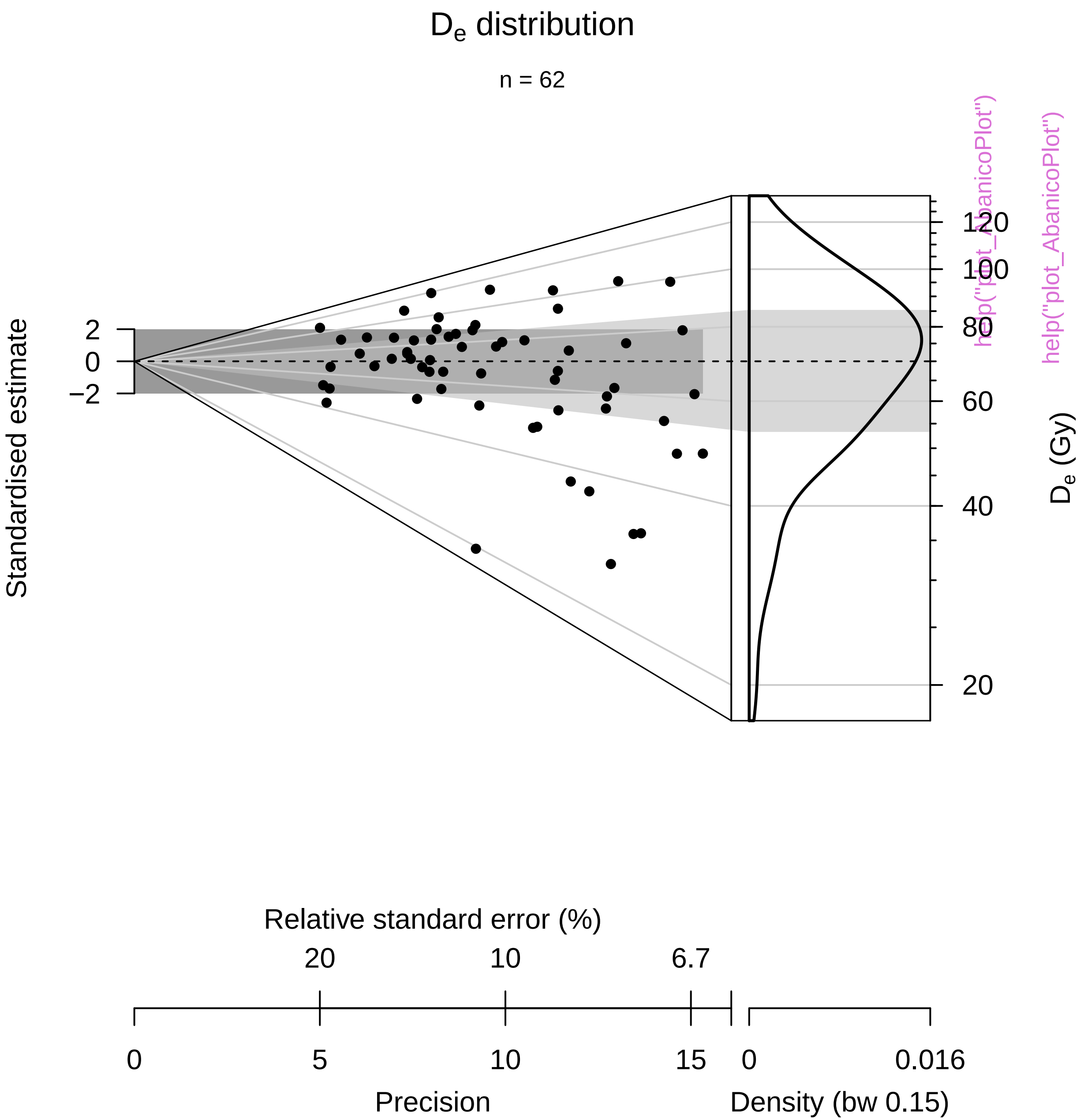
D_e distribution
n = 62
Standardised estimate
2
0
−2
120
100
80
60
40
20
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
n
0
10
0
5
10
15
0
0.016
Precision
Density (bw 0.15)



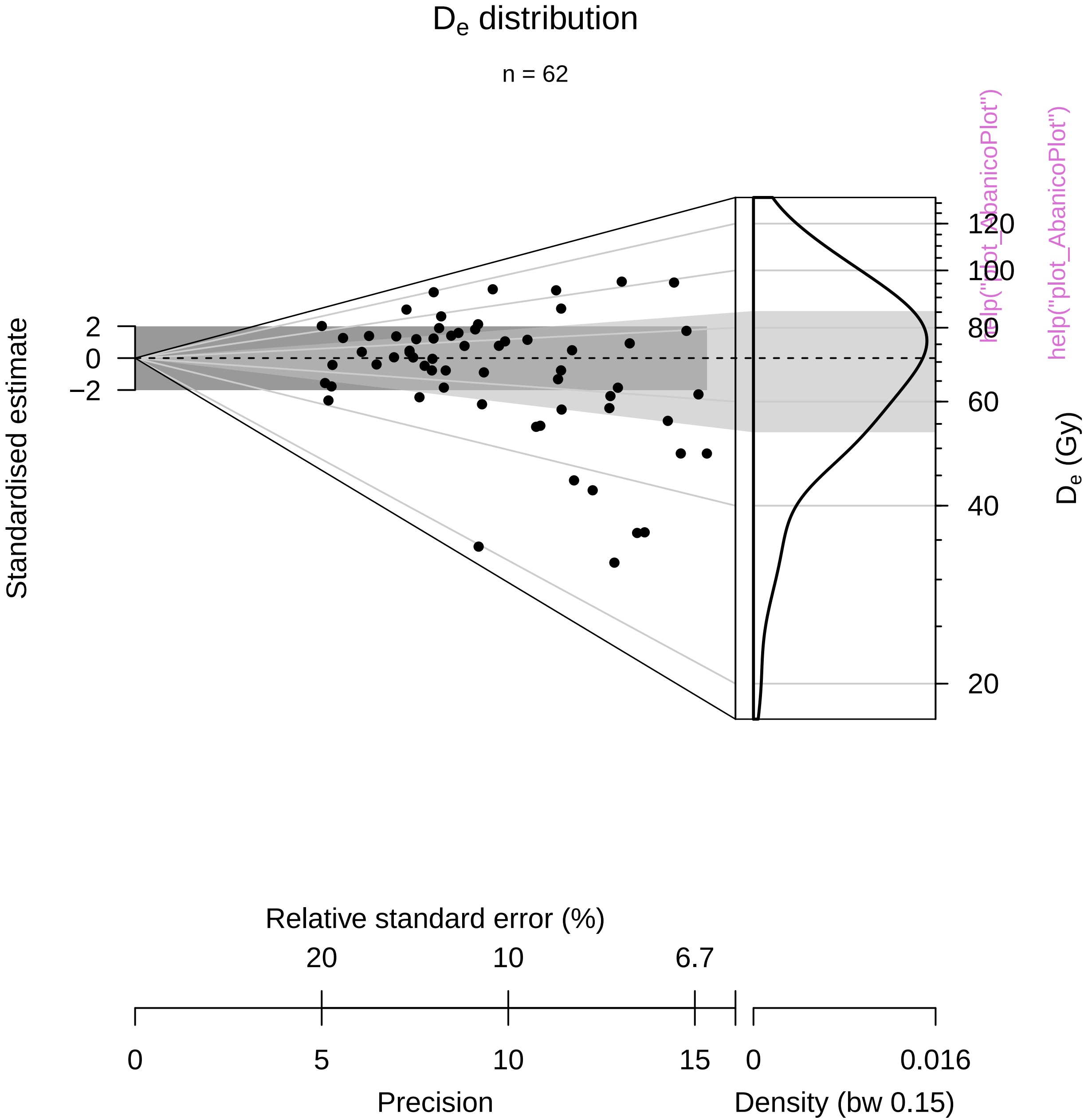
De distribution
n = 62
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Standardised estimate
2
0
−2
120
100
80
60
40
20
De (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)

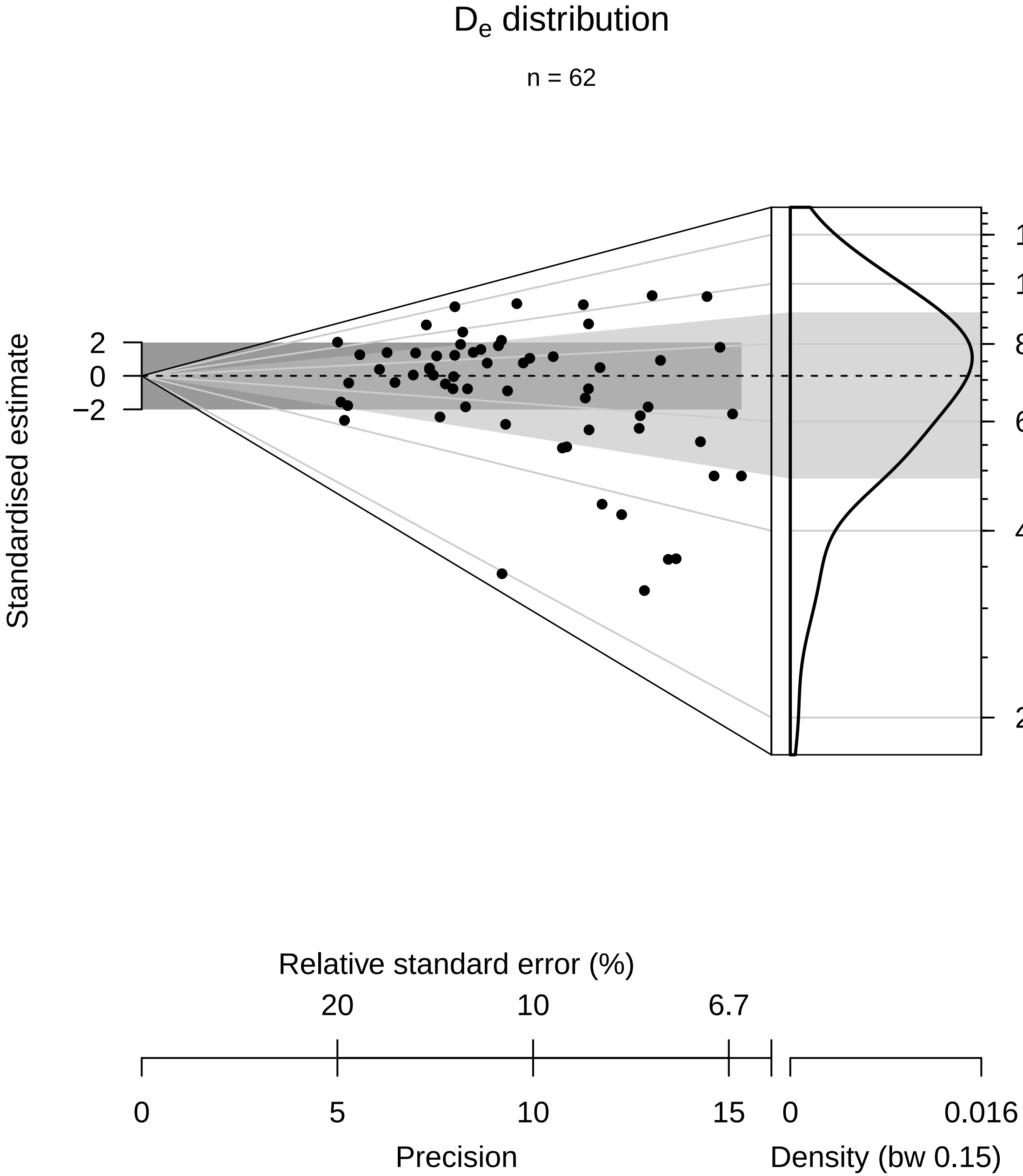


De distribution
n = 62
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Standardised estimate
2
0
−2
120
100
80
60
40
20
De (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)

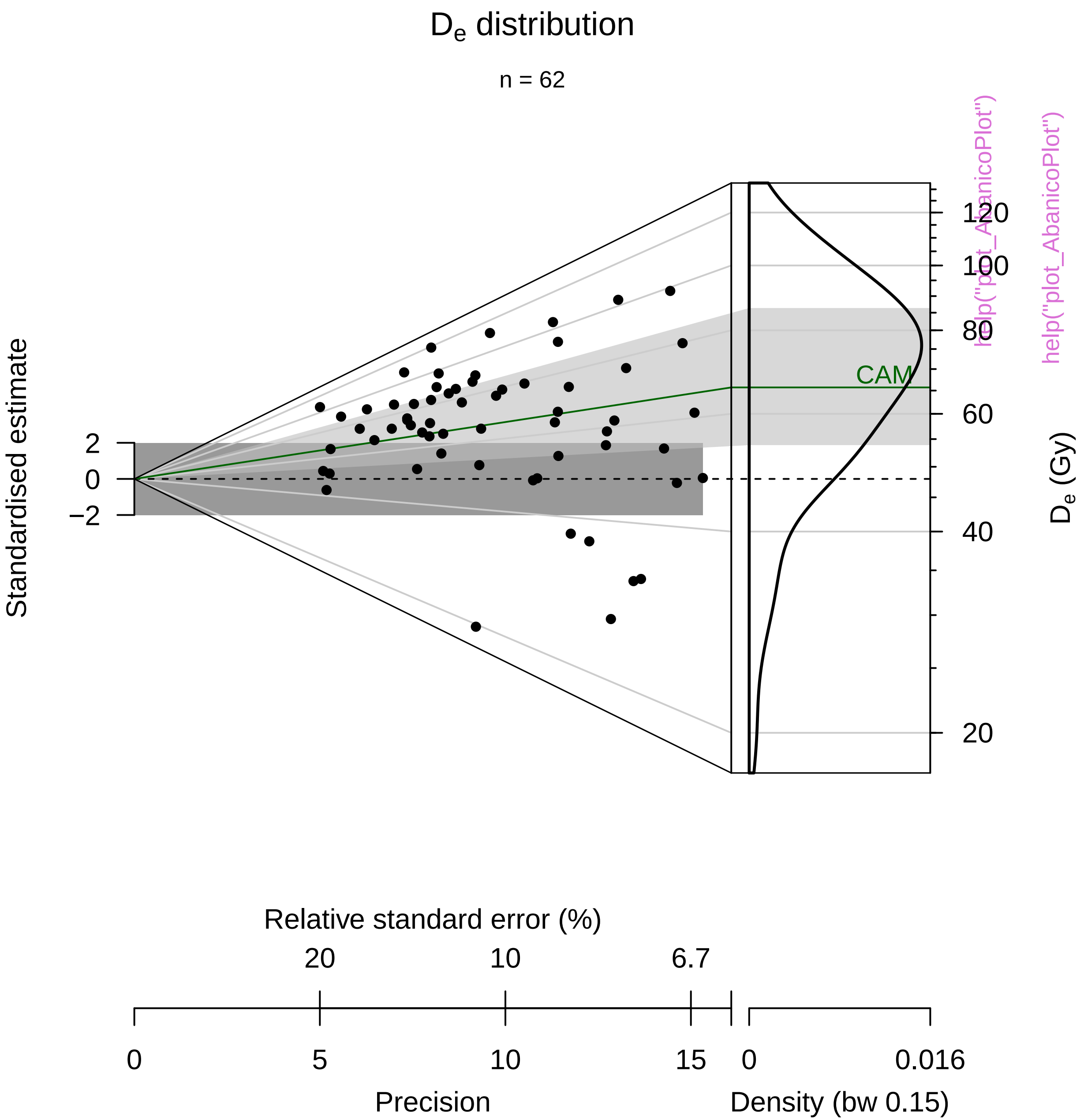


D_e distribution
n = 62
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Standardised estimate
2
0
−2
120
100
80
60
40
20
D_e (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)

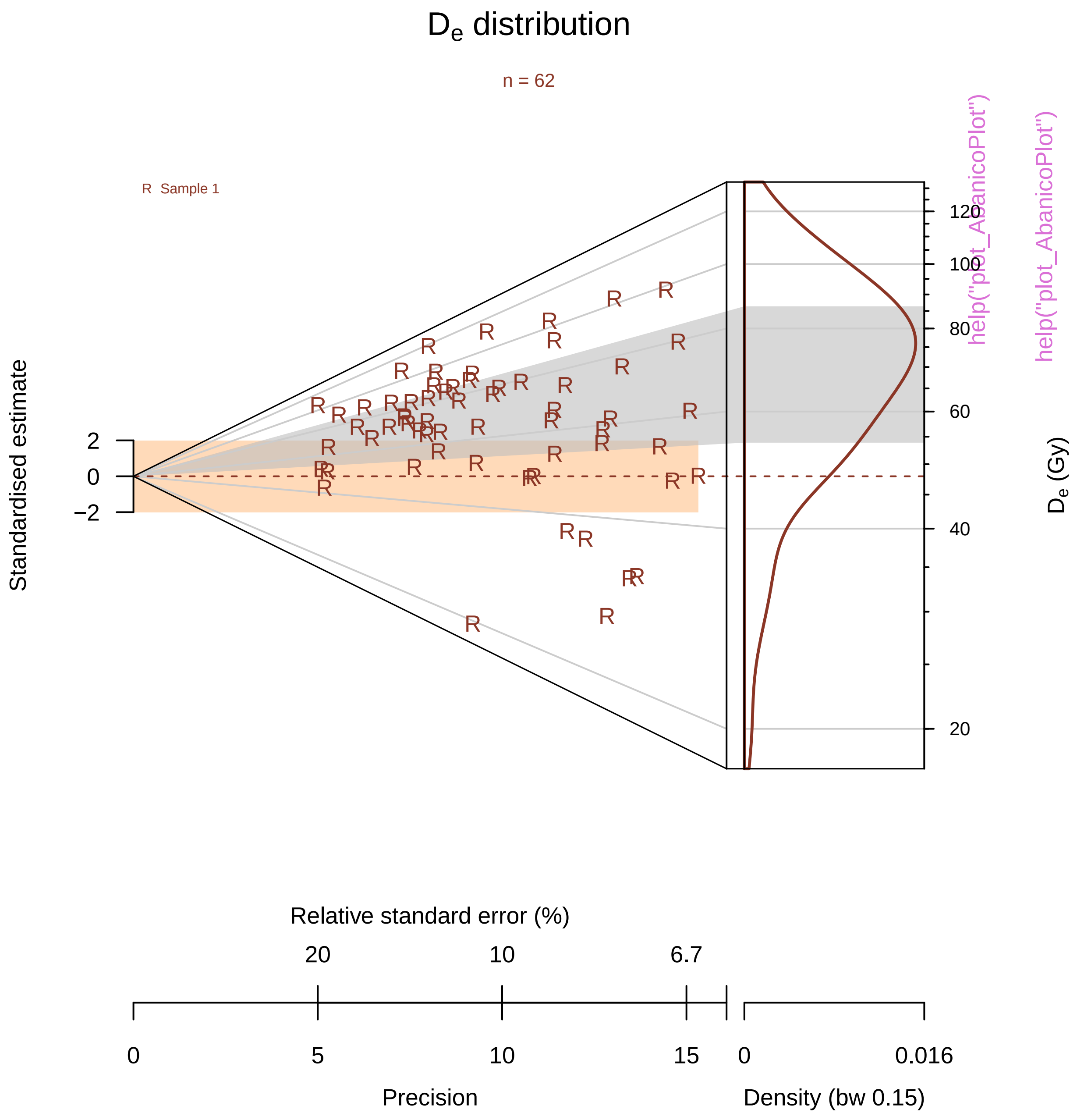

De distribution
n = 62
Standardised estimate
2
0
−2
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
120
100
80
60
40
20
De (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.016
Density (bw 0.15)



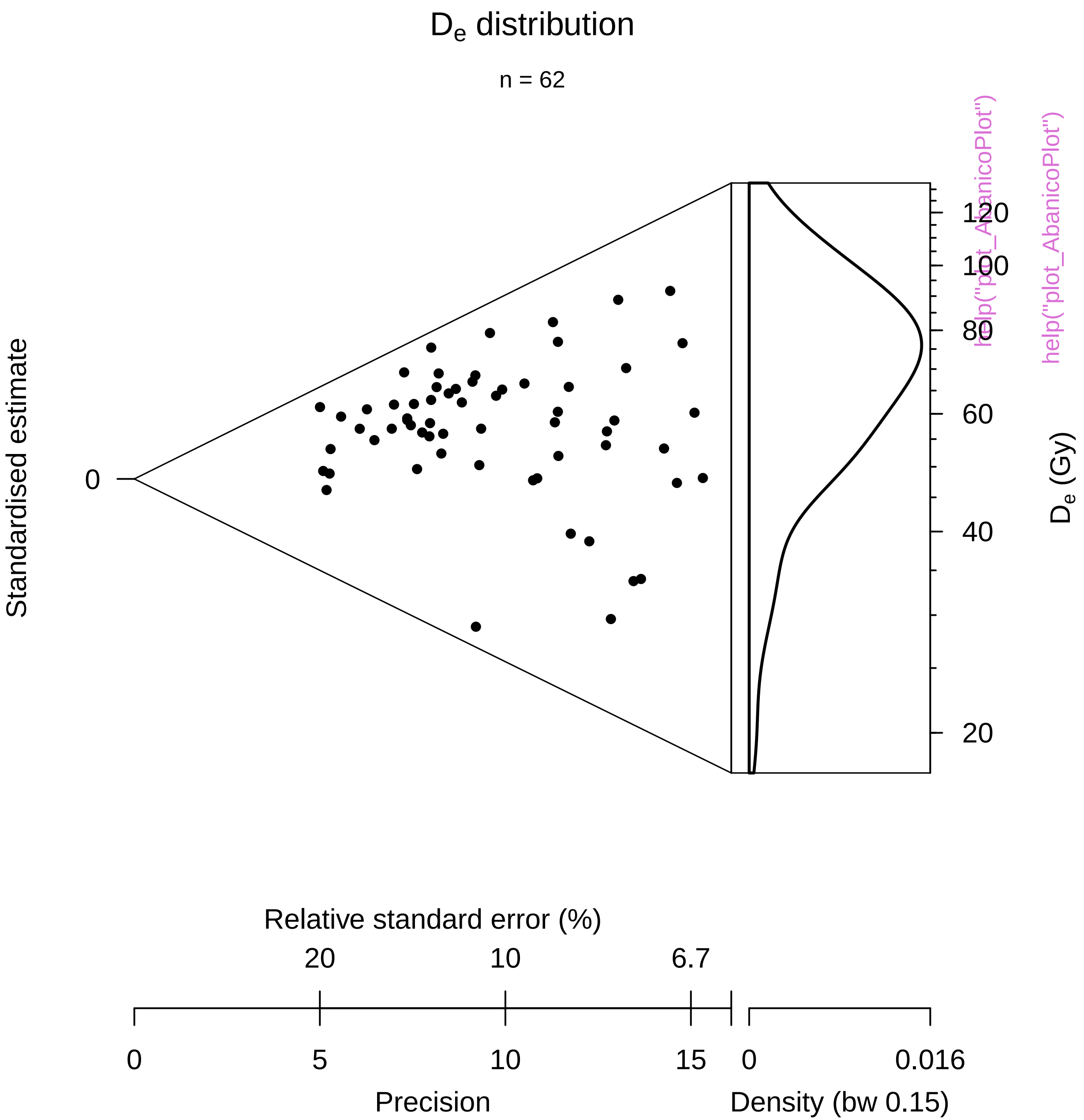
De distribution
n = 62
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Standardised estimate
2
0
−2
120
100
80
60
40
20
De (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)



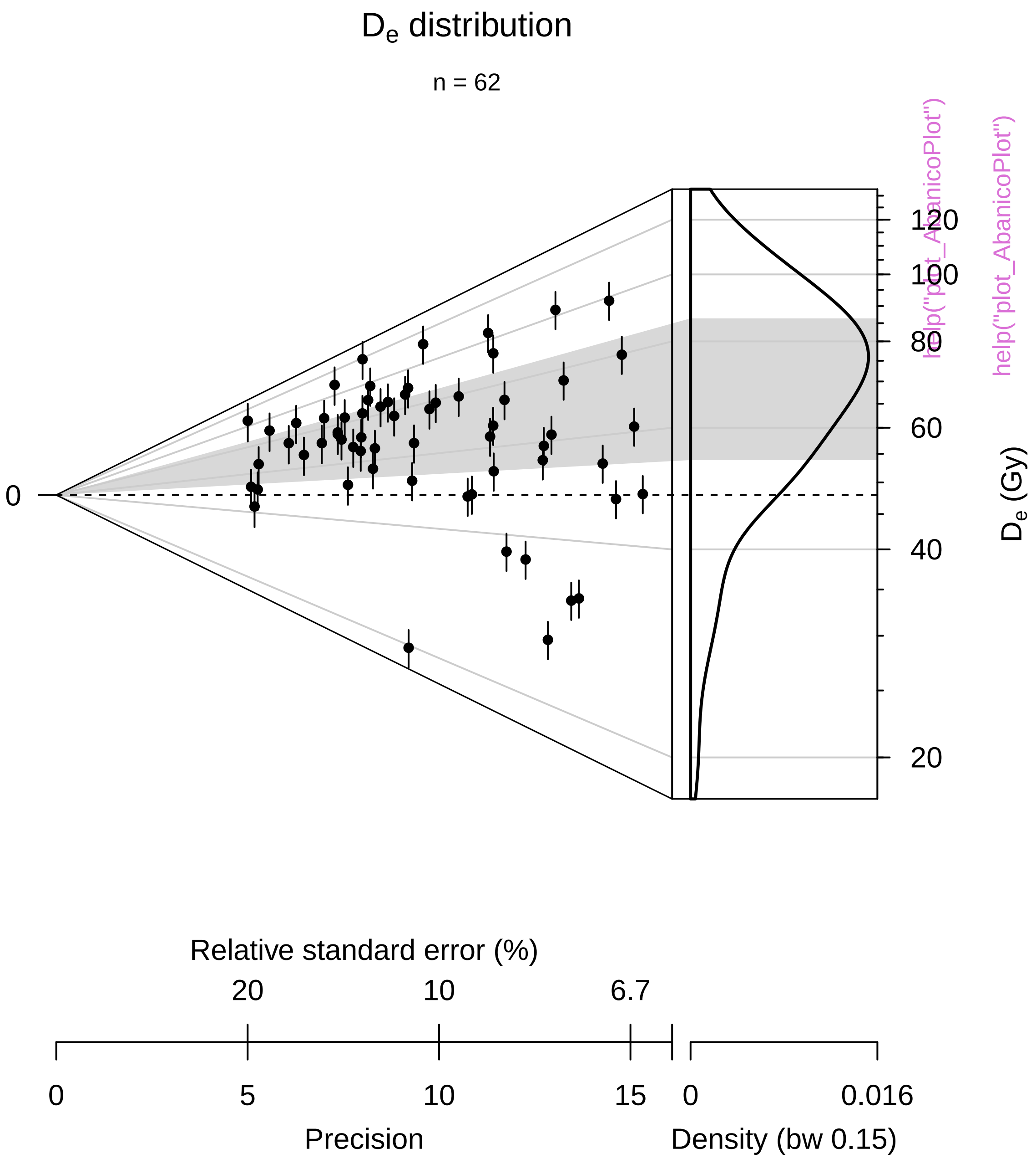
D_e distribution
n = 62
Standardised estimate
2
0
−2
CAM
120
100
80
60
40
20
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.016
Density (bw 0.15)



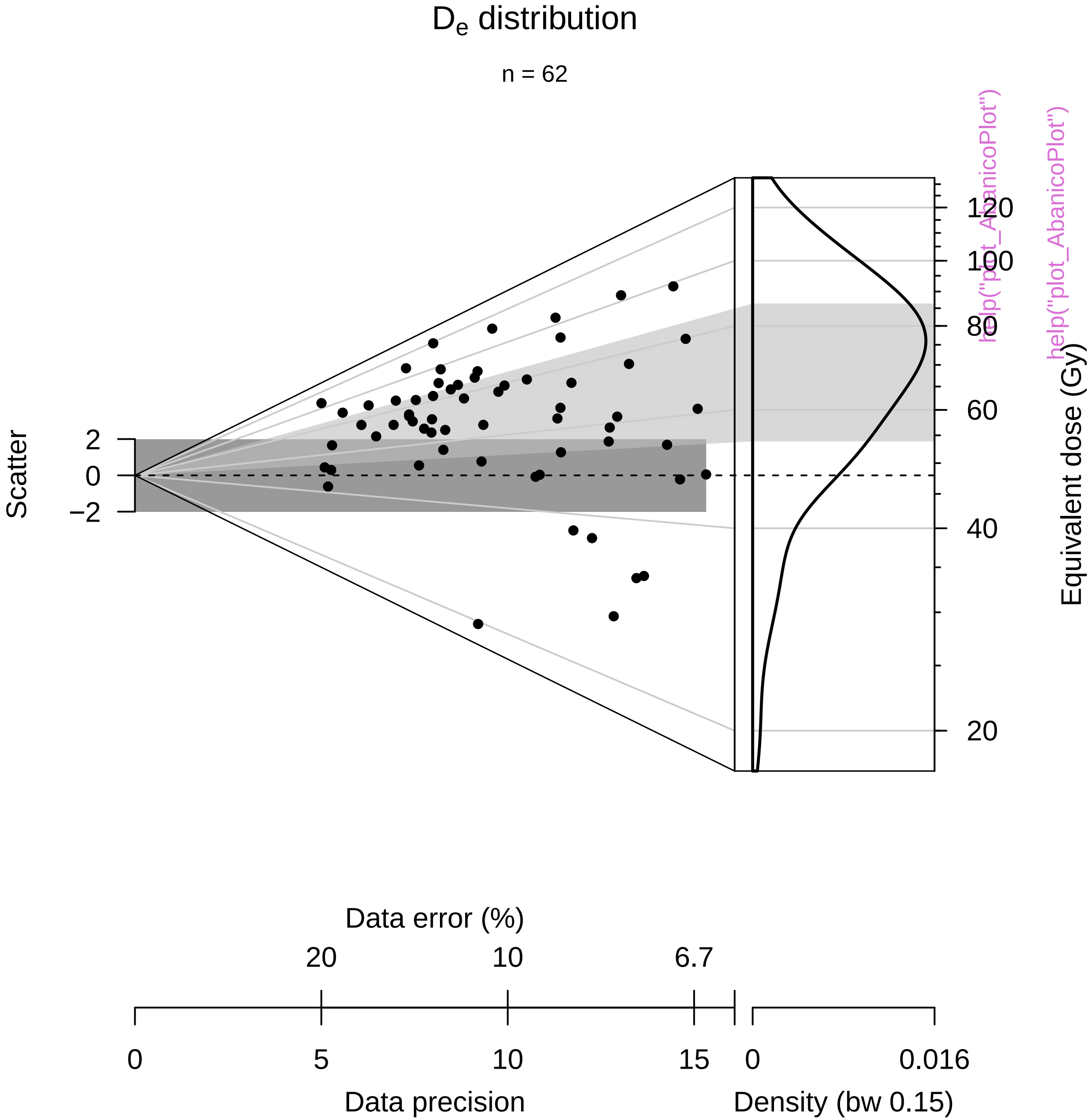
D_e distribution
n = 62
R Sample 1
Standardised estimate
2
0
−2
120
100
80
60
40
20
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.016
Density (bw 0.15)



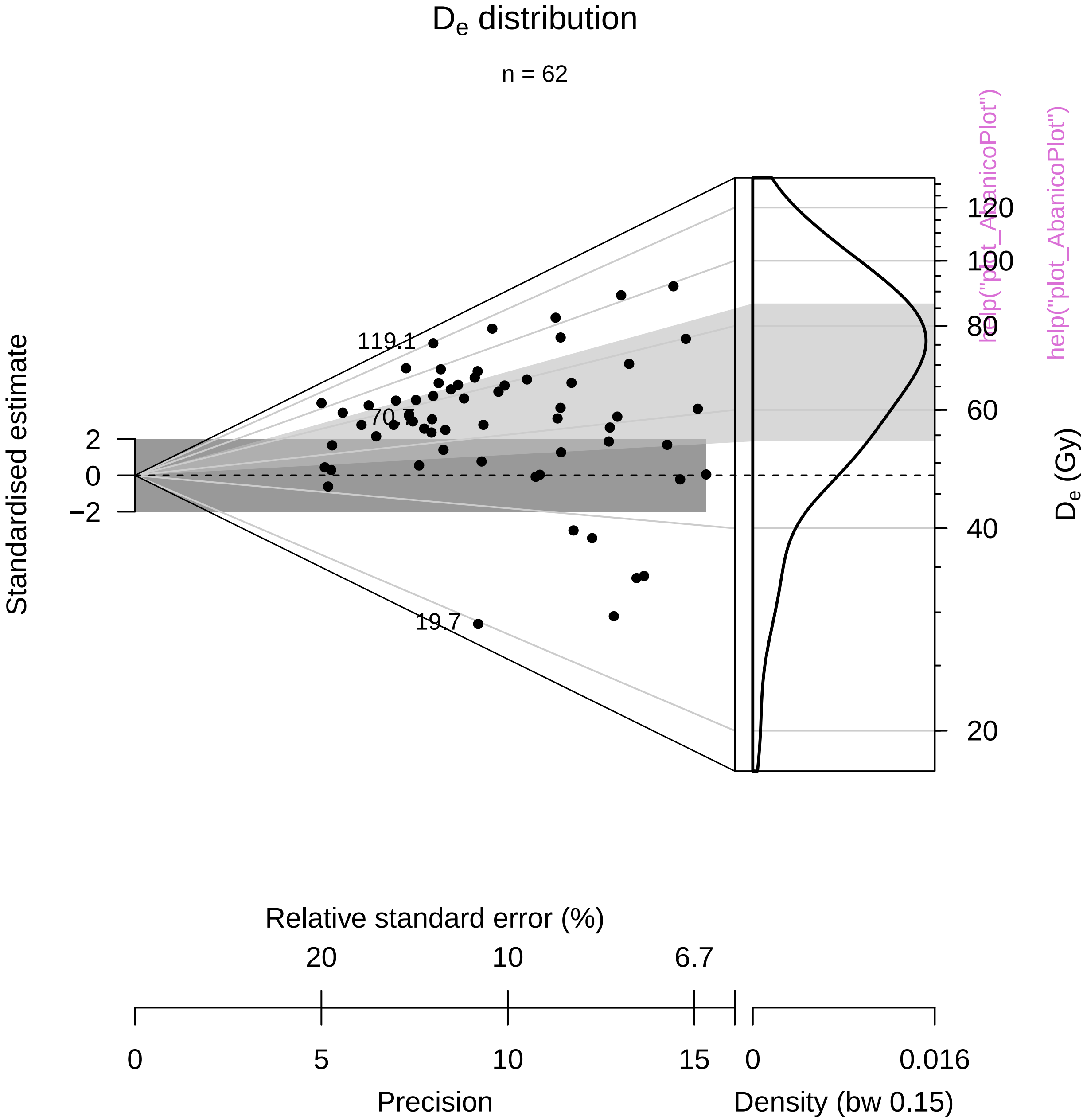
D_e distribution
n = 62
Standardised estimate
0
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
120
100
80
60
40
20
D_e (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.016
Density (bw 0.15)



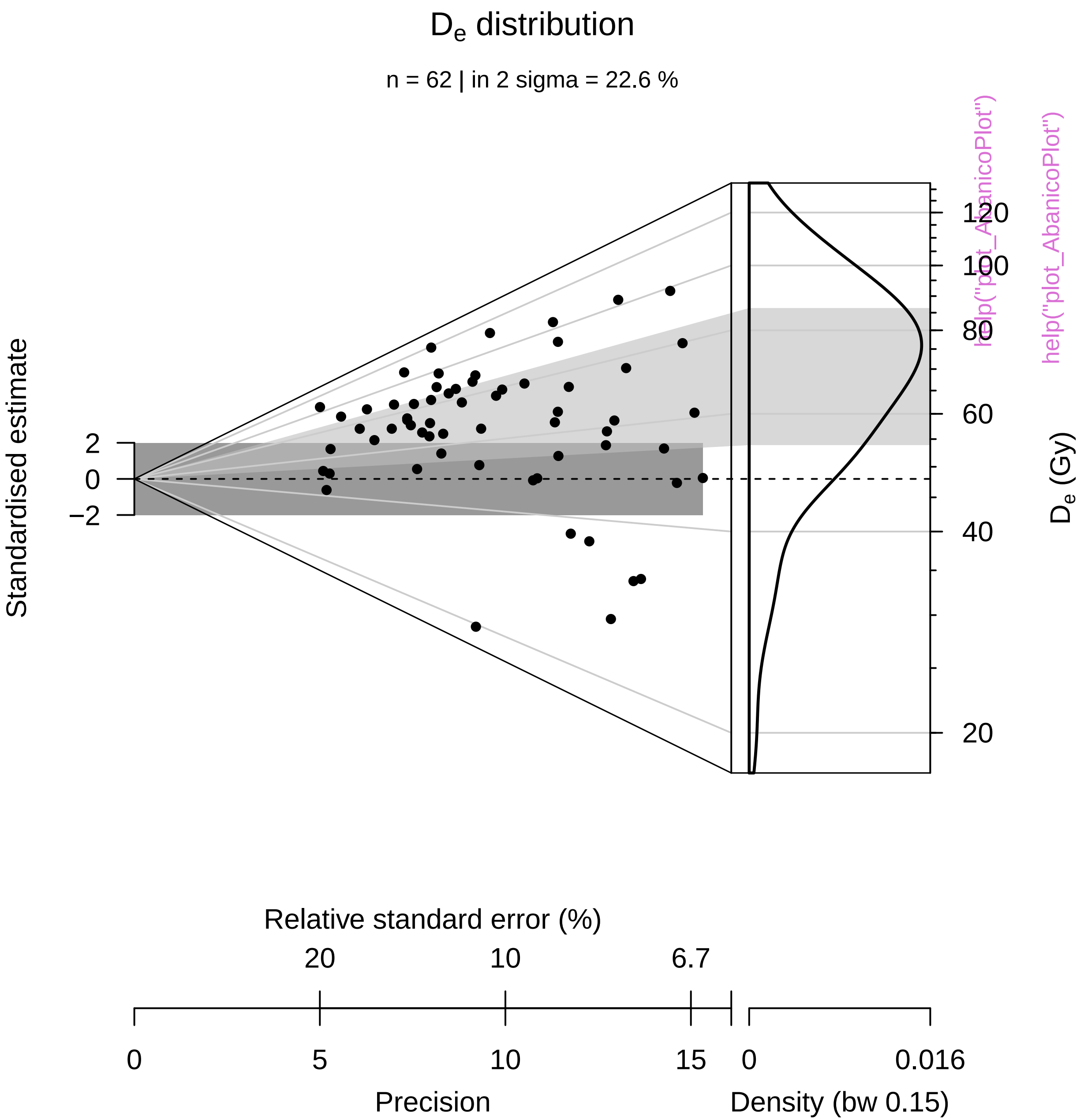
D_e distribution
n = 62
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
0
120
100
80
60
40
20
D_e (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)



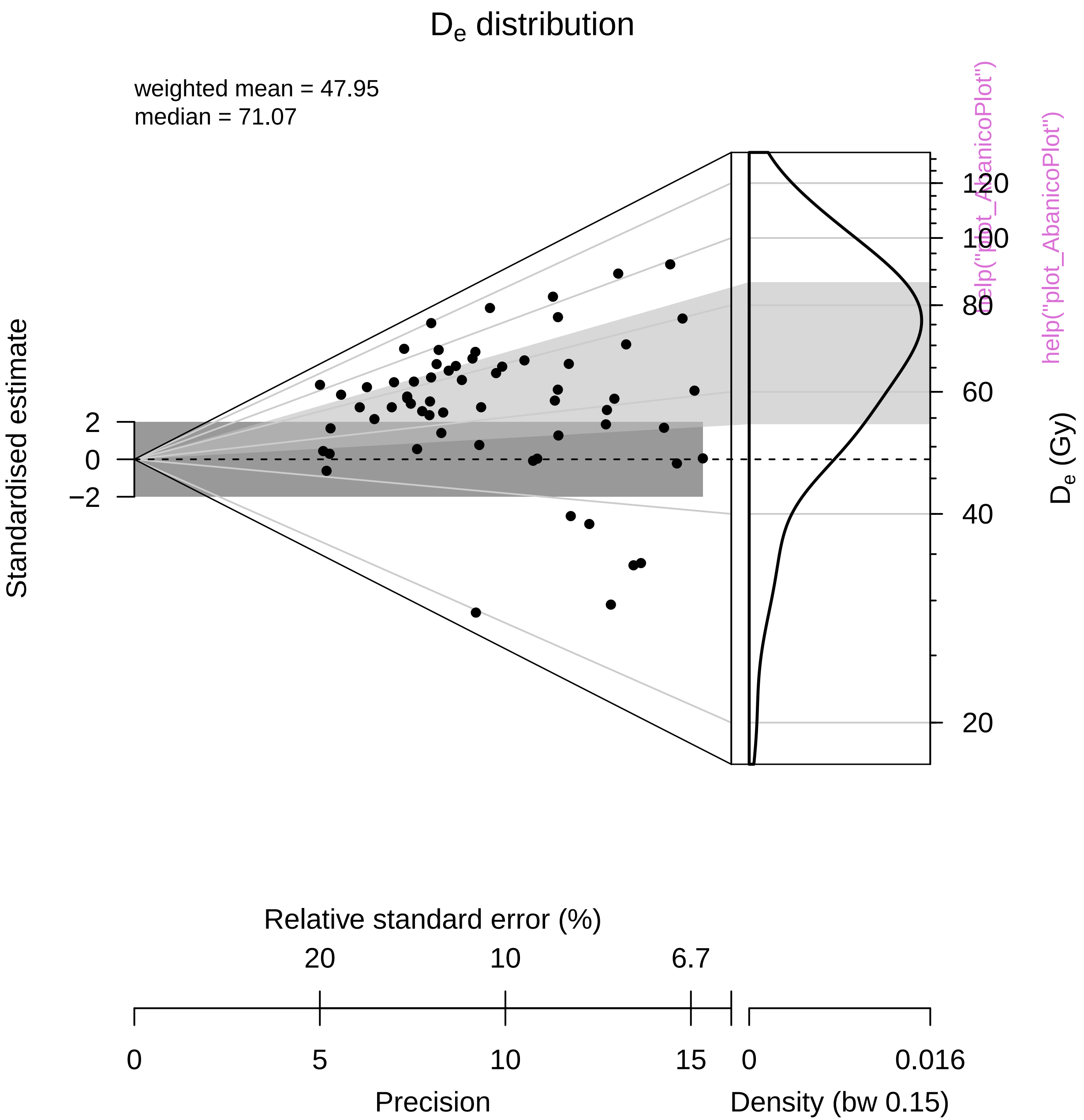
De distribution
n = 62
Scatter
2
0
−2
120
100
80
60
40
20
Equivalent dose (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Data error (%)
20
10
6.7
0
5
10
15
Data precision
0
0.016
Density (bw 0.15)



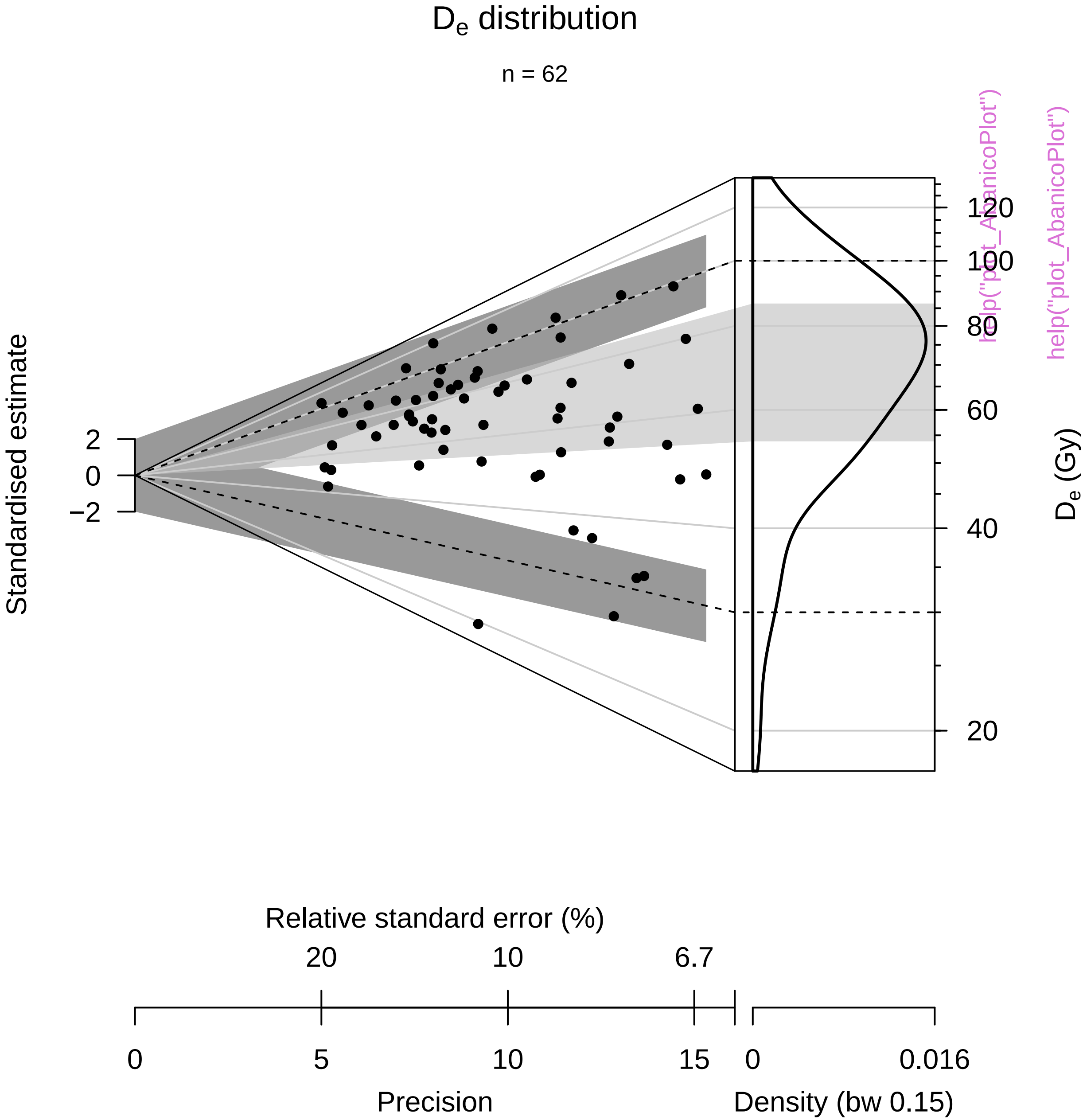
D_e distribution
n = 62
Standardised estimate
2
0
−2
119.1
70.7
19.7
120
100
80
60
40
20
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.016
Density (bw 0.15)



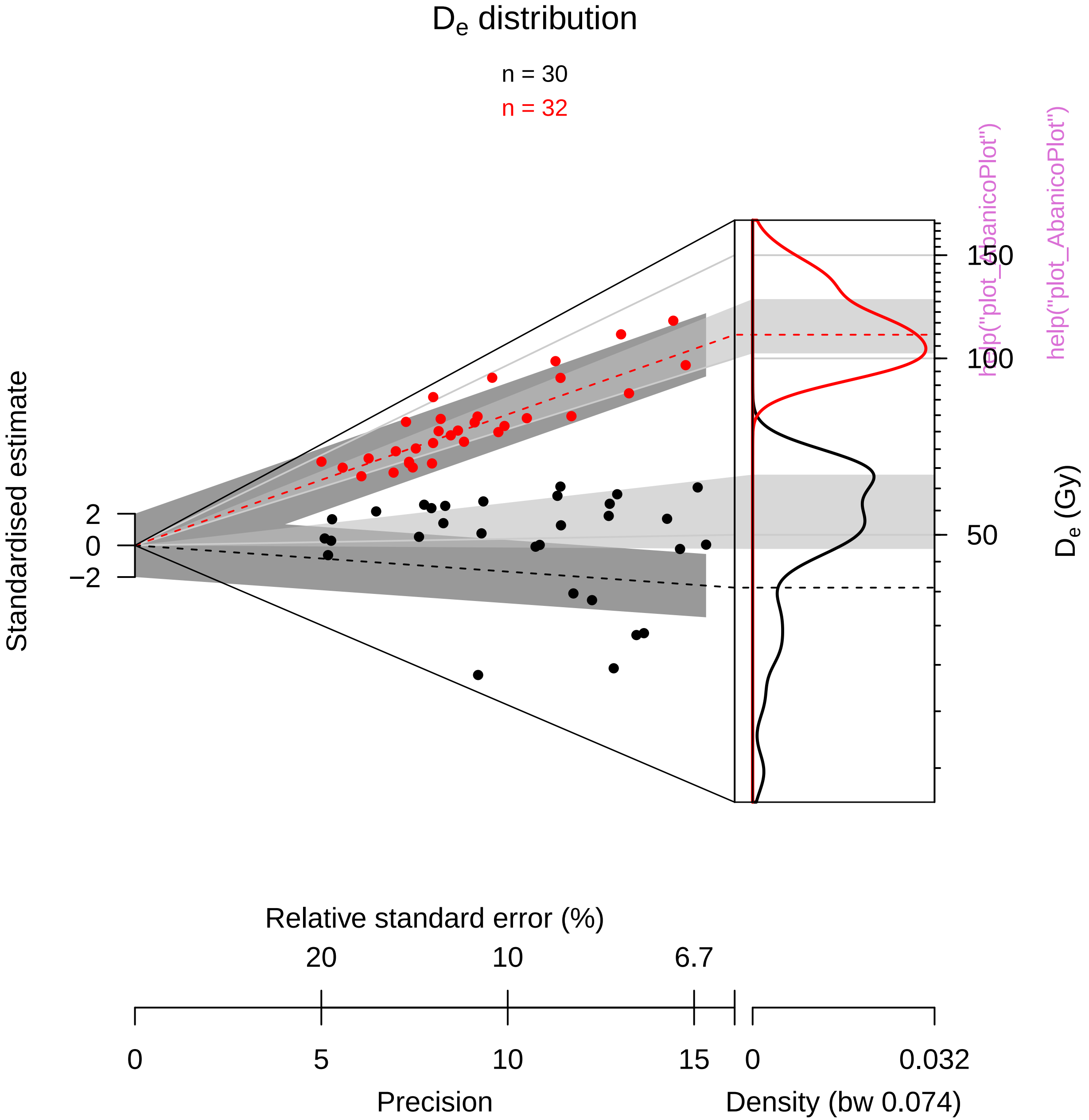
D_e distribution
n = 62 | in 2 sigma = 22.6 %
Standardised estimate
2
0
−2
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
120
100
80
60
40
20
D_e (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)



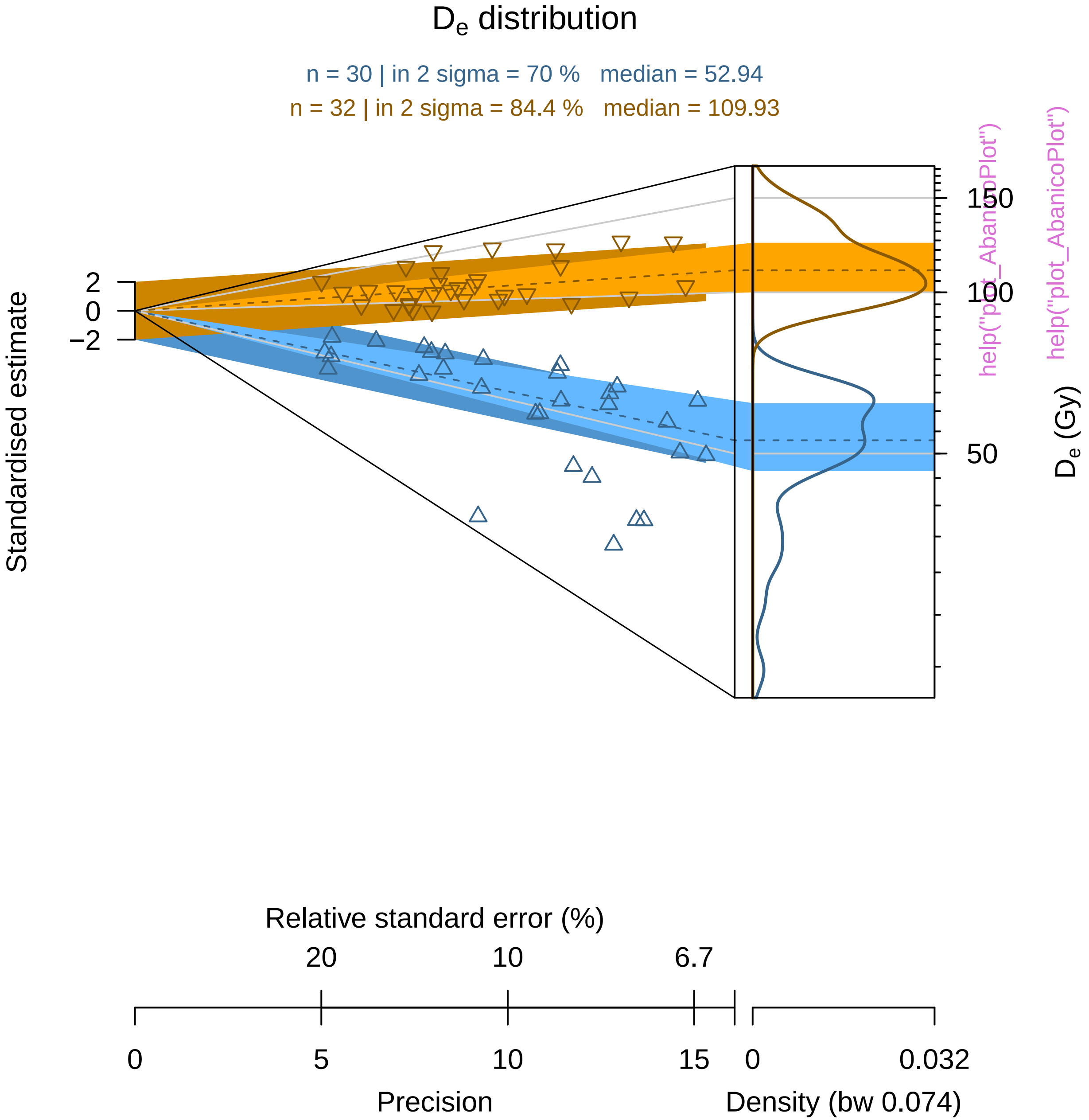
D$_e$ distribution
weighted mean = 47.95
median = 71.07
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Standardised estimate
2
0
−2
120
100
80
60
40
20
D$_e$ (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.016
Density (bw 0.15)



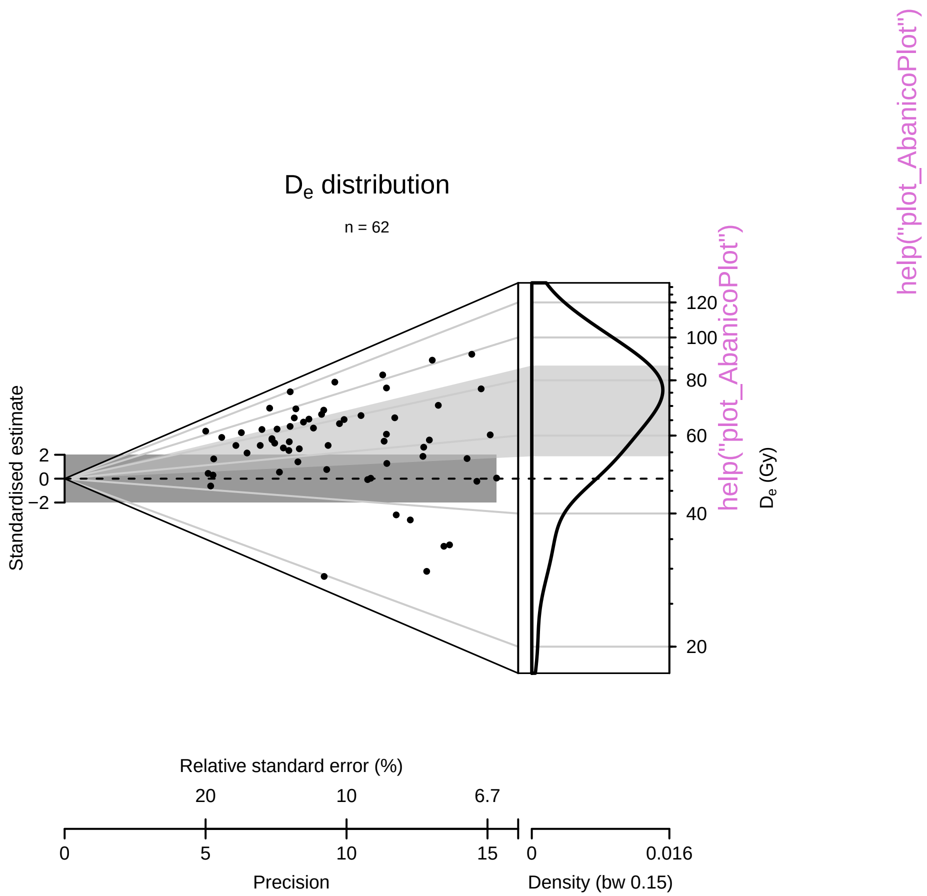
D_e distribution
n = 62
Standardised estimate
2
0
−2
120
100
80
60
40
20
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)



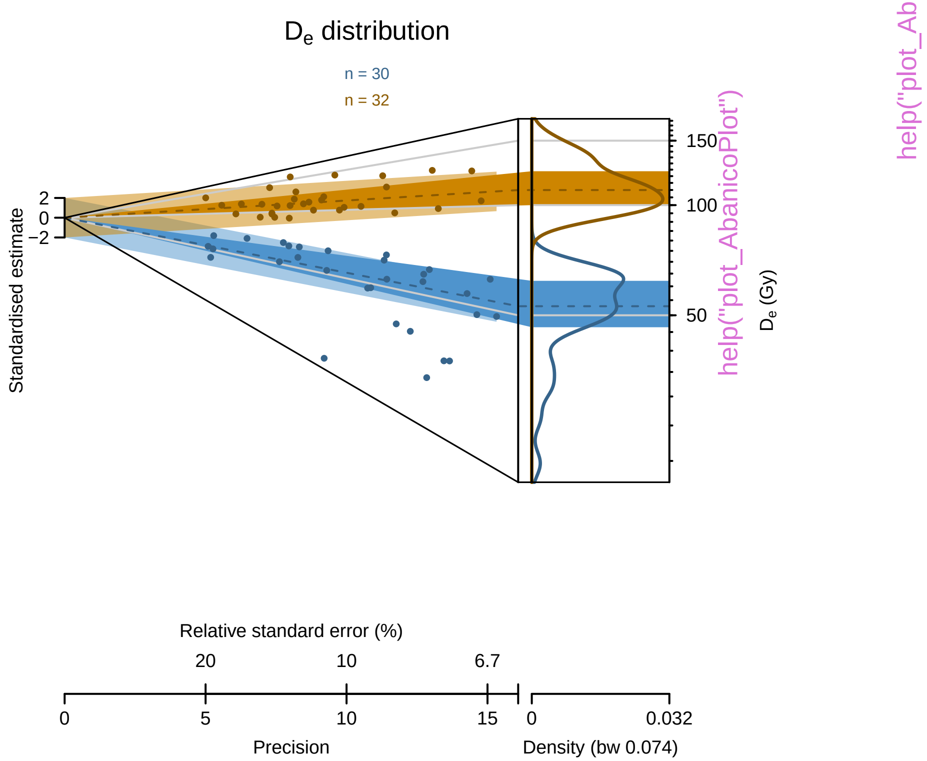
D_e distribution
n = 30
n = 32
Standardised estimate
2
0
−2
150
100
50
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.032
Precision
Density (bw 0.074)



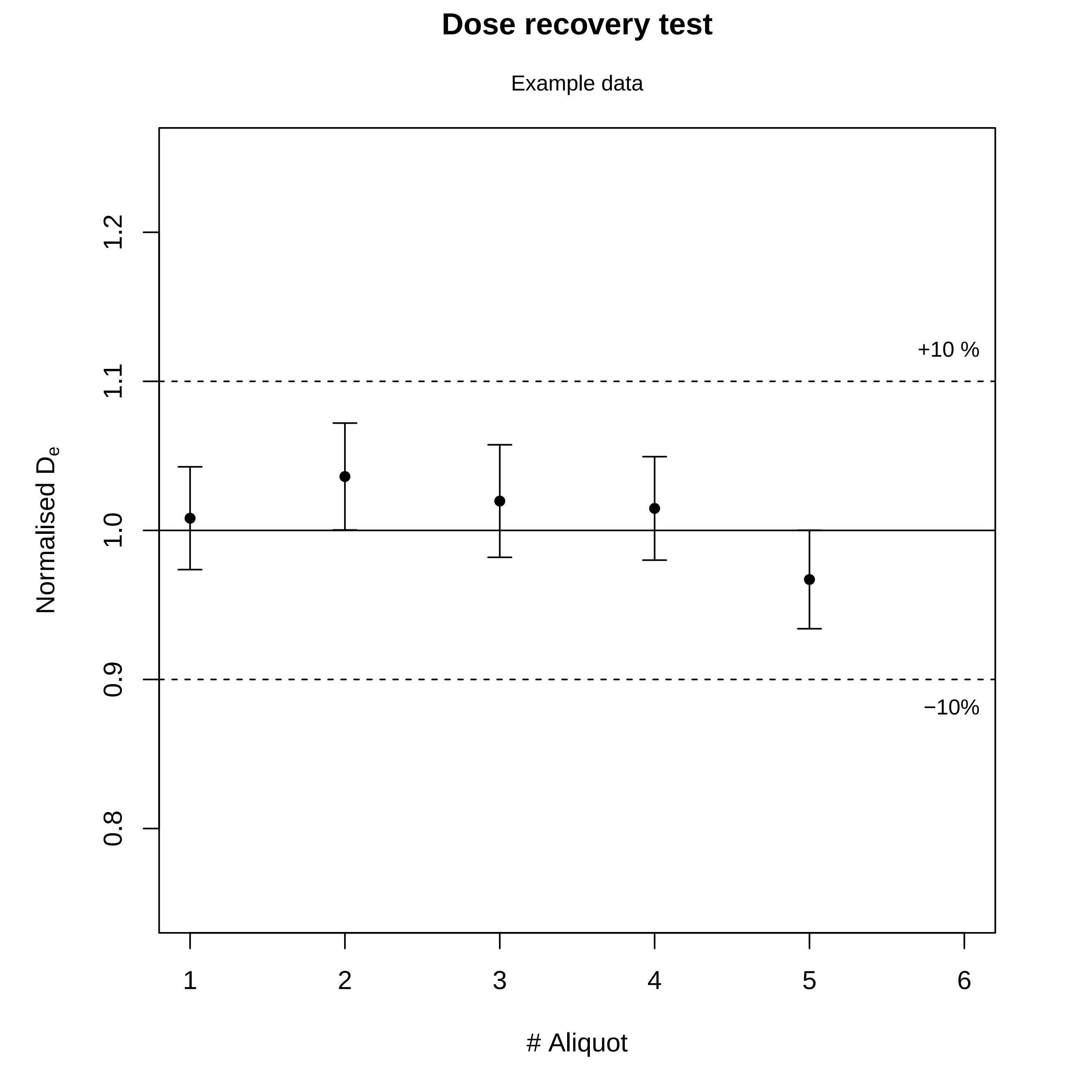
D_e distribution
n = 30 | in 2 sigma = 70 %   median = 52.94
n = 32 | in 2 sigma = 84.4 %   median = 109.93
Standardised estimate
2
0
−2
150
100
50
D_e (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision
0
0.032
Density (bw 0.074)

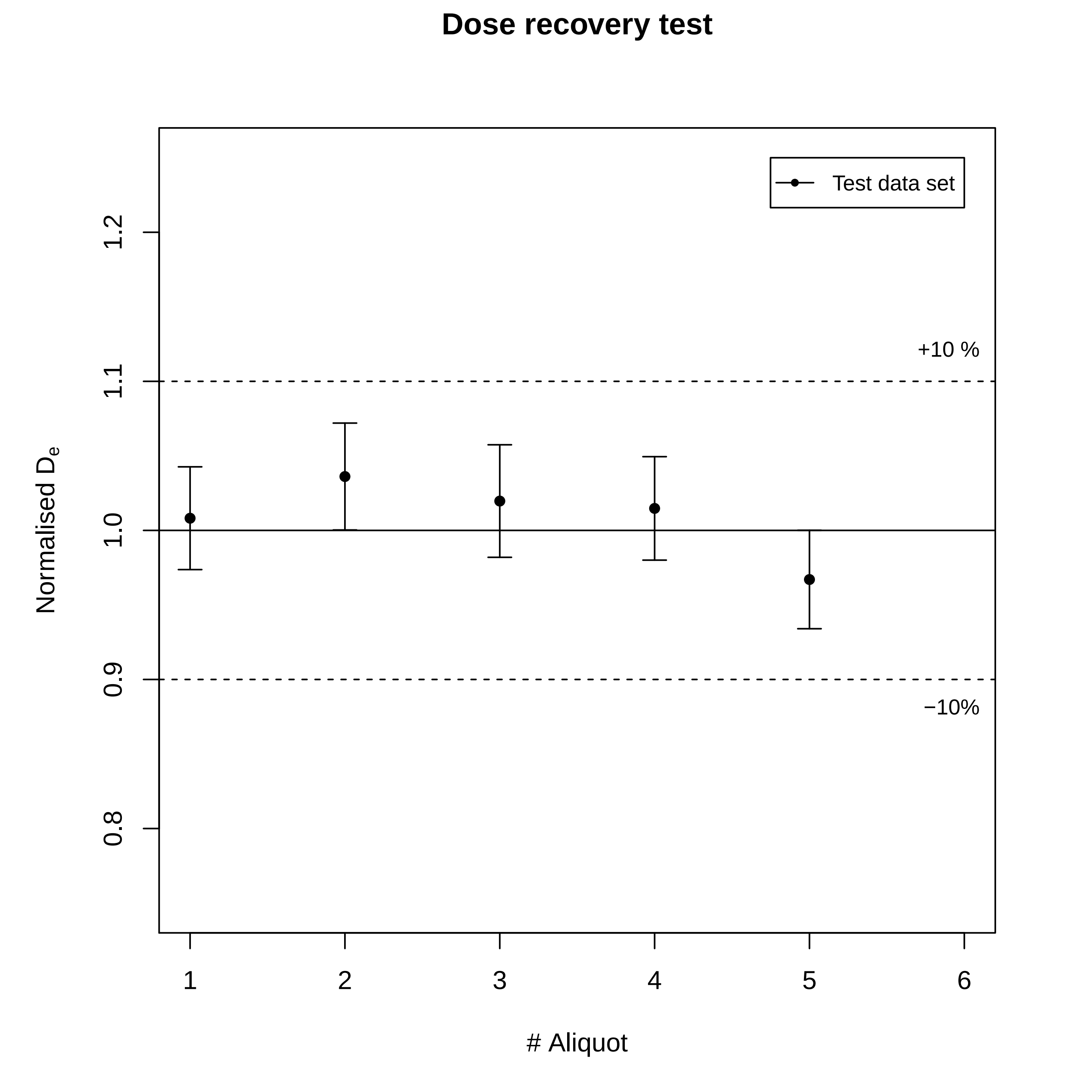


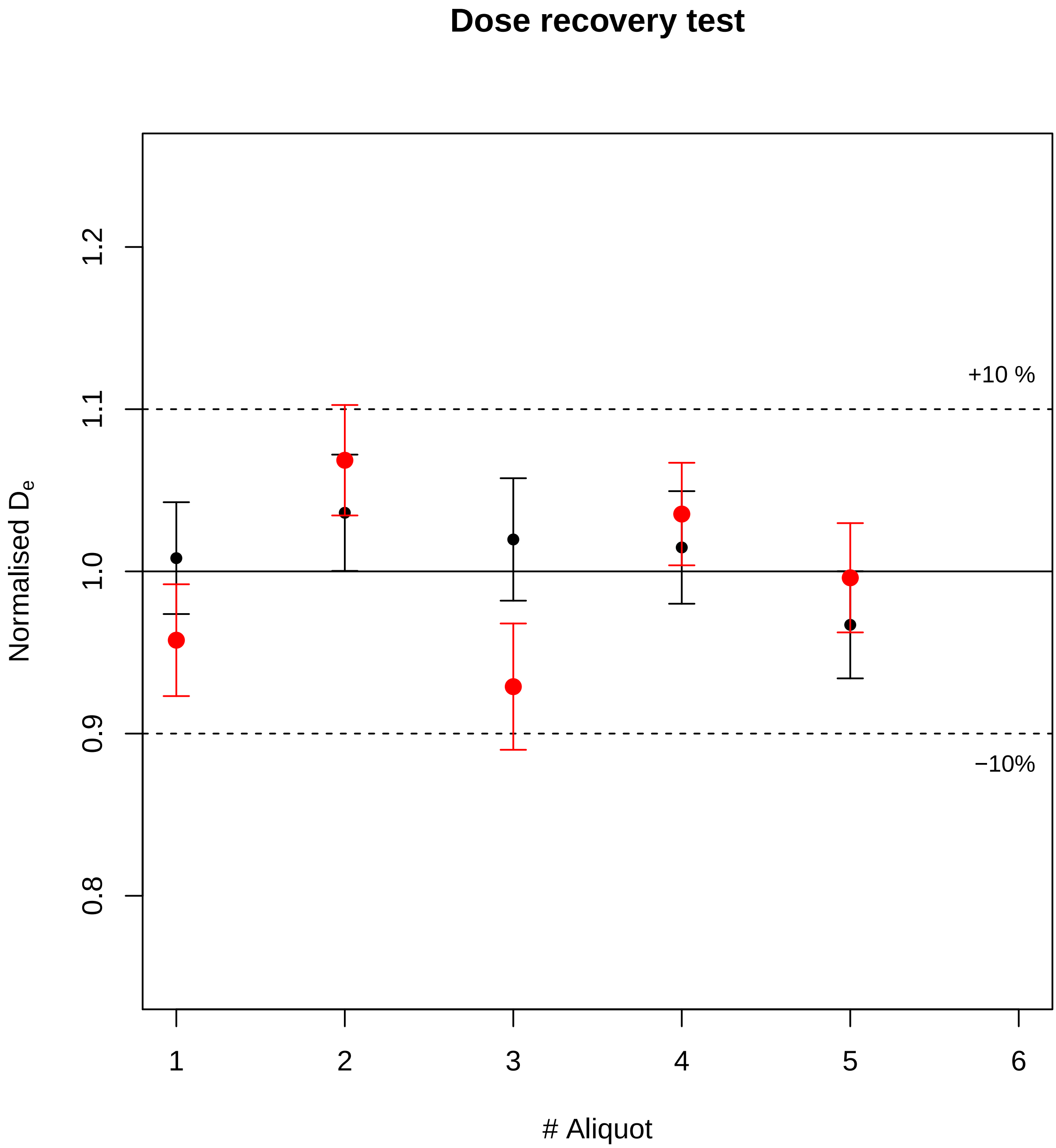
help("plot_AbanicoPlot")
D_e distribution
n = 62
Standardised estimate
2
0
−2
120
100
80
60
40
20
help("plot_AbanicoPlot")
D_e (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.016
Precision
Density (bw 0.15)

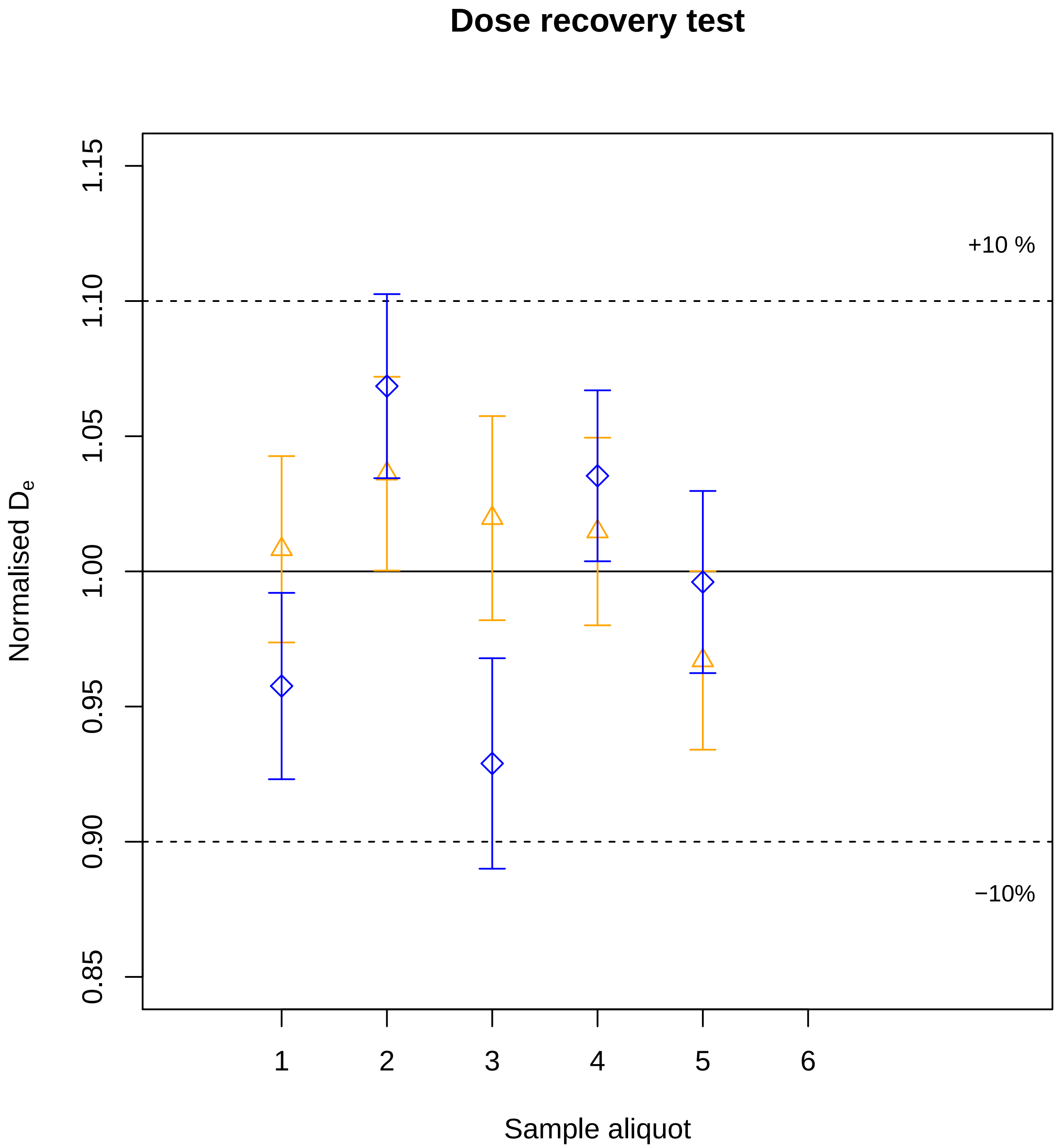


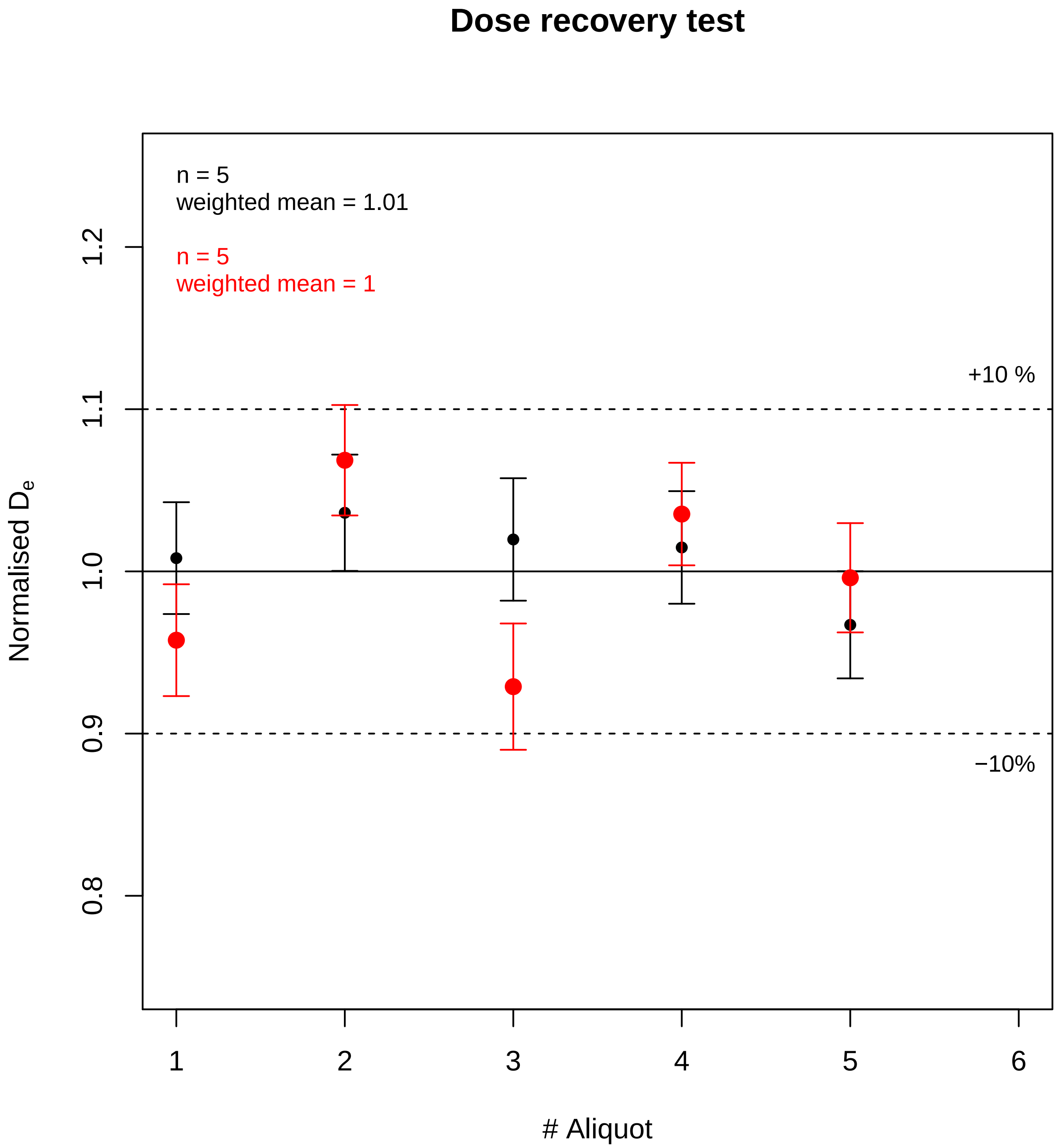
De distribution
n = 30
n = 32
2
0
−2
Standardised estimate
150
100
50
De (Gy)
help("plot_AbanicoPlot")
help("plot_AbanicoPlot")
Relative standard error (%)
20
10
6.7
0
5
10
15
0
0.032
Precision
Density (bw 0.074)


Dose recovery test
Example data
+10 %
−10%
Normalised D_e
Aliquot
1.2
1.1
1.0
0.9
0.8
1
2
3
4
5
6

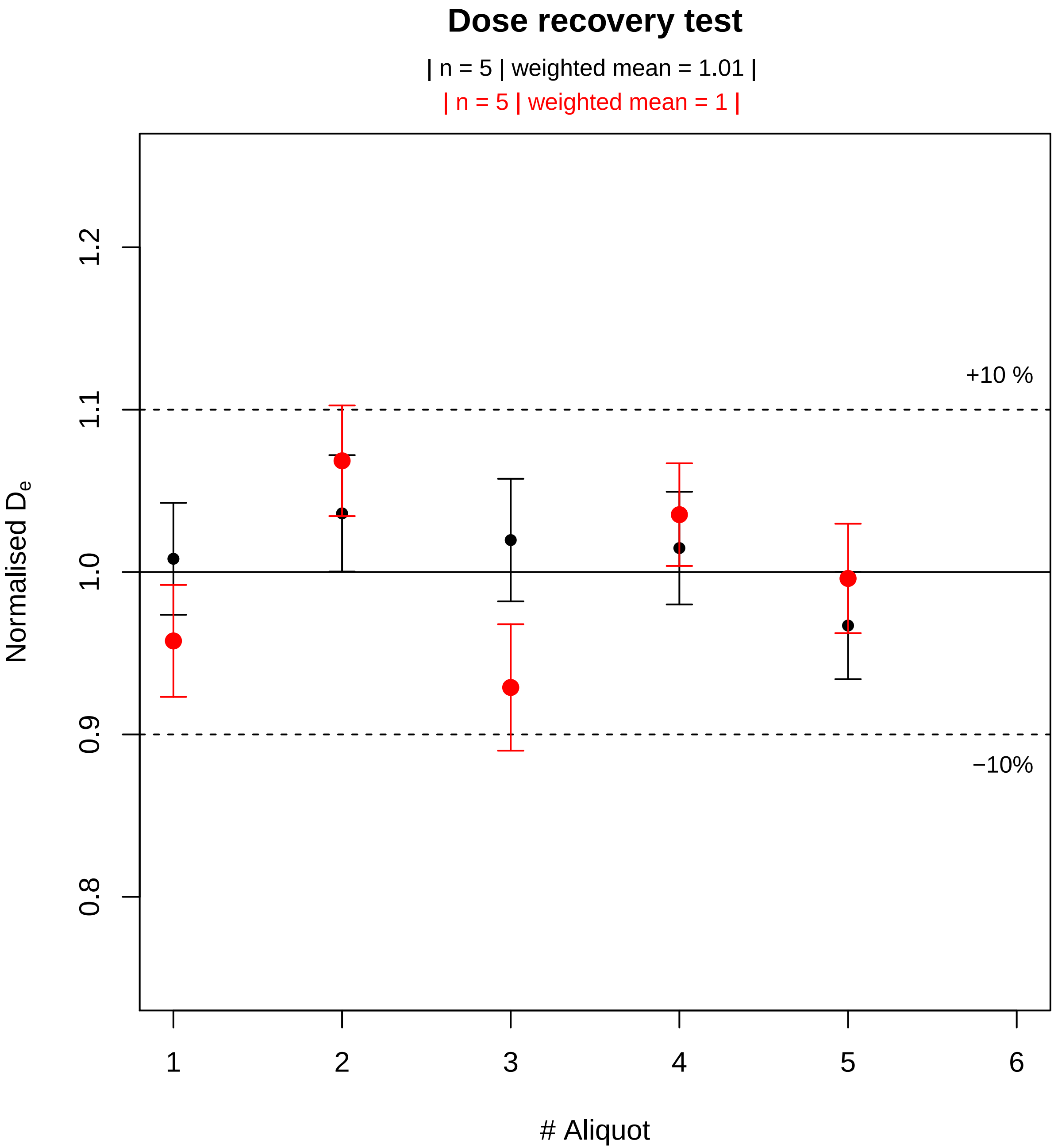

Dose recovery test
Test data set
+10 %
−10%
1.2
1.1
1.0
0.9
0.8
Normalised D_e
1
2
3
4
5
6
Aliquot


Dose recovery test
Normalised D_e
Aliquot
+10 %
−10%
0.8
0.9
1.0
1.1
1.2
1
2
3
4
5
6

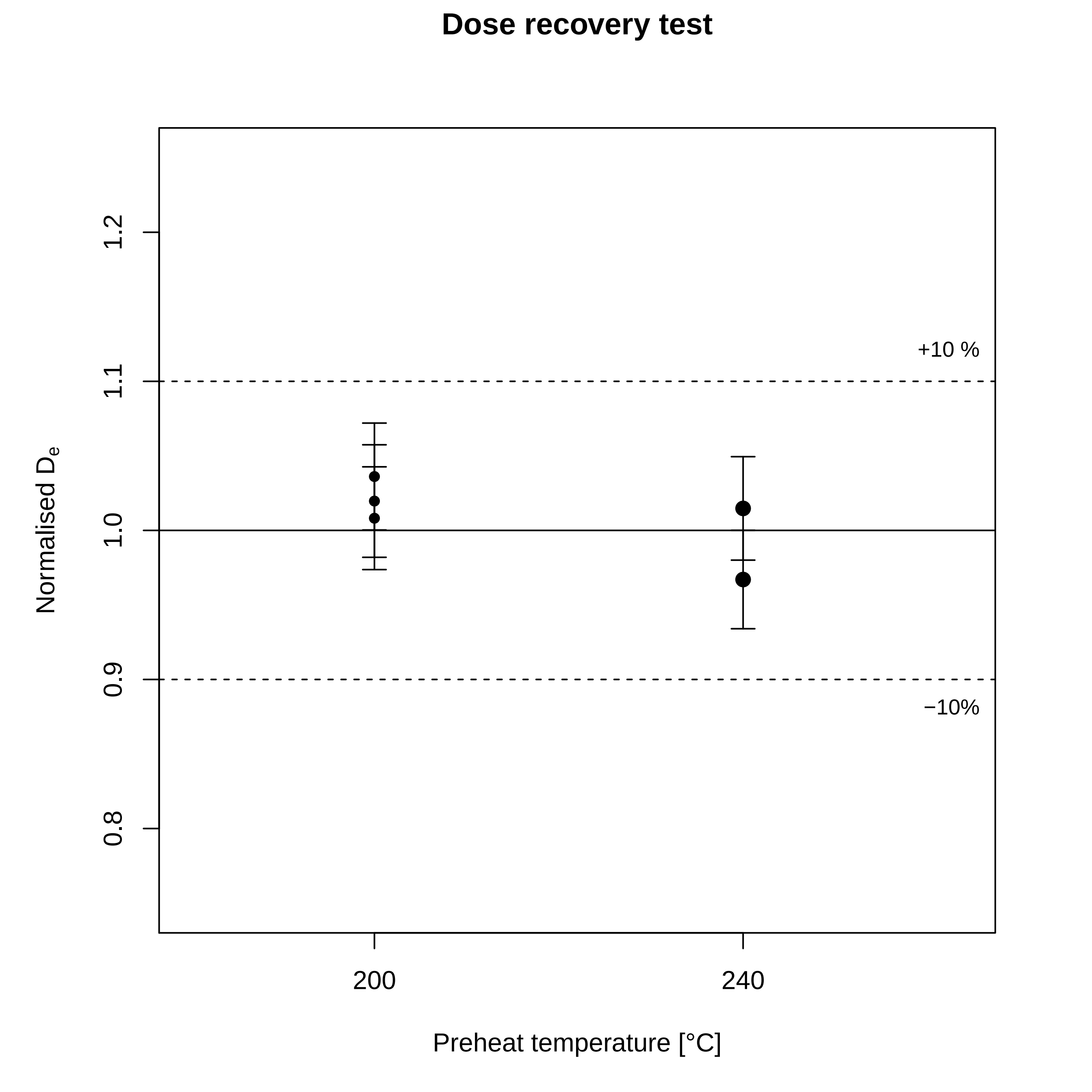

Dose recovery test
+10 %
−10%
Normalised D_e
1.15
1.10
1.05
1.00
0.95
0.90
0.85
1
2
3
4
5
6
Sample aliquot

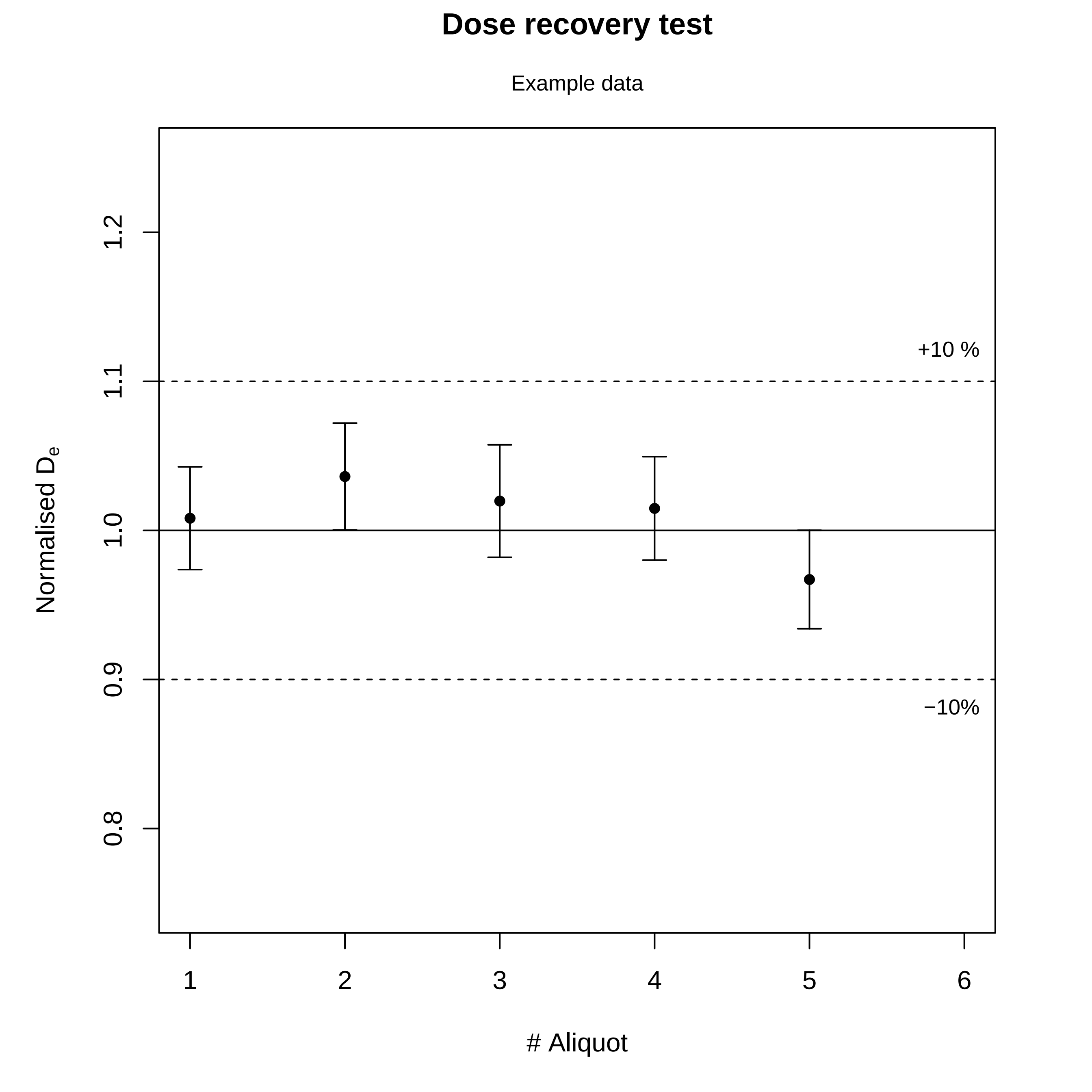


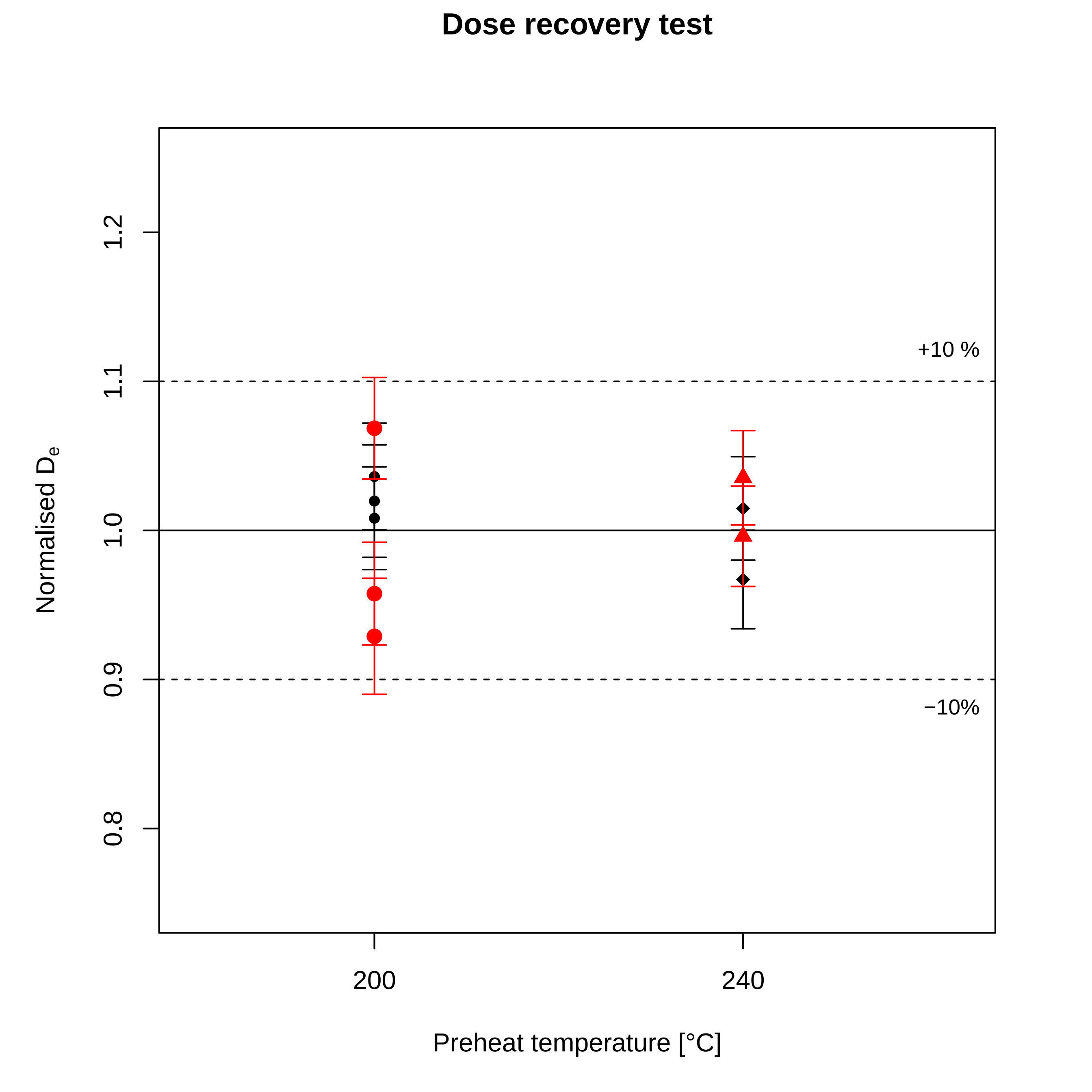
Dose recovery test
n = 5
weighted mean = 1.01
n = 5
weighted mean = 1
+10 %
−10%
1.2
1.1
1.0
0.9
0.8
Normalised D_e
1
2
3
4
5
6
Aliquot



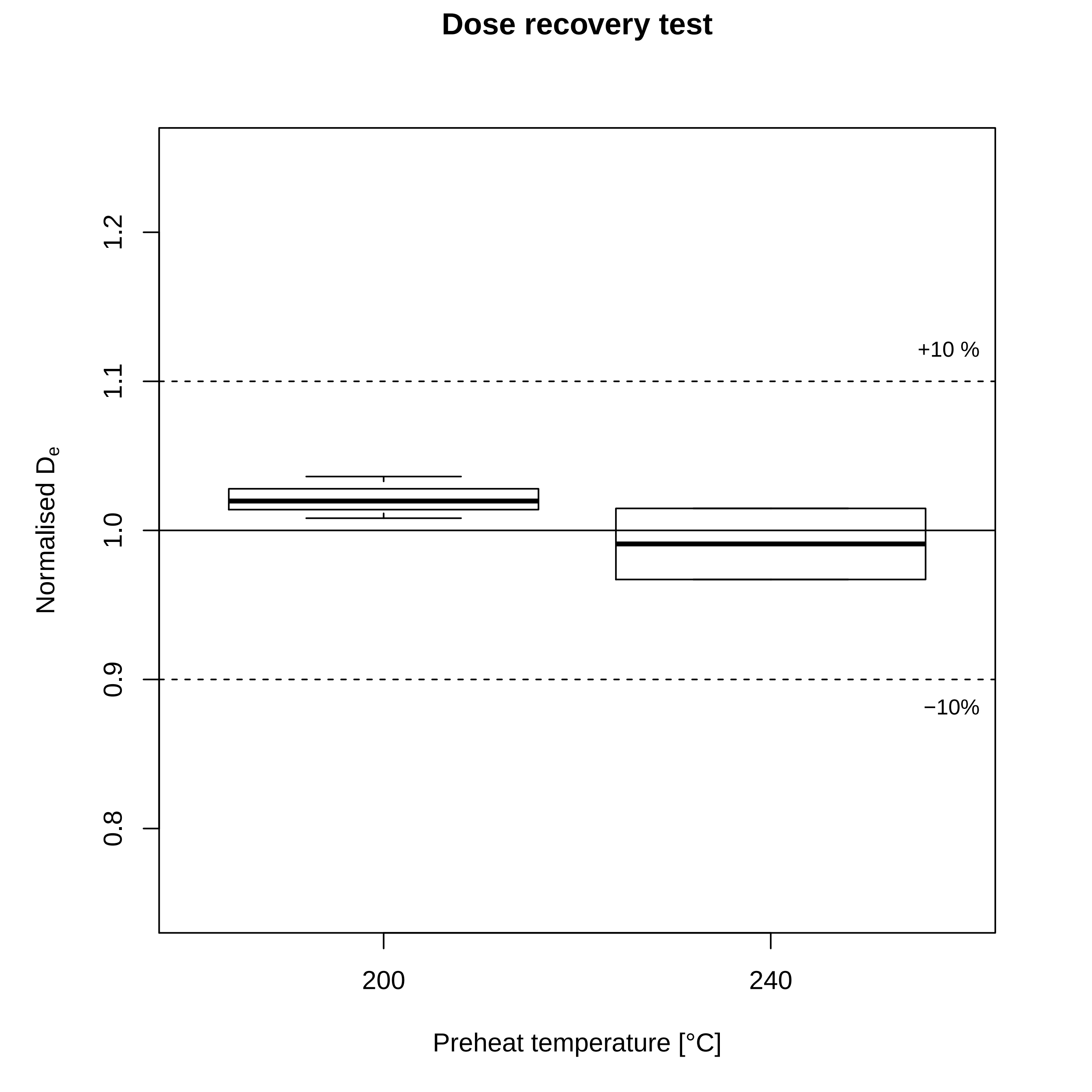
Dose recovery test
| n = 5 | weighted mean = 1.01 |
| n = 5 | weighted mean = 1 |
Normalised D_e
1.2
1.1
1.0
0.9
0.8
+10 %
−10%
1
2
3
4
5
6
Aliquot


Dose recovery test
+10 %
−10%
1.2
1.1
1.0
0.9
0.8
Normalised D_e
200
240
Preheat temperature [°C]

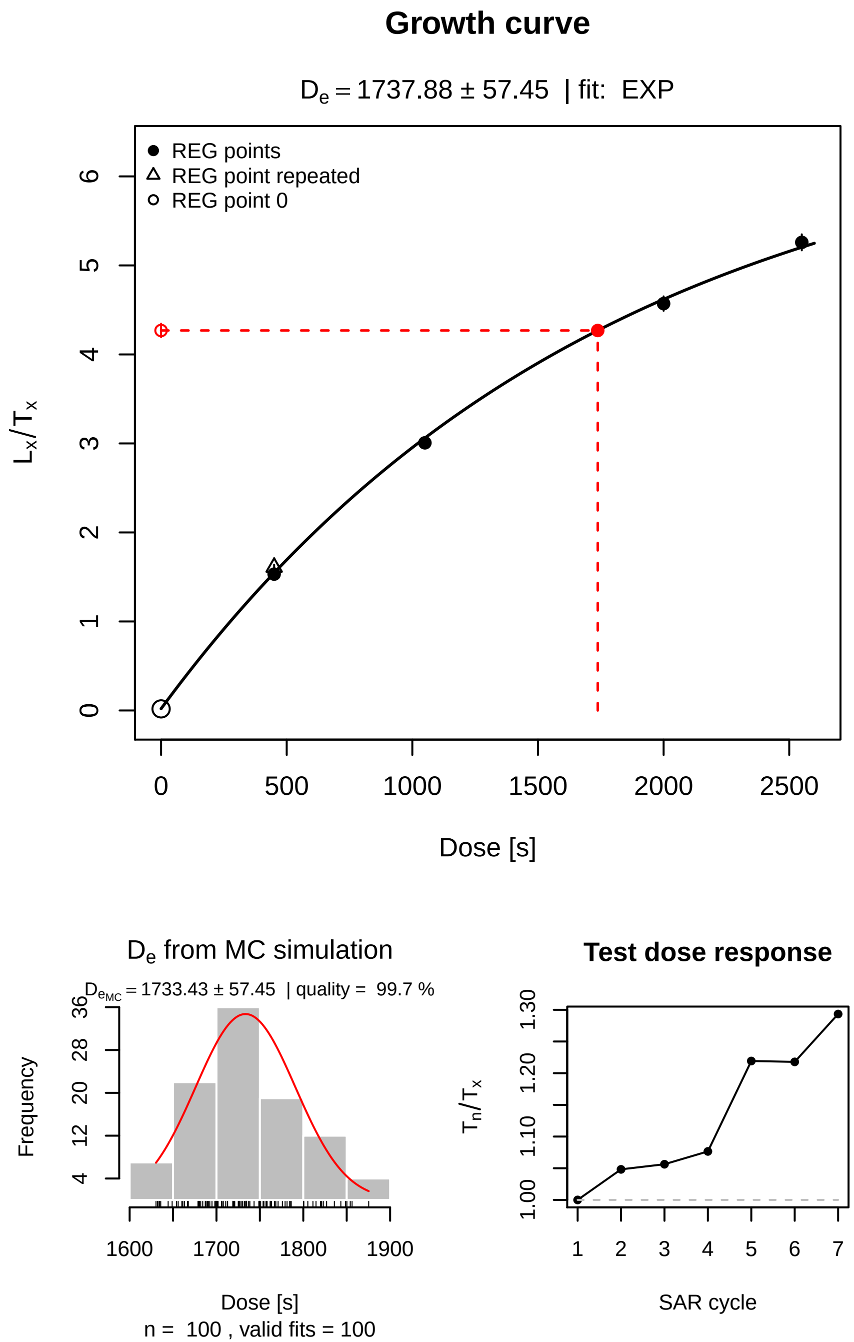

Dose recovery test
Example data
+10 %
−10%
Normalised De
1.2
1.1
1.0
0.9
0.8
1
2
3
4
5
6
Aliquot



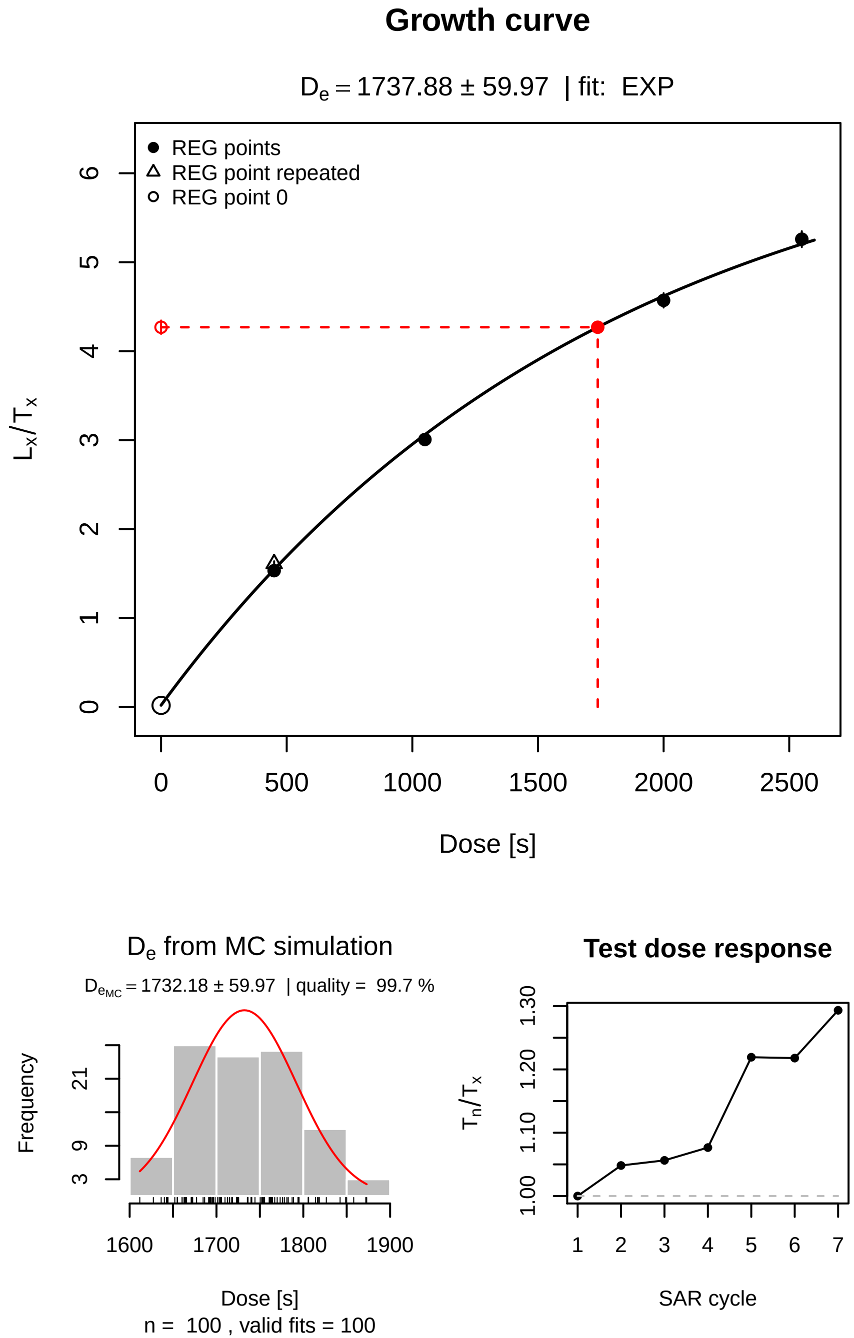
Dose recovery test
1.2
1.1
1.0
0.9
0.8
Normalised D_e
+10 %
−10%
200
240
Preheat temperature [°C]



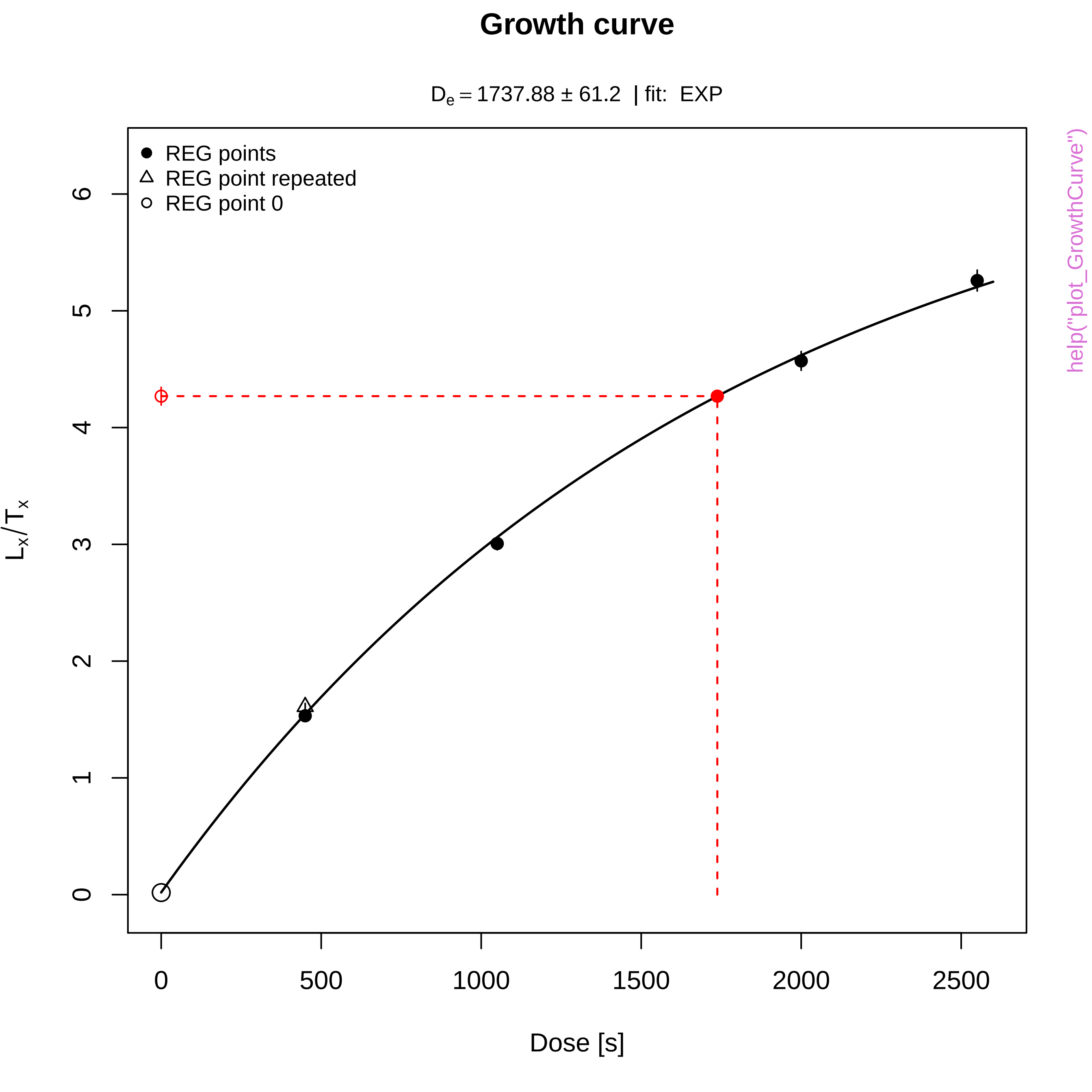
Dose recovery test
Normalised D_e
1.2
1.1
1.0
0.9
0.8
+10 %
−10%
200
240
Preheat temperature [°C]

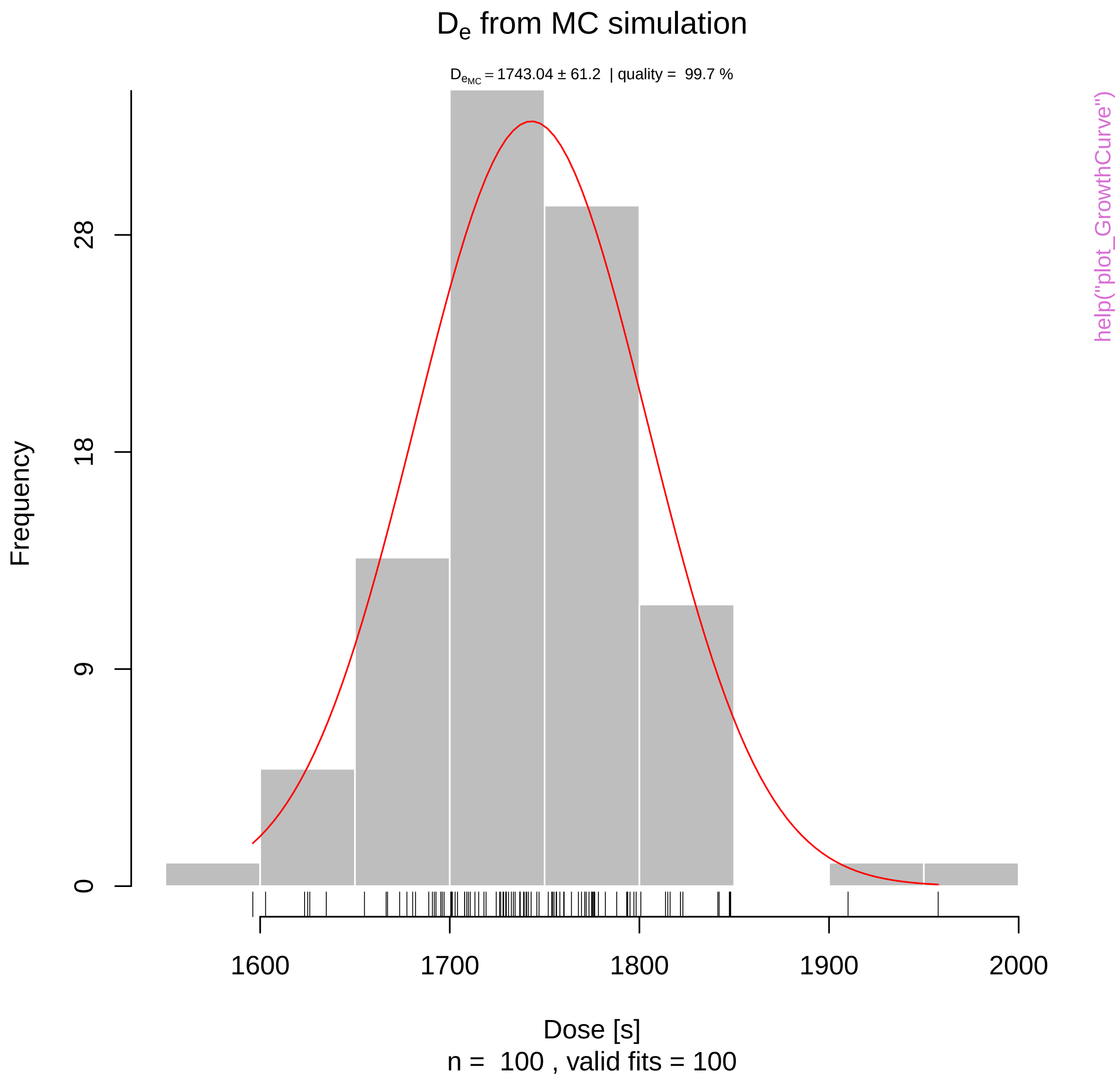


Growth curve
De = 1737.88 ± 57.45 | fit: EXP
REG points
REG point repeated
REG point 0
Lx/Tx
Dose [s]
De from MC simulation
DeMC = 1733.43 ± 57.45 | quality = 99.7 %
Frequency
Dose [s]
n = 100 , valid fits = 100
Test dose response
Tn/Tx
SAR cycle

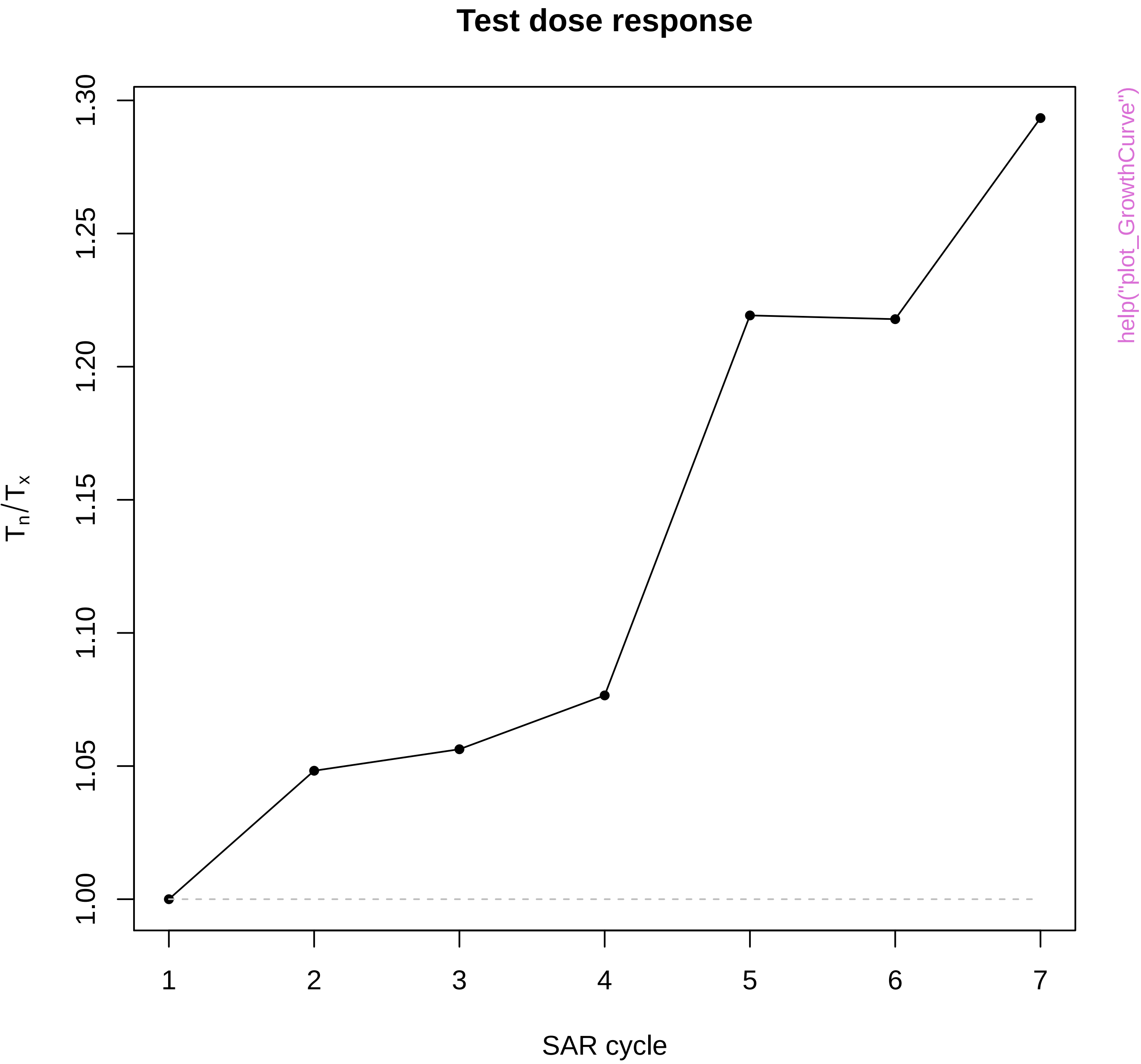


Growth curve
$D_e = 1737.88 \pm 59.97$ | fit: EXP
REG points
REG point repeated
REG point 0
L_x/T_x
Dose [s]
0
500
1000
1500
2000
2500
0
1
2
3
4
5
6
D_e from MC simulation
$D_{e_{MC}} = 1732.18 \pm 59.97$ | quality = 99.7 %
Frequency
3
9
21
1600
1700
1800
1900
Dose [s]
n = 100 , valid fits = 100
Test dose response
T_n/T_x
1.00
1.10
1.20
1.30
1
2
3
4
5
6
7
SAR cycle

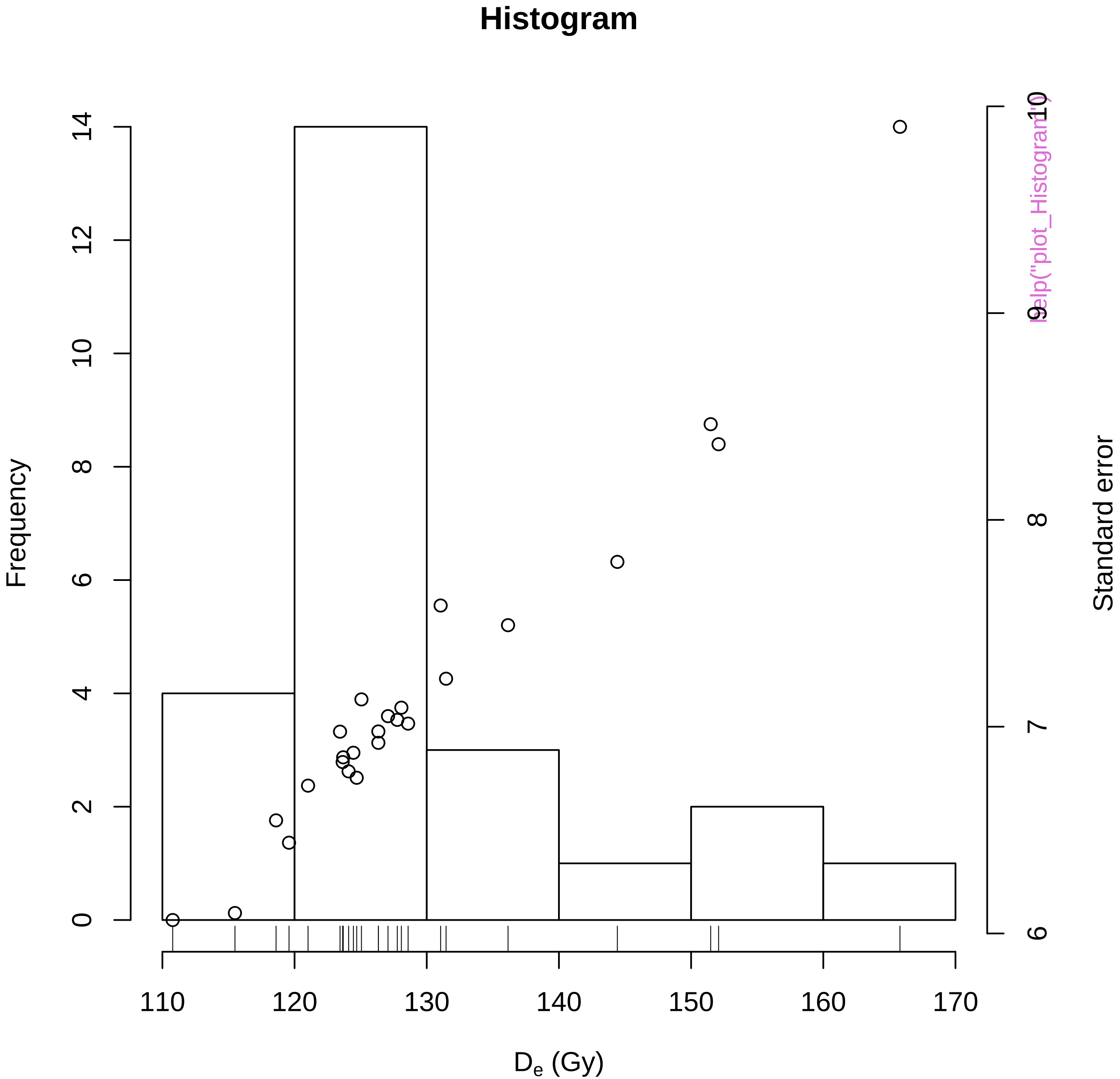

Growth curve
$D_e = 1737.88 \pm 61.2$ | fit: EXP
REG points
REG point repeated
REG point 0
L_x/T_x
0
1
2
3
4
5
6
0
500
1000
1500
2000
2500
Dose [s]
help("plot_GrowthCurve")



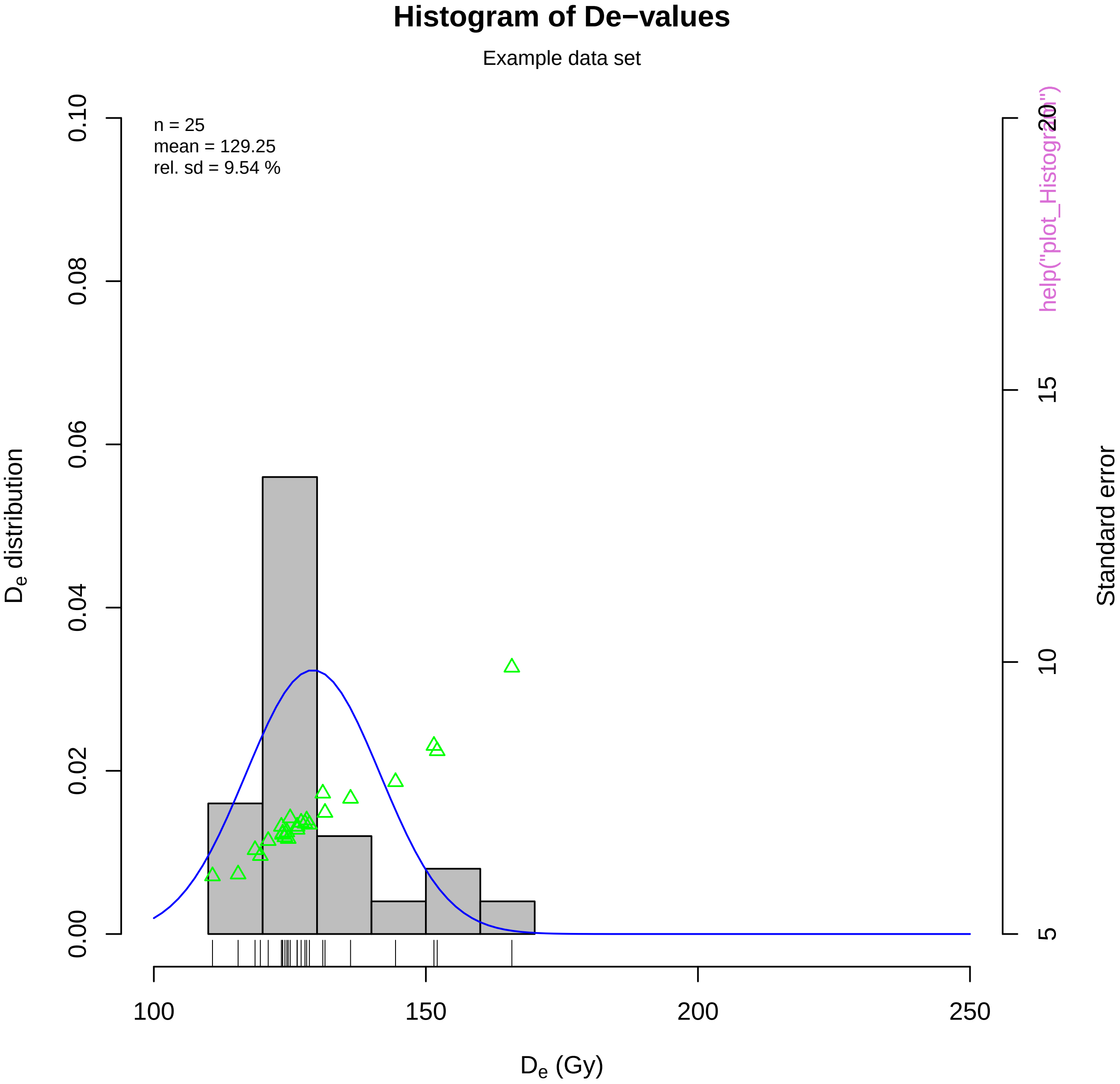
D_e from MC simulation
$D_{e_{MC}}$ = 1743.04 ± 61.2 | quality = 99.7 %
Frequency
0
9
18
28
1600
1700
1800
1900
2000
Dose [s]
n = 100 , valid fits = 100
help("plot_GrowthCurve")

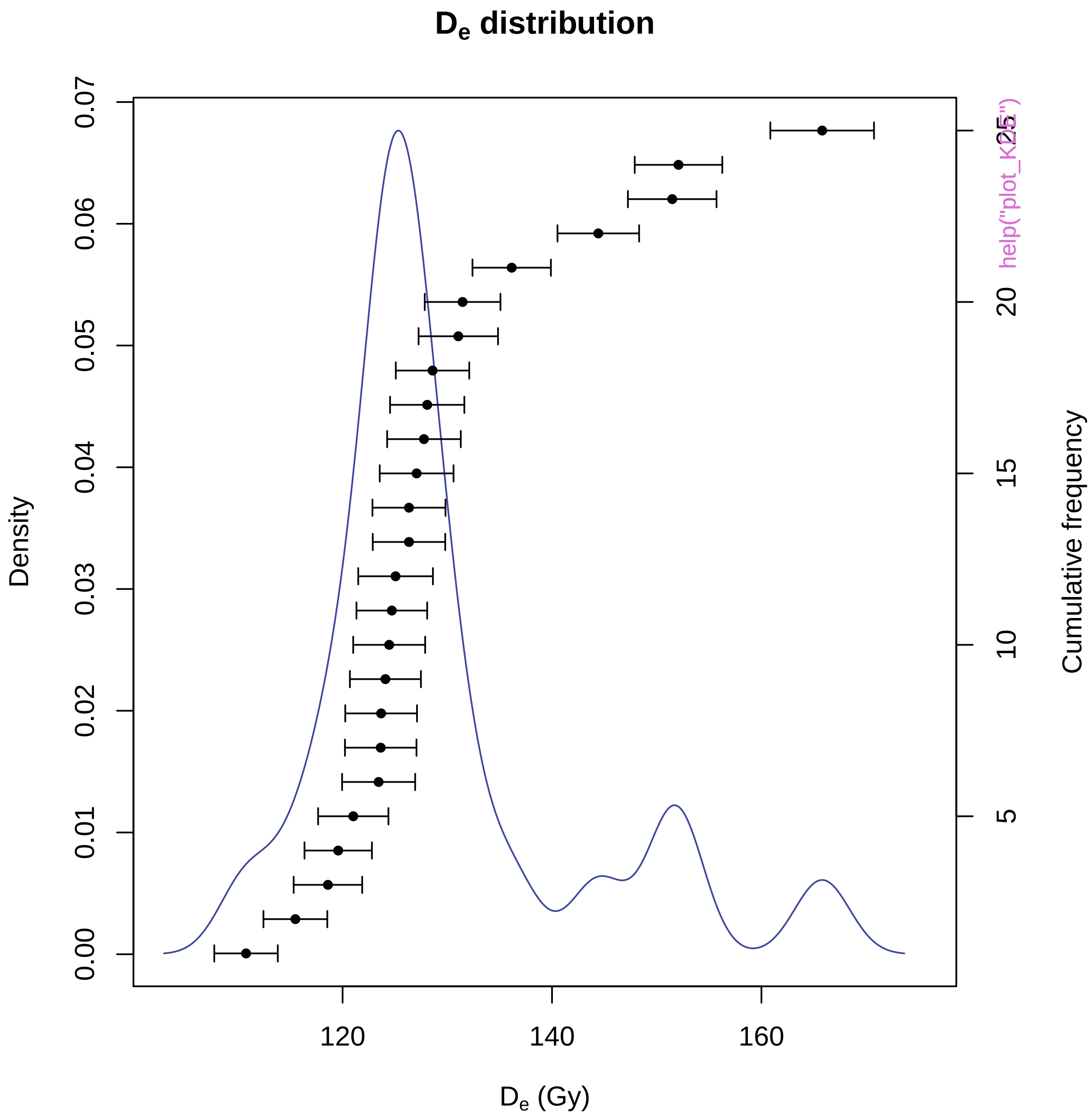


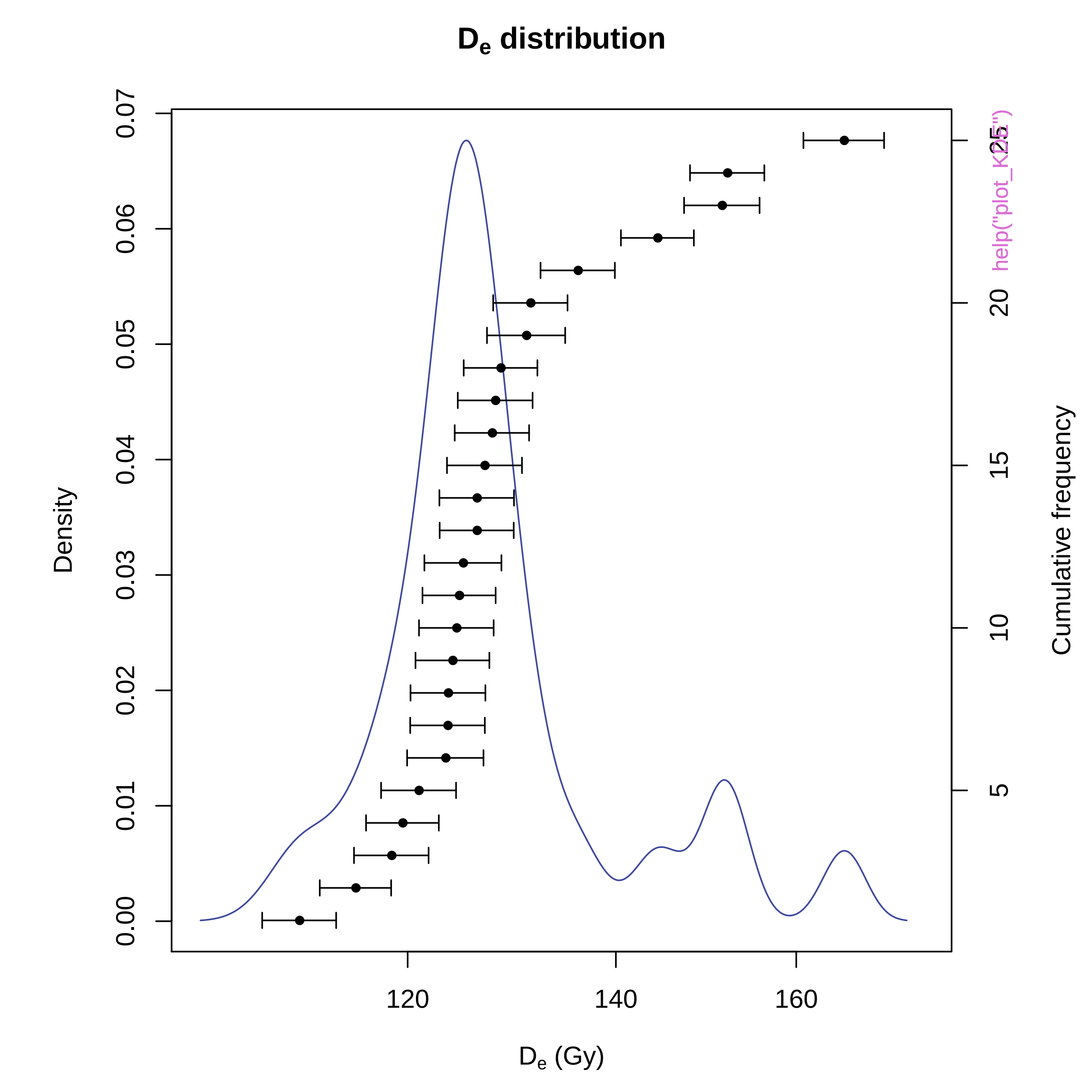
Test dose response
1.30
1.25
1.20
1.15
1.10
1.05
1.00
T_n/T_x
1
2
3
4
5
6
7
SAR cycle
help("plot_GrowthCurve")



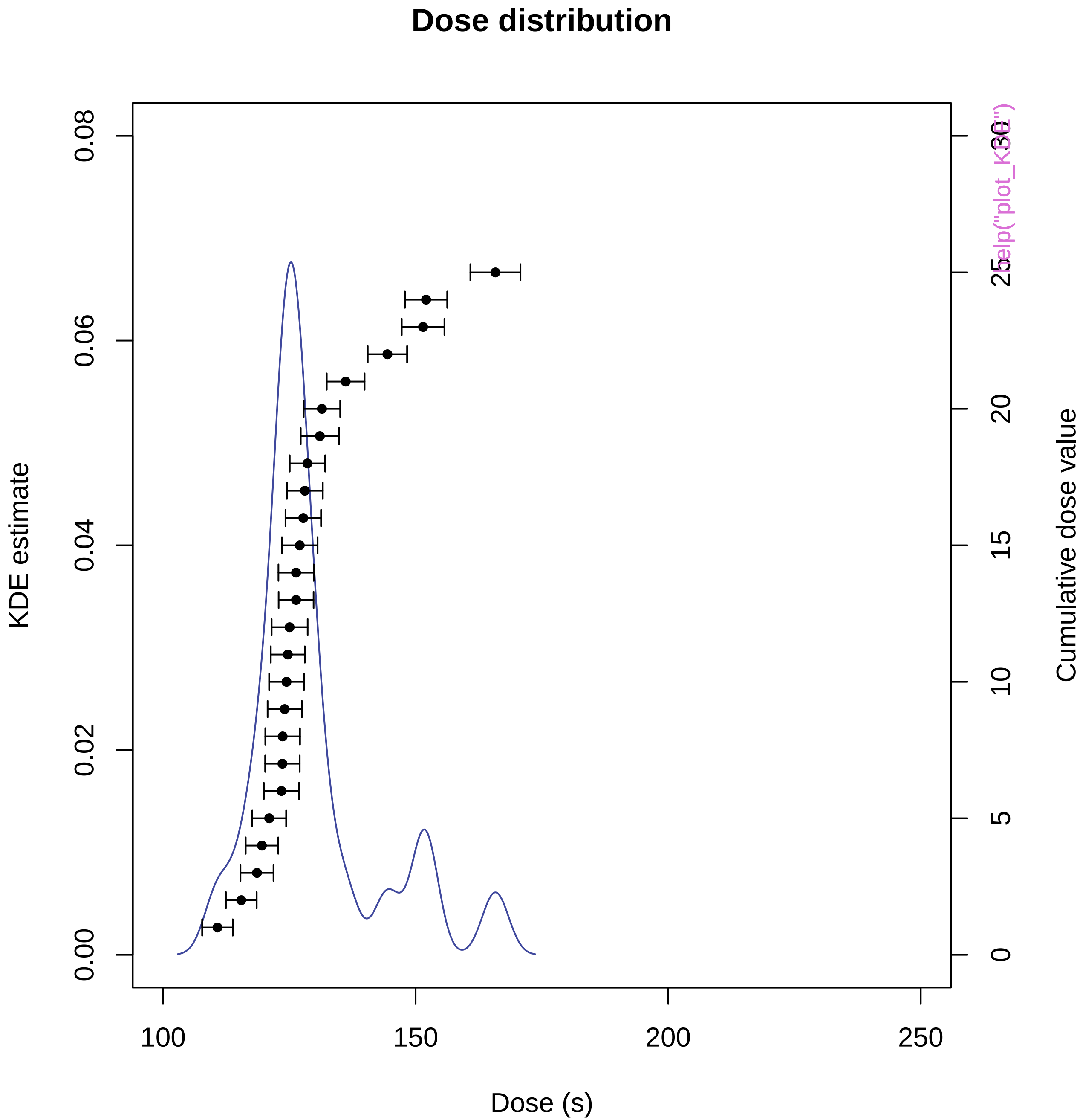
Histogram
Frequency
0
2
4
6
8
10
12
14
110
120
130
140
150
160
170
De (Gy)
Standard error
6
7
8
9
10
help("plot_Histogram")


Histogram of De−values
Example data set
n = 25
mean = 129.25
rel. sd = 9.54 %
help("plot_Histogram")
0.00
0.02
0.04
0.06
0.08
0.10
D_e distribution
5
10
15
20
Standard error
100
150
200
250
D_e (Gy)

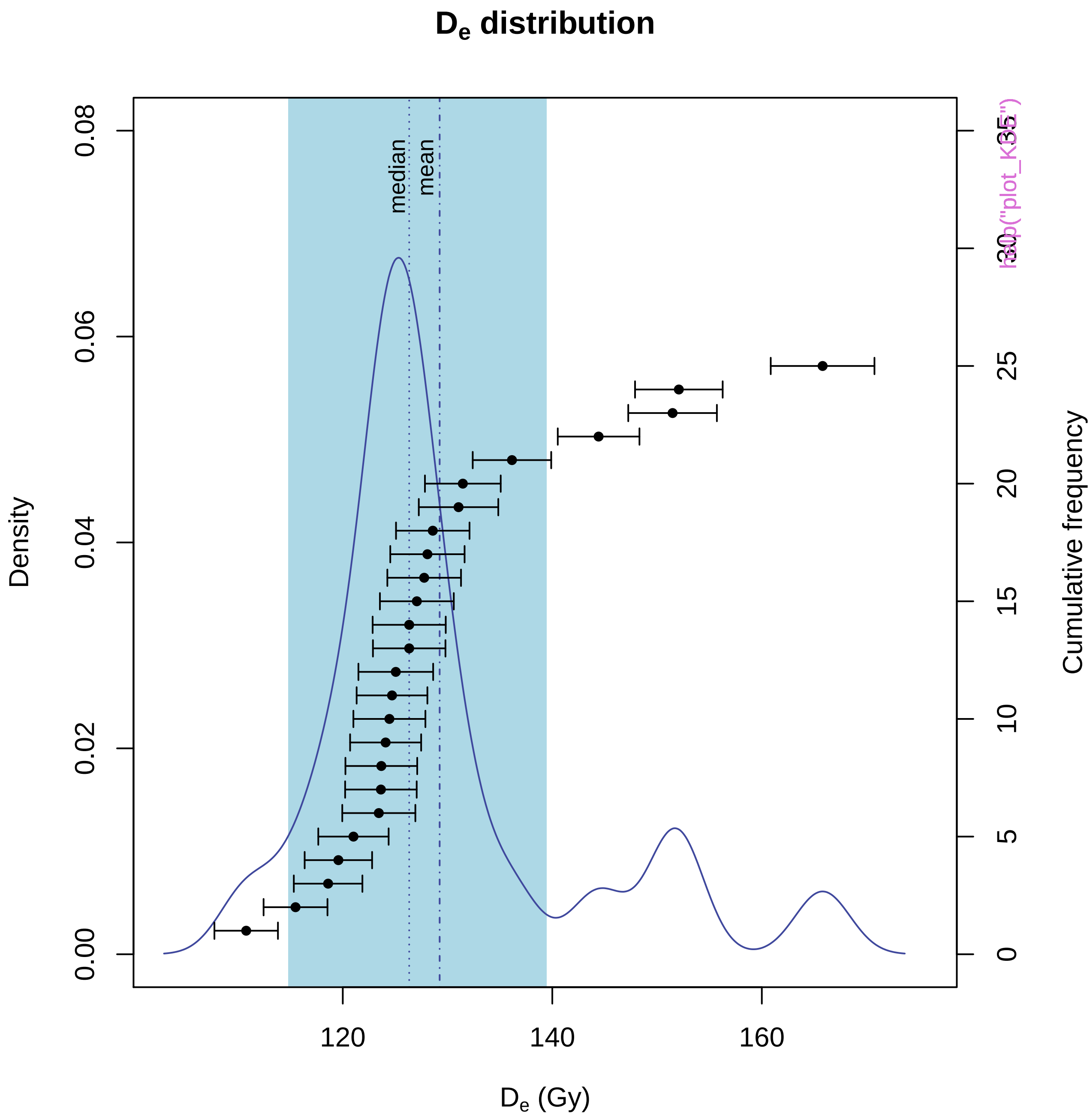

De distribution
Density
Cumulative frequency
De (Gy)
help("plot_KDE")
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
120
140
160
5
10
15
20
25



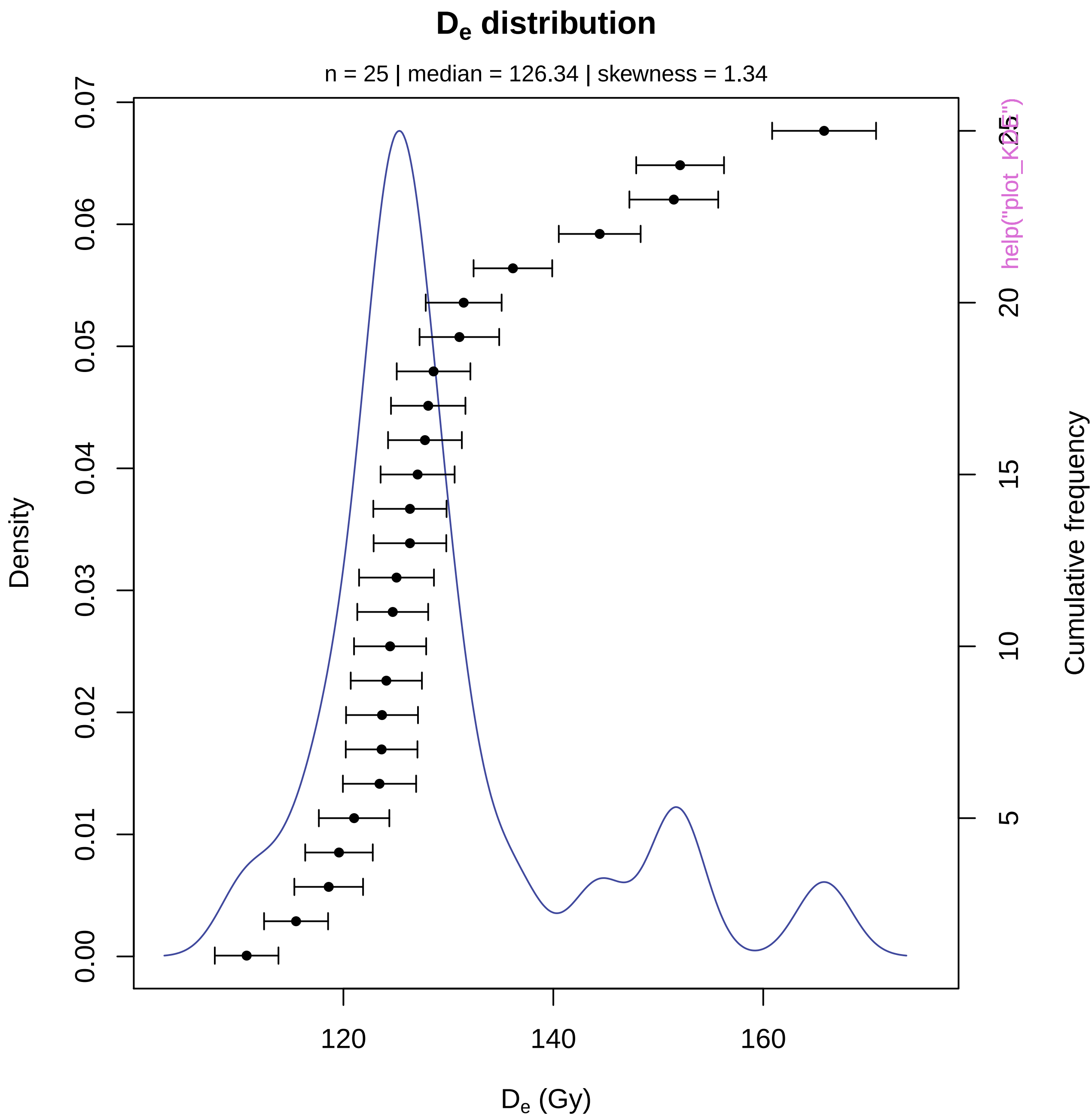
D_e distribution
Density
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
120
140
160
D_e (Gy)
Cumulative frequency
5
10
15
20
25
help("plot_KDE")



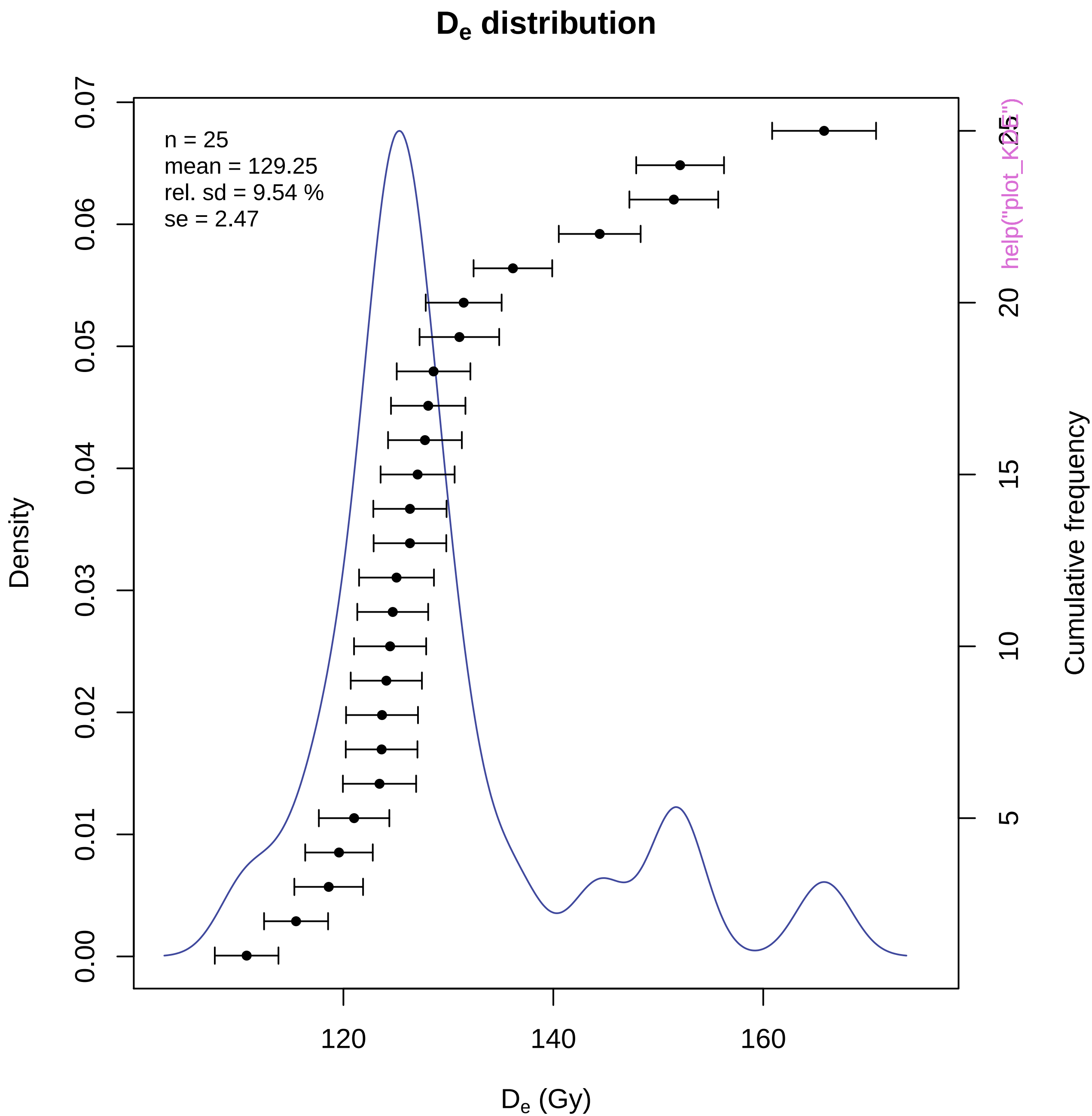
Dose distribution
KDE estimate
0.00
0.02
0.04
0.06
0.08
Cumulative dose value
0
5
10
15
20
25
30
help("plot_KDE")
Dose (s)
100
150
200
250



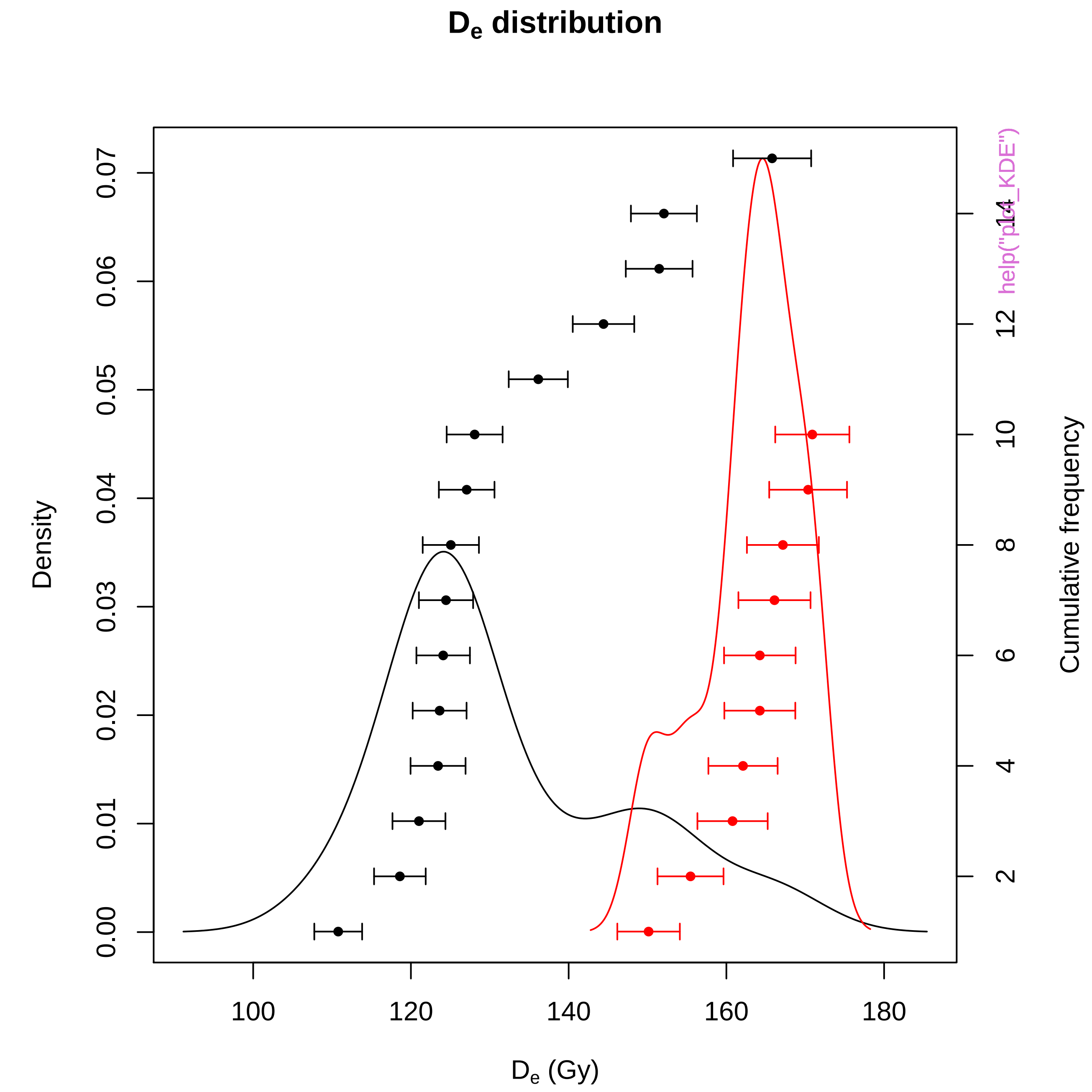
D_e distribution
median
mean
help("plot_KDE")
Density
0.00
0.02
0.04
0.06
0.08
120
140
160
D_e (Gy)
Cumulative frequency
0
5
10
15
20
25
30
35



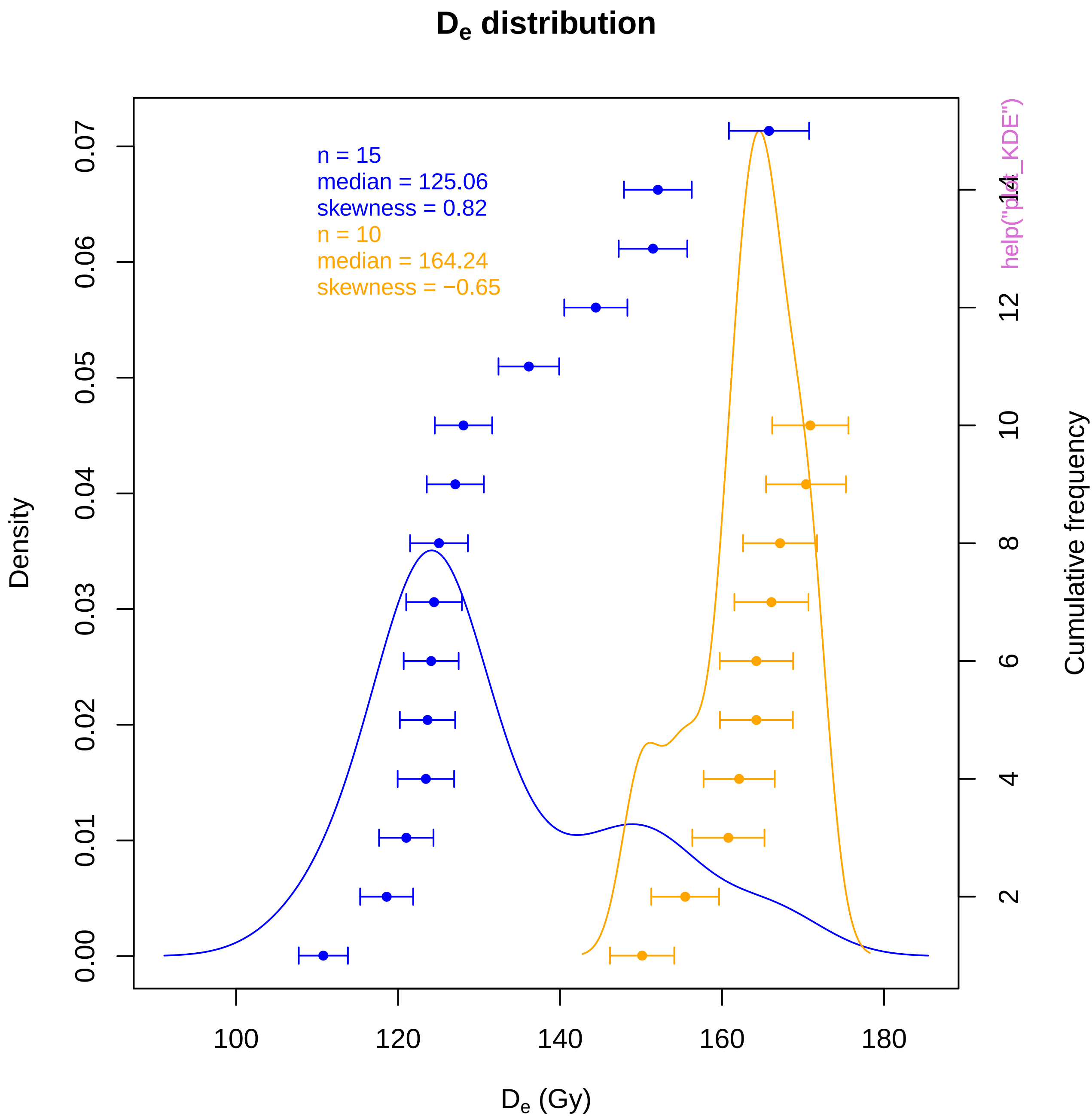
De distribution
n = 25 | median = 126.34 | skewness = 1.34
Density
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
120
140
160
De (Gy)
Cumulative frequency
5
10
15
20
25
help("plot_KDE")



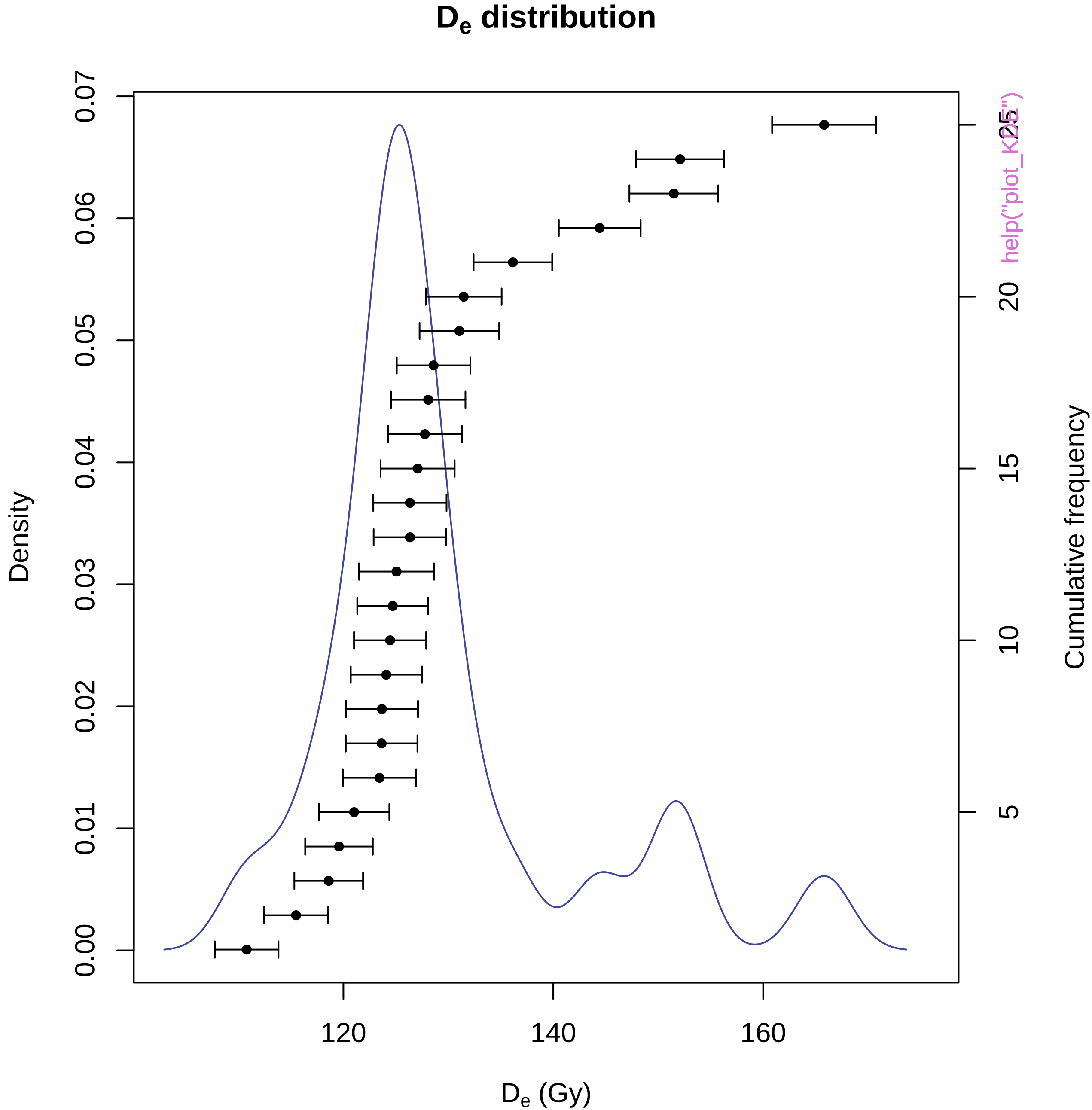
De distribution
n = 25
mean = 129.25
rel. sd = 9.54 %
se = 2.47
help("plot_KDE")
Density
Cumulative frequency
De (Gy)
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
5
10
15
20
25
120
140
160



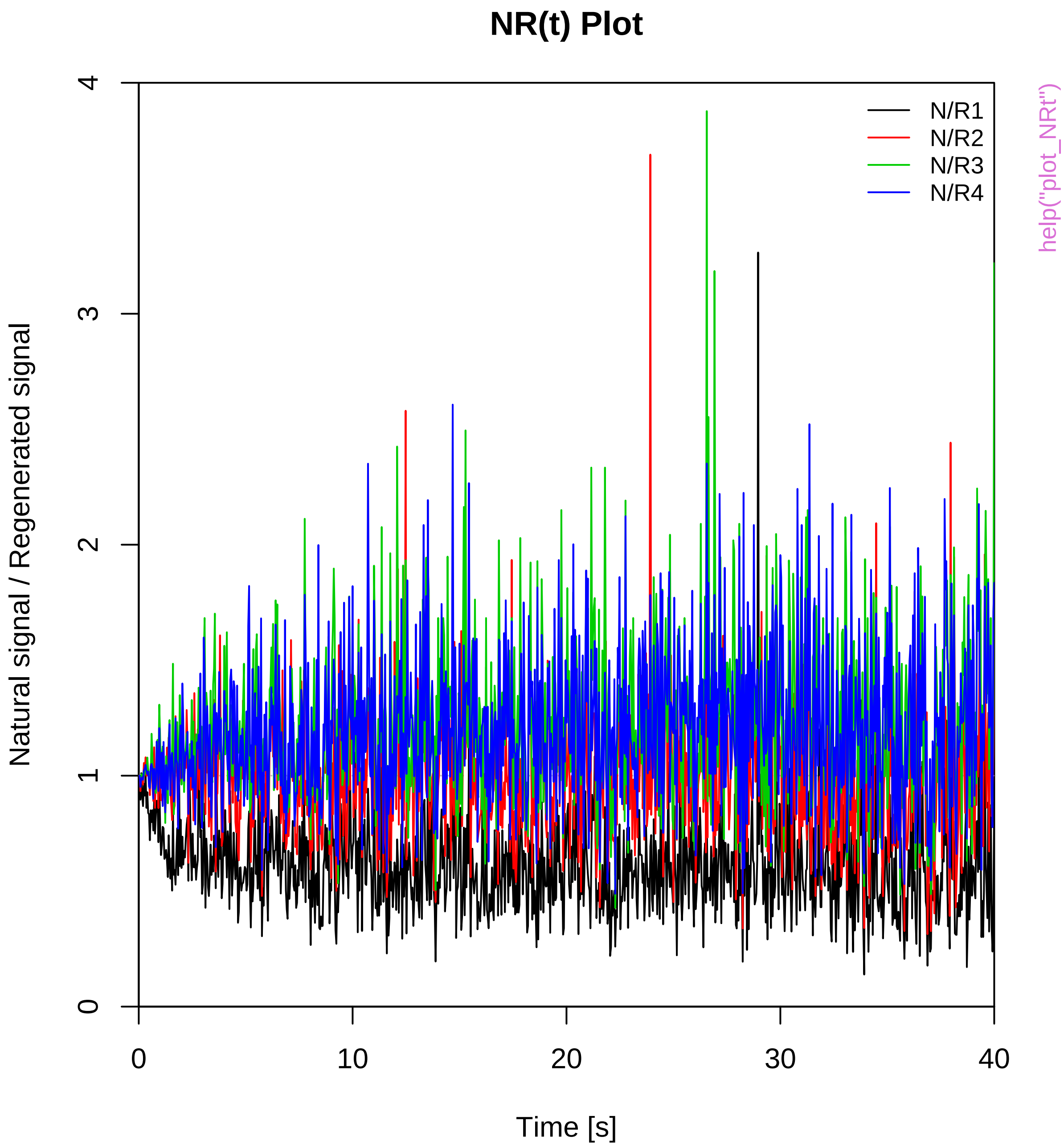
De distribution
Density
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
100
120
140
160
180
De (Gy)
Cumulative frequency
2
4
6
8
10
12
14
help("plot_KDE")

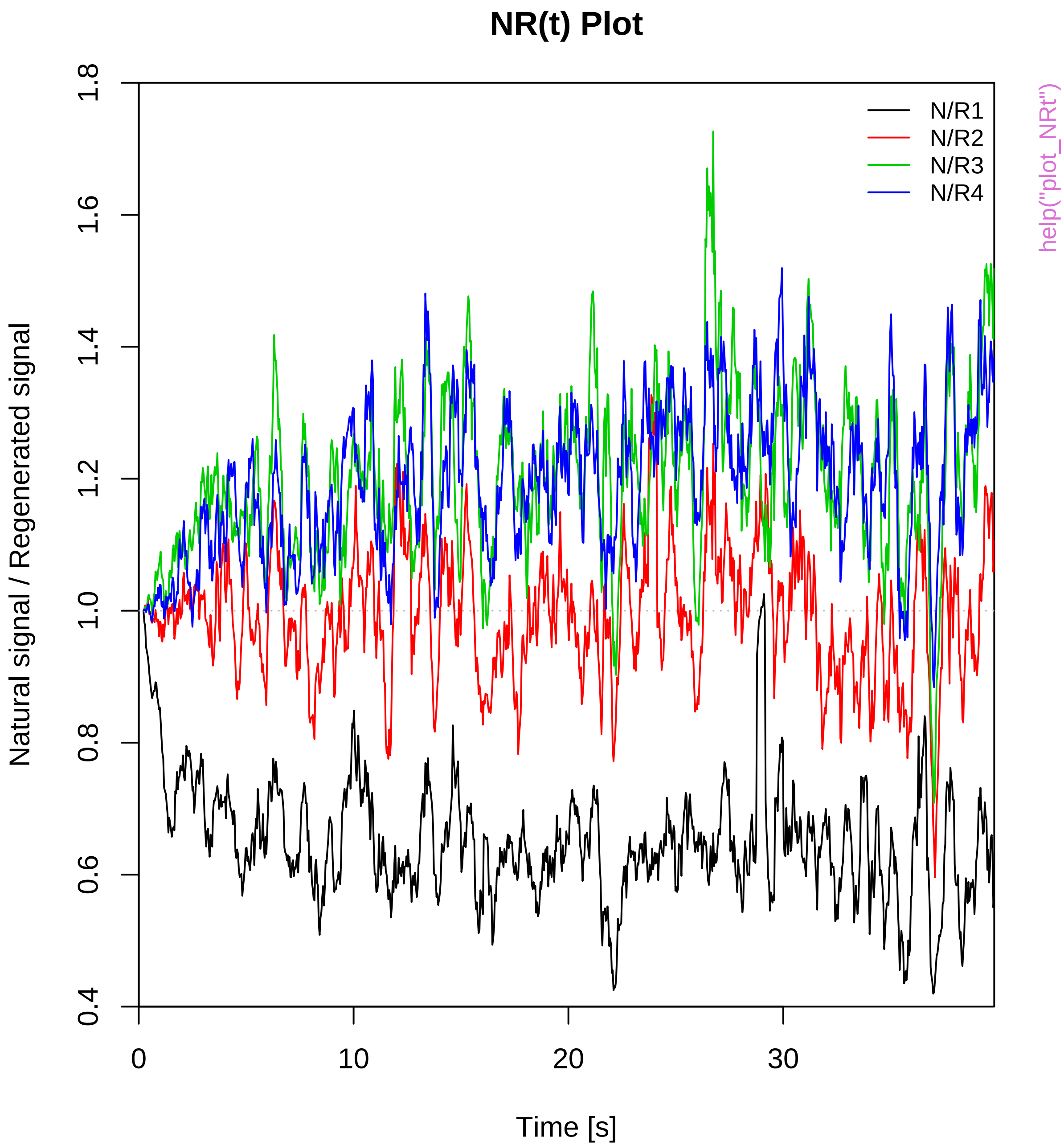


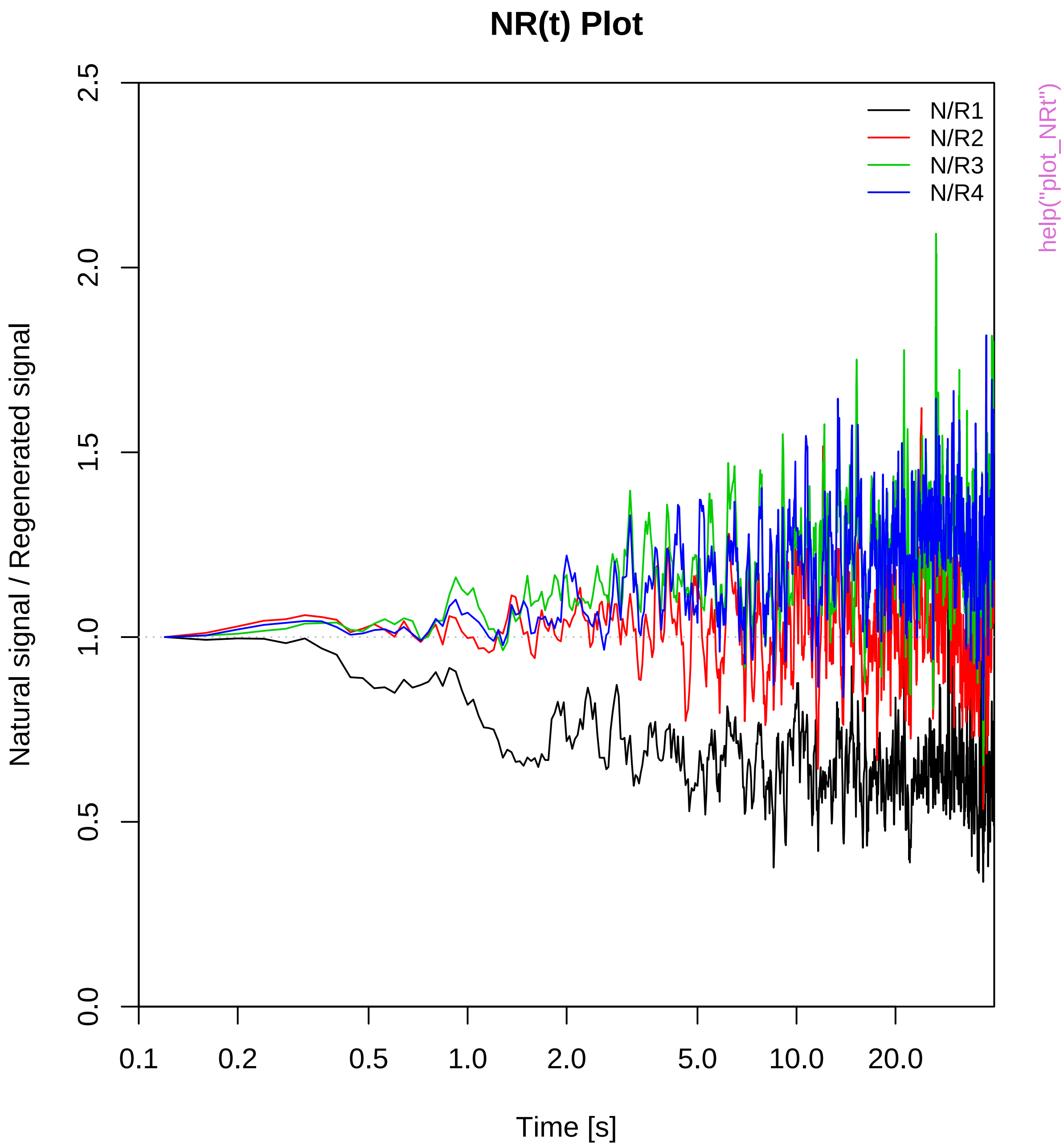
D_e distribution
n = 15
median = 125.06
skewness = 0.82
n = 10
median = 164.24
skewness = −0.65
help("plot_KDE")
Density
Cumulative frequency
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
2
4
6
8
10
12
14
100
120
140
160
180
D_e (Gy)

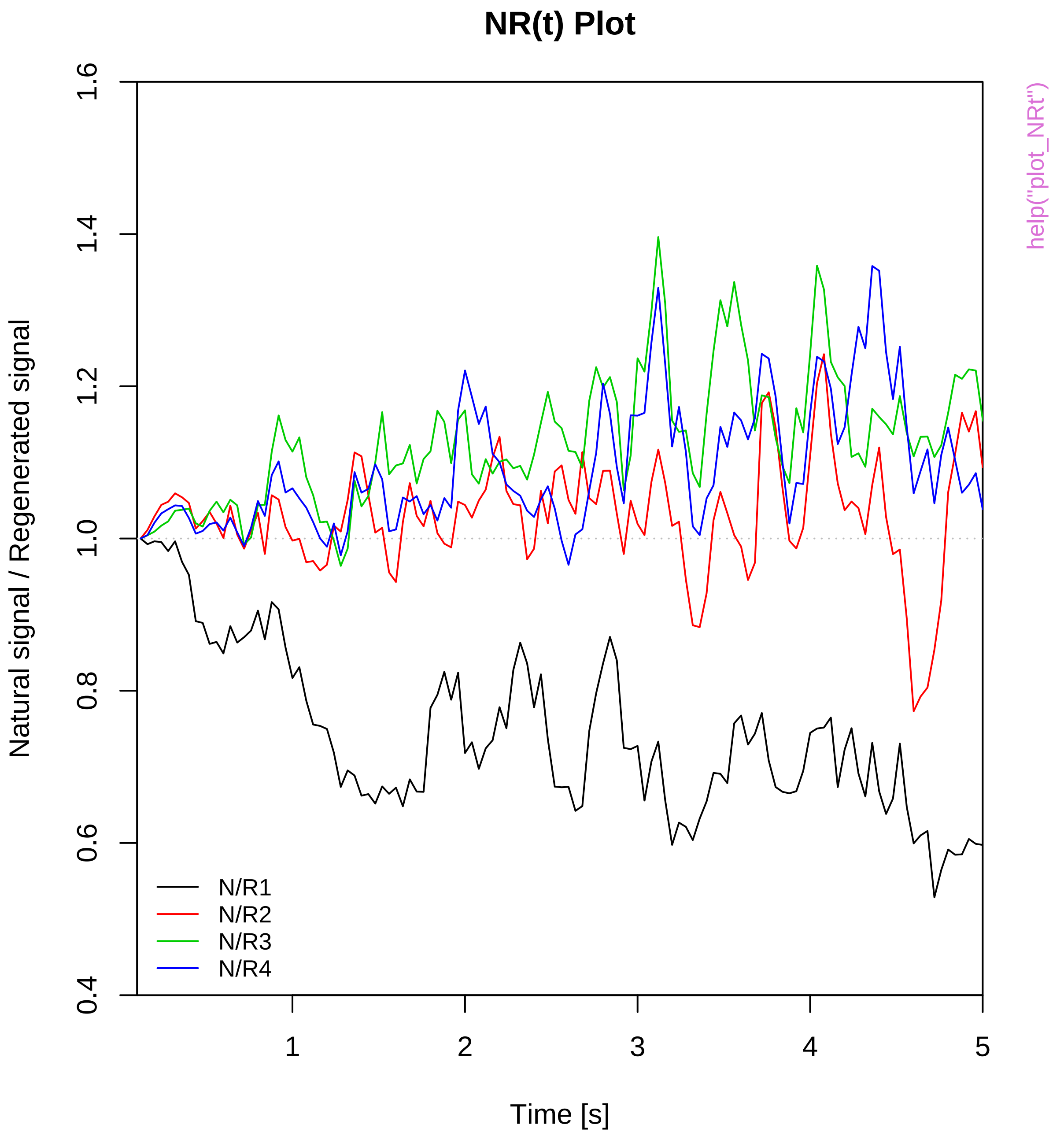


D_e distribution
Density
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
120
140
160
D_e (Gy)
5
10
15
20
25
Cumulative frequency
help("plot_KDE")

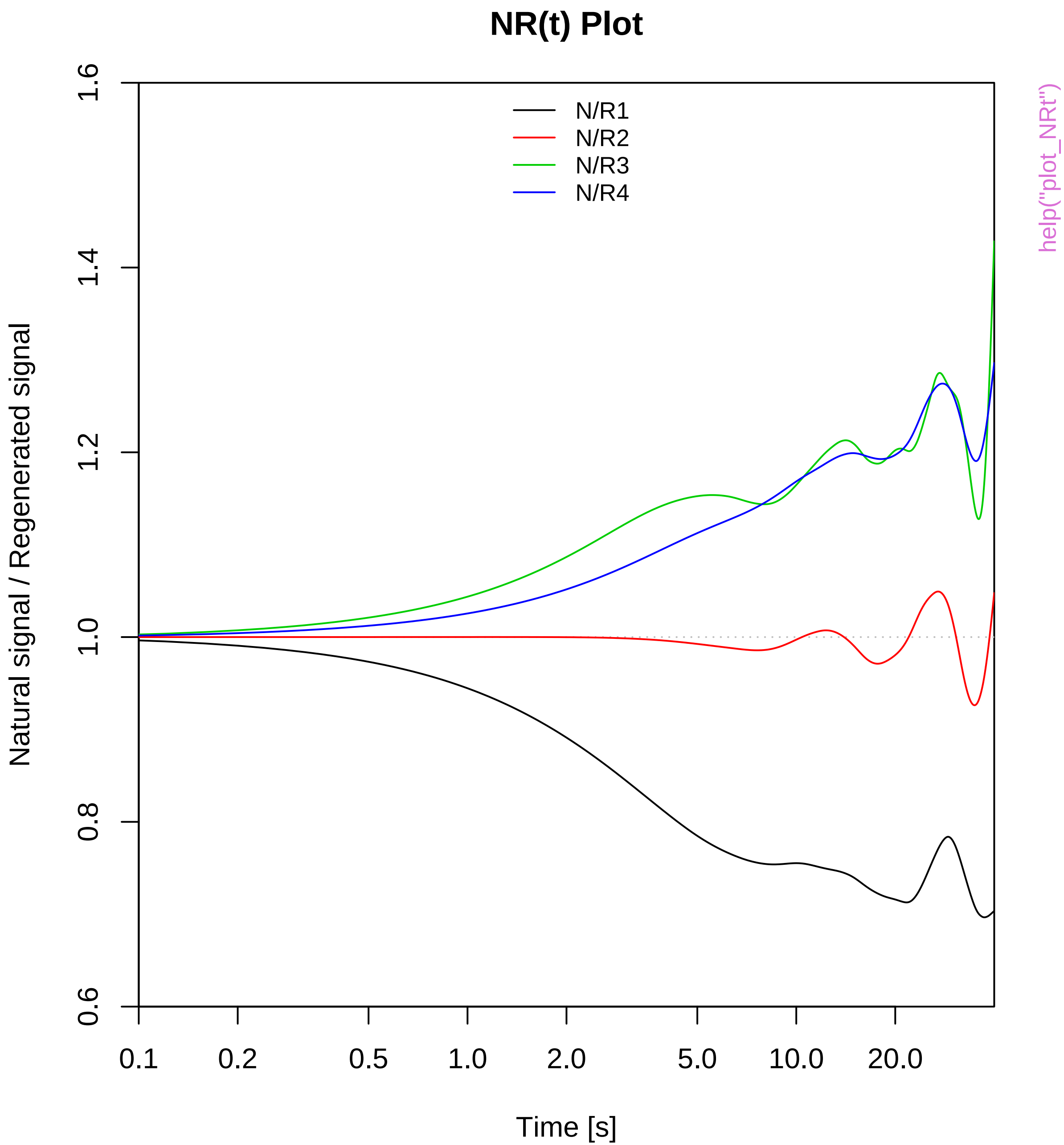

NR(t) Plot
Natural signal / Regenerated signal
Time [s]
0
1
2
3
4
0
10
20
30
40
N/R1
N/R2
N/R3
N/R4
help("plot_NRt")

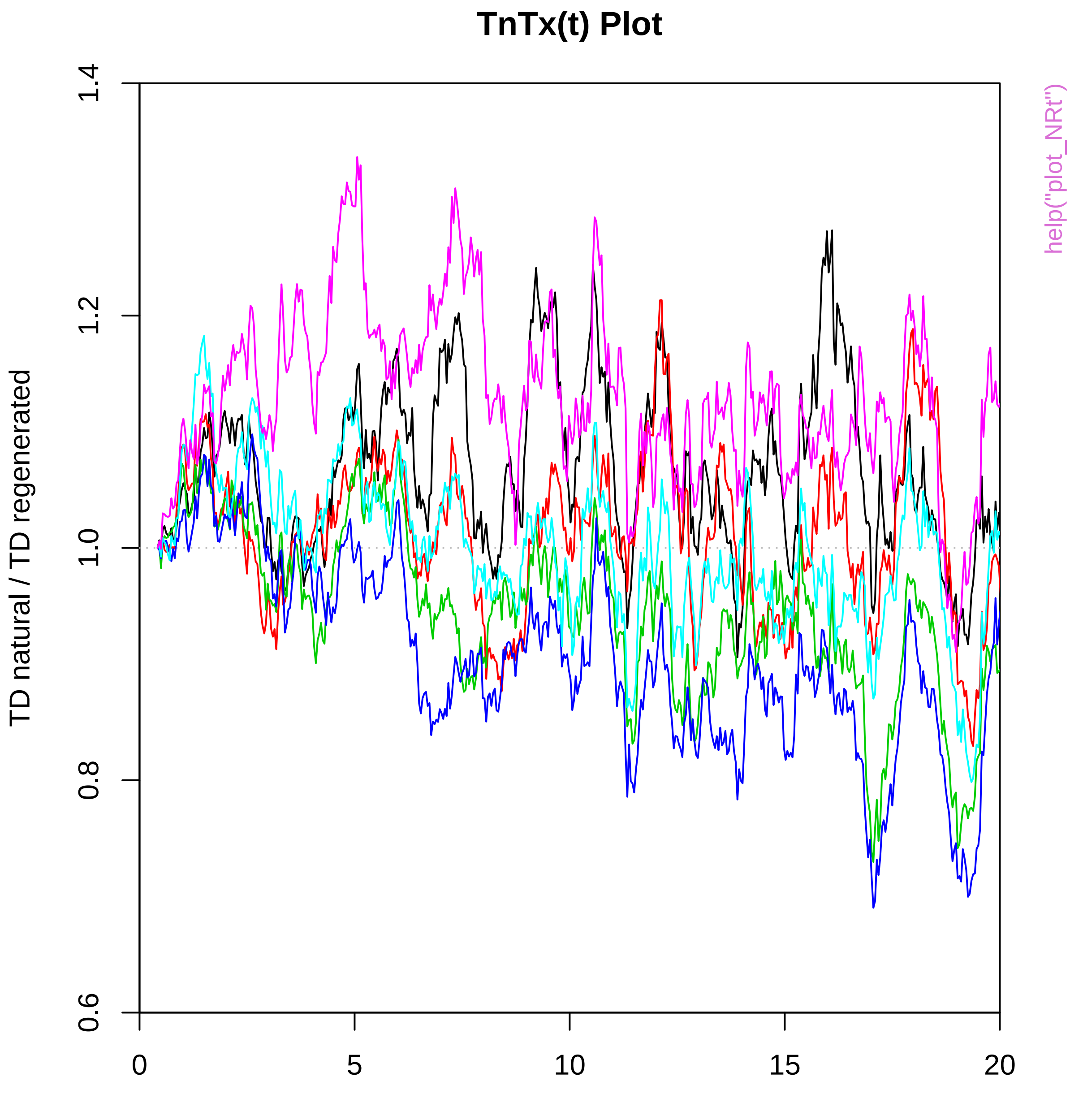

NR(t) Plot
Natural signal / Regenerated signal
Time [s]
N/R1
N/R2
N/R3
N/R4
help("plot_NRt")
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
0
10
20
30


NR(t) Plot
Natural signal / Regenerated signal
Time [s]
0.0
0.5
1.0
1.5
2.0
2.5
0.1
0.2
0.5
1.0
2.0
5.0
10.0
20.0
N/R1
N/R2
N/R3
N/R4
help("plot_NRt")

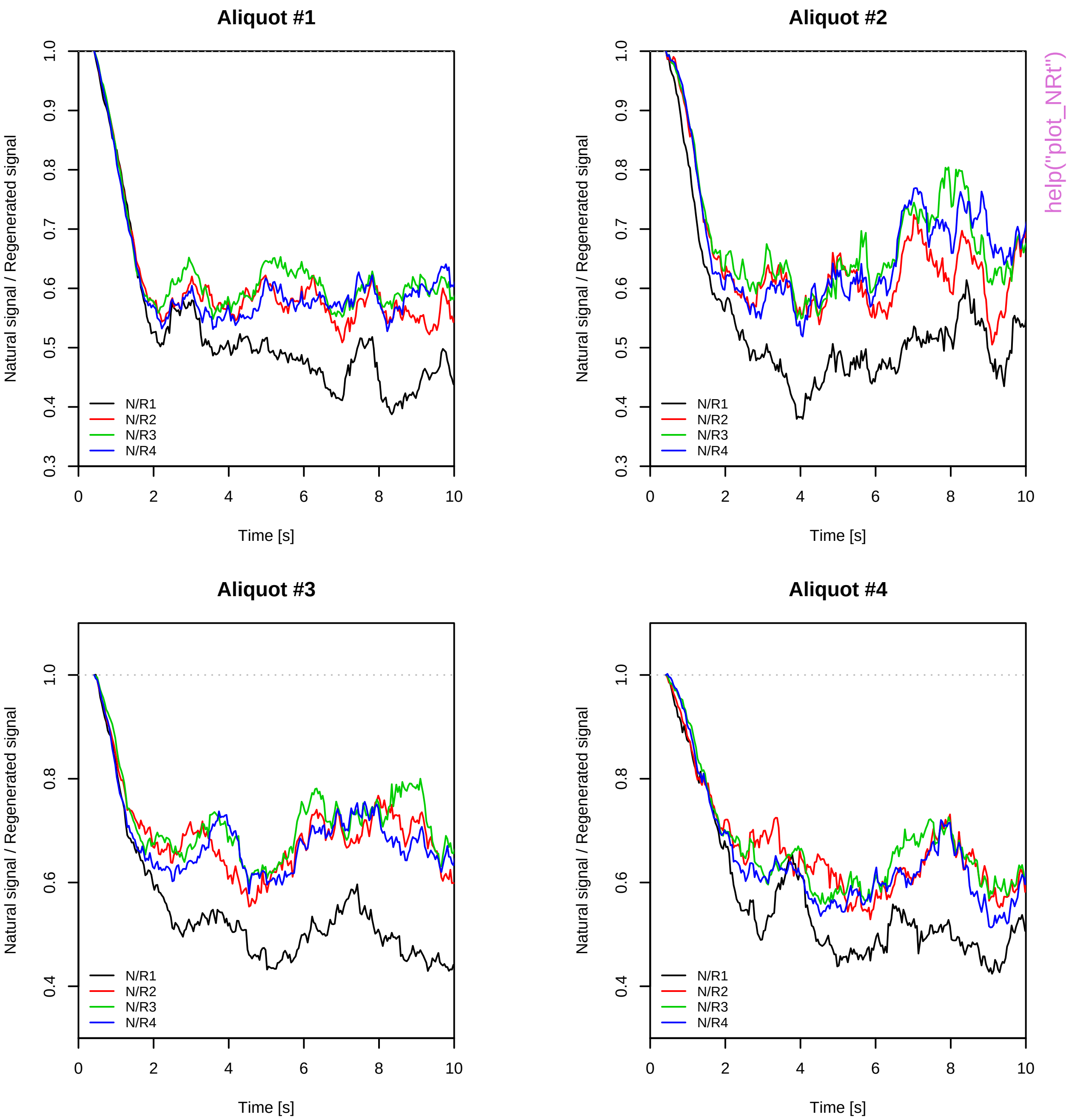


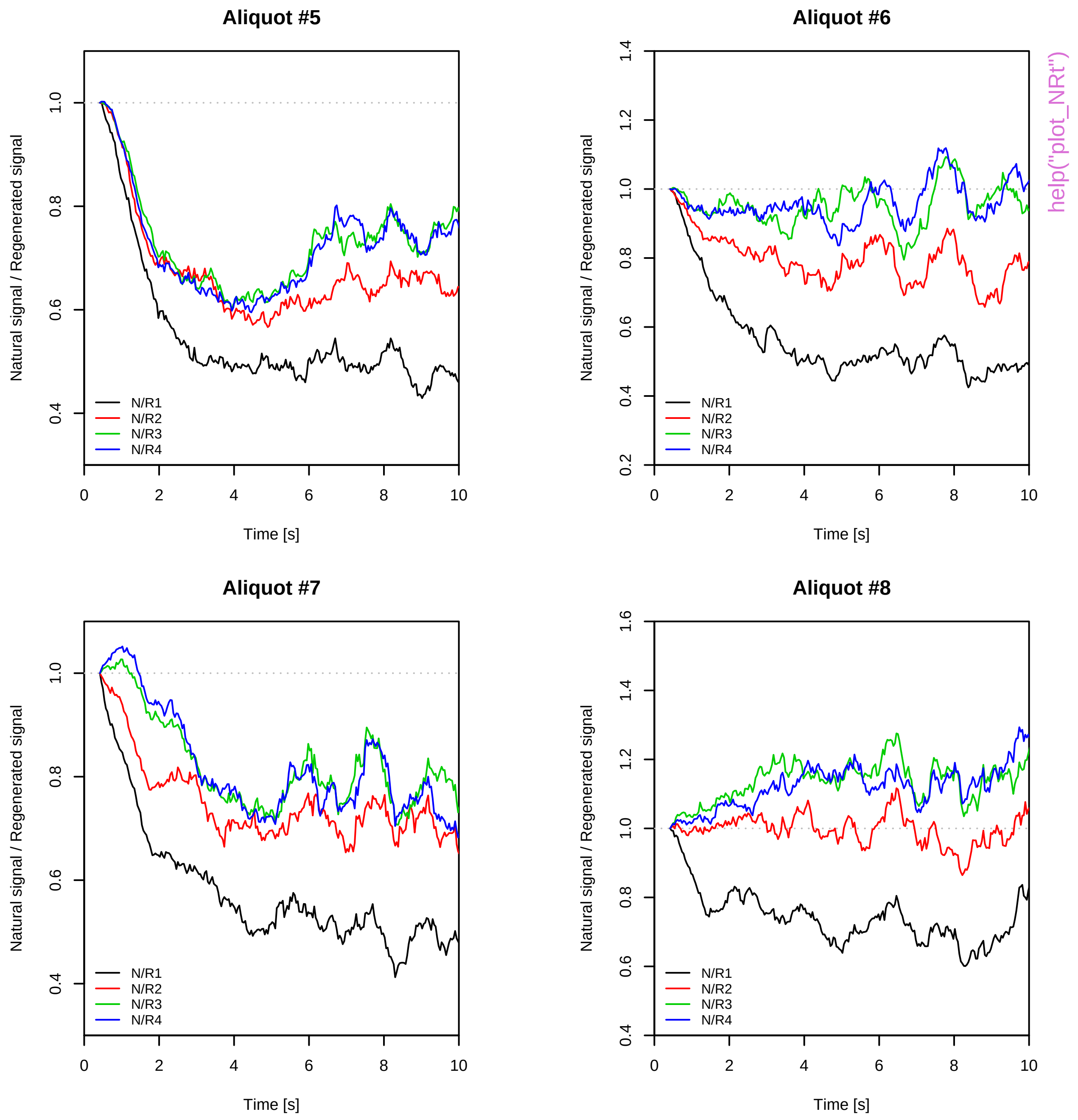
NR(t) Plot
Natural signal / Regenerated signal
Time [s]
help("plot_NRt")
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1
2
3
4
5
N/R1
N/R2
N/R3
N/R4

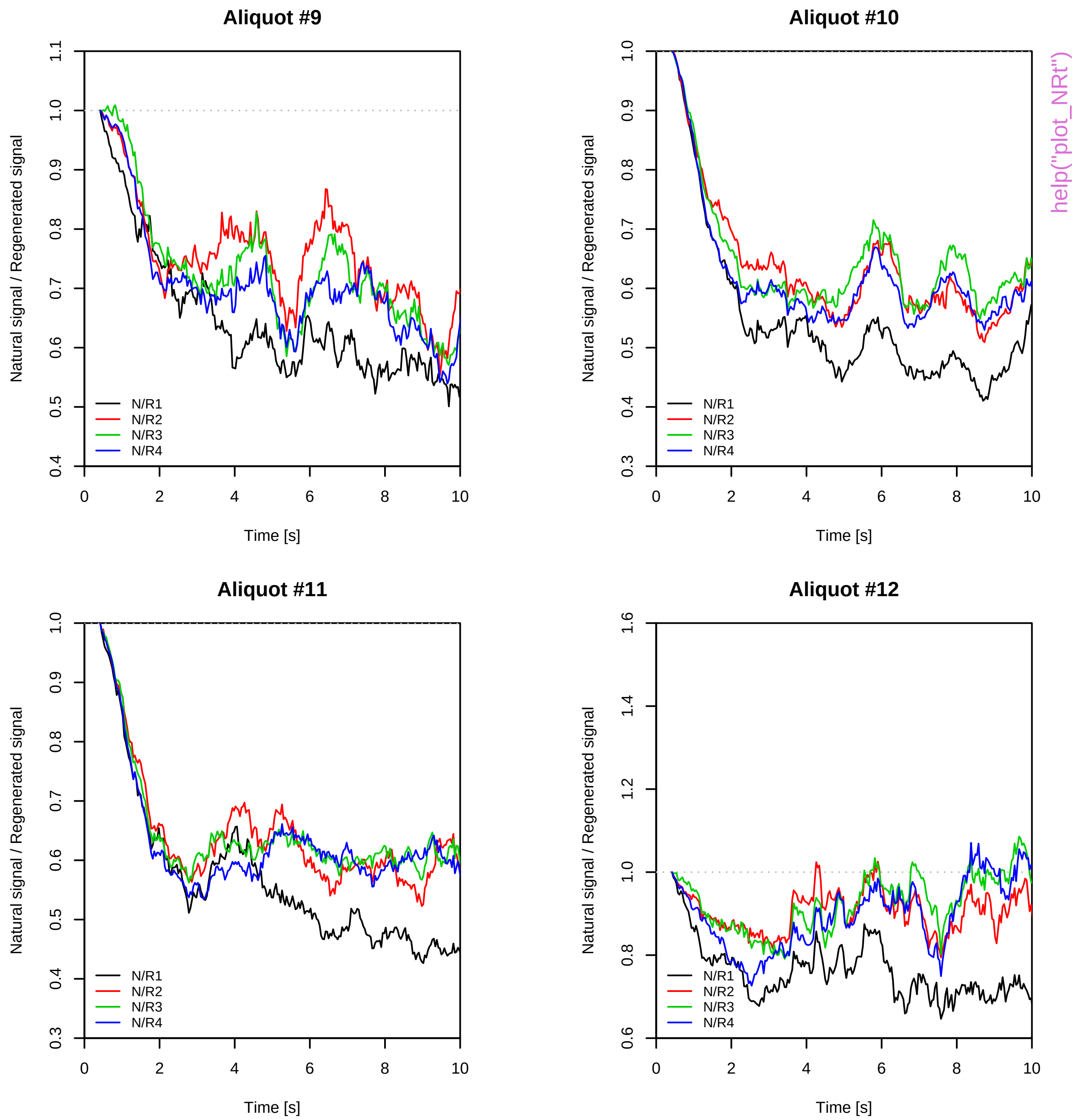

NR(t) Plot
N/R1
N/R2
N/R3
N/R4
help("plot_NRt")
Natural signal / Regenerated signal
0.6
0.8
1.0
1.2
1.4
1.6
0.1
0.2
0.5
1.0
2.0
5.0
10.0
20.0
Time [s]

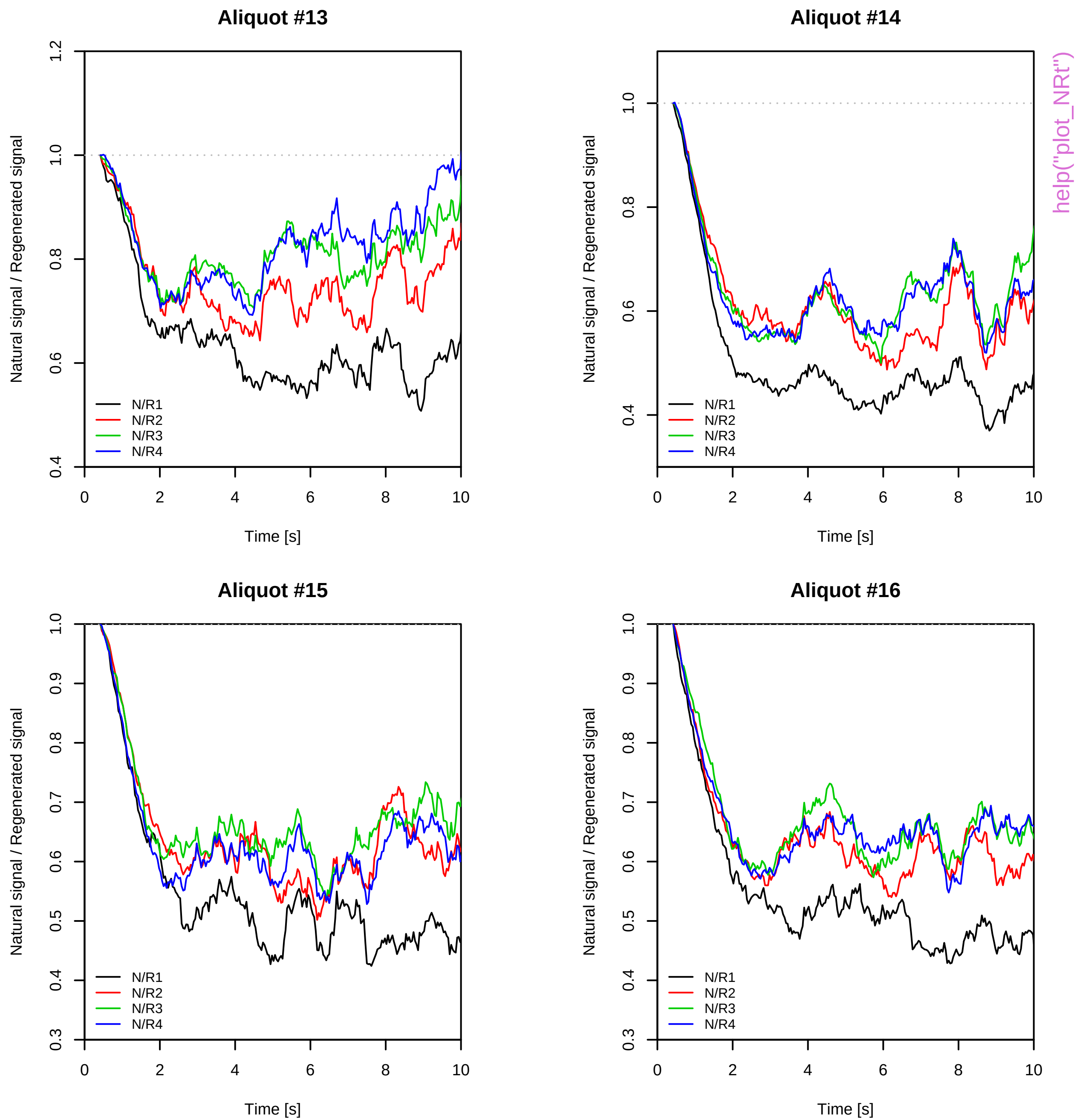


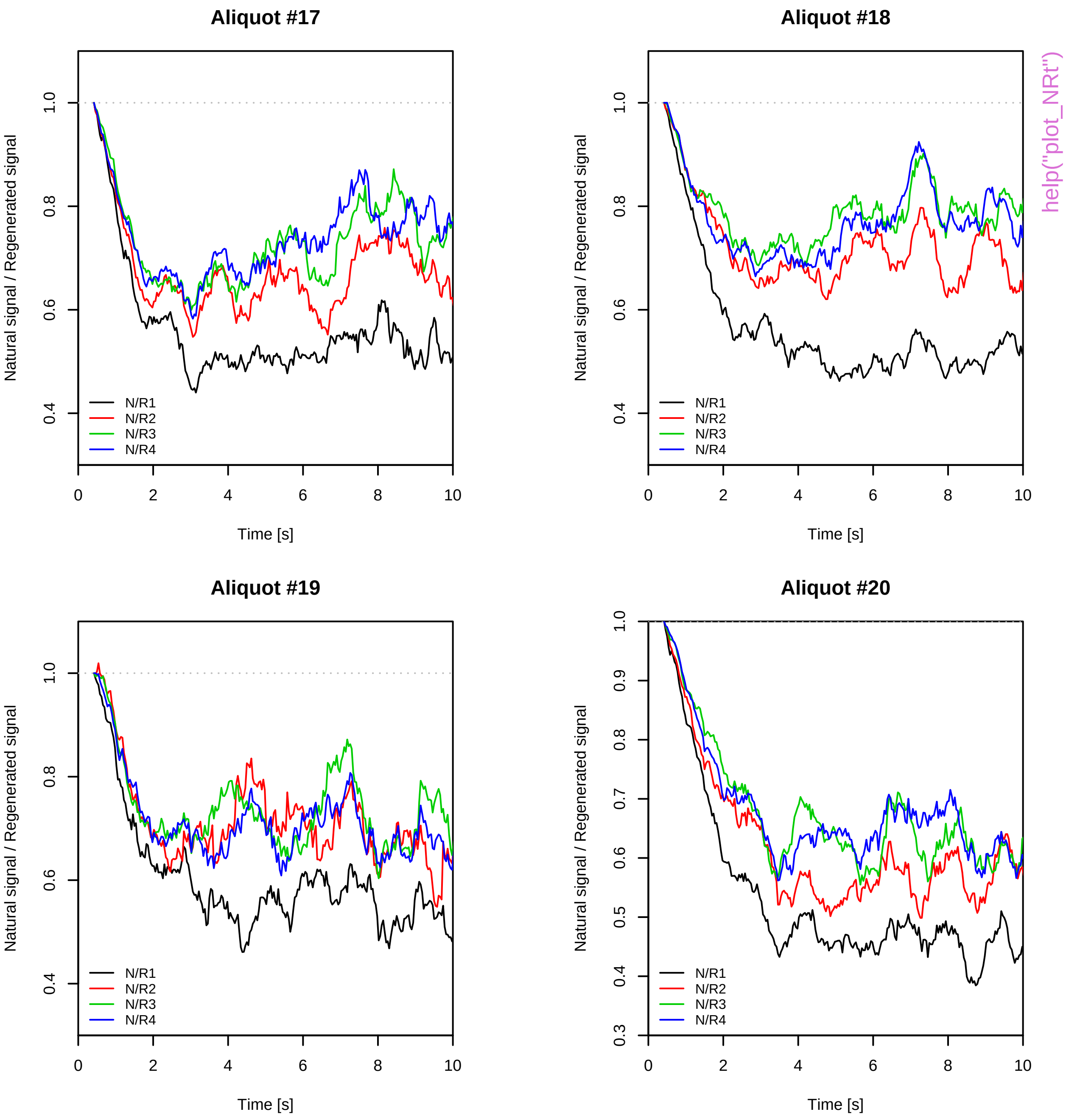
TnTx(t) Plot
TD natural / TD regenerated
Time [s]
help("plot_NRt")
0.6
0.8
1.0
1.2
1.4
0
5
10
15
20


Aliquot #1
Aliquot #2
Aliquot #3
Aliquot #4
Natural signal / Regenerated signal
Time [s]
N/R1
N/R2
N/R3
N/R4
help("plot_NRt")

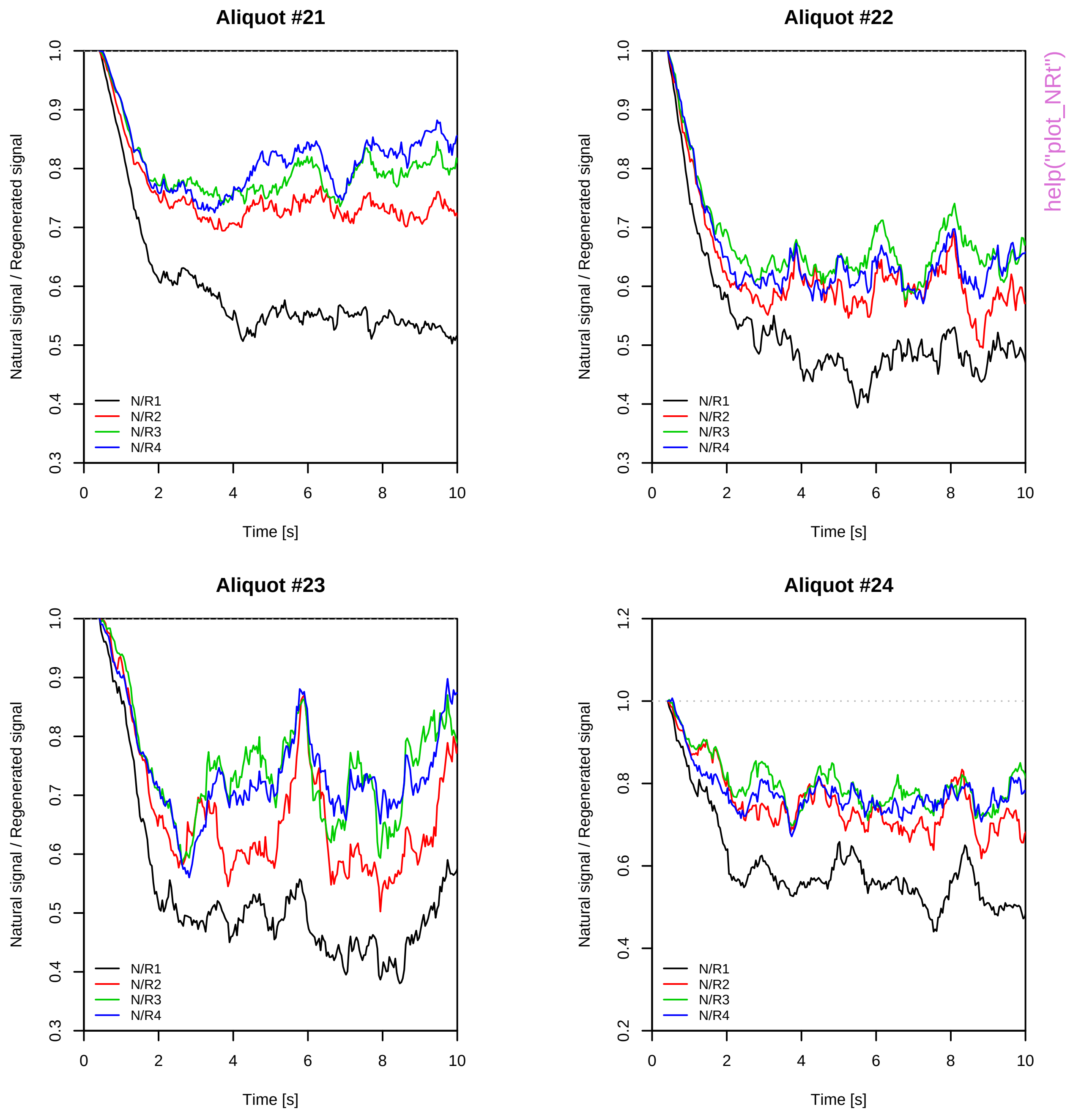

Aliquot #5
Aliquot #6
Aliquot #7
Aliquot #8
Natural signal / Regenerated signal
Time [s]
N/R1
N/R2
N/R3
N/R4
help("plot_NRt")
0
2
4
6
8
10
0.4
0.6
0.8
1.0
0.2
1.2
1.4
1.6

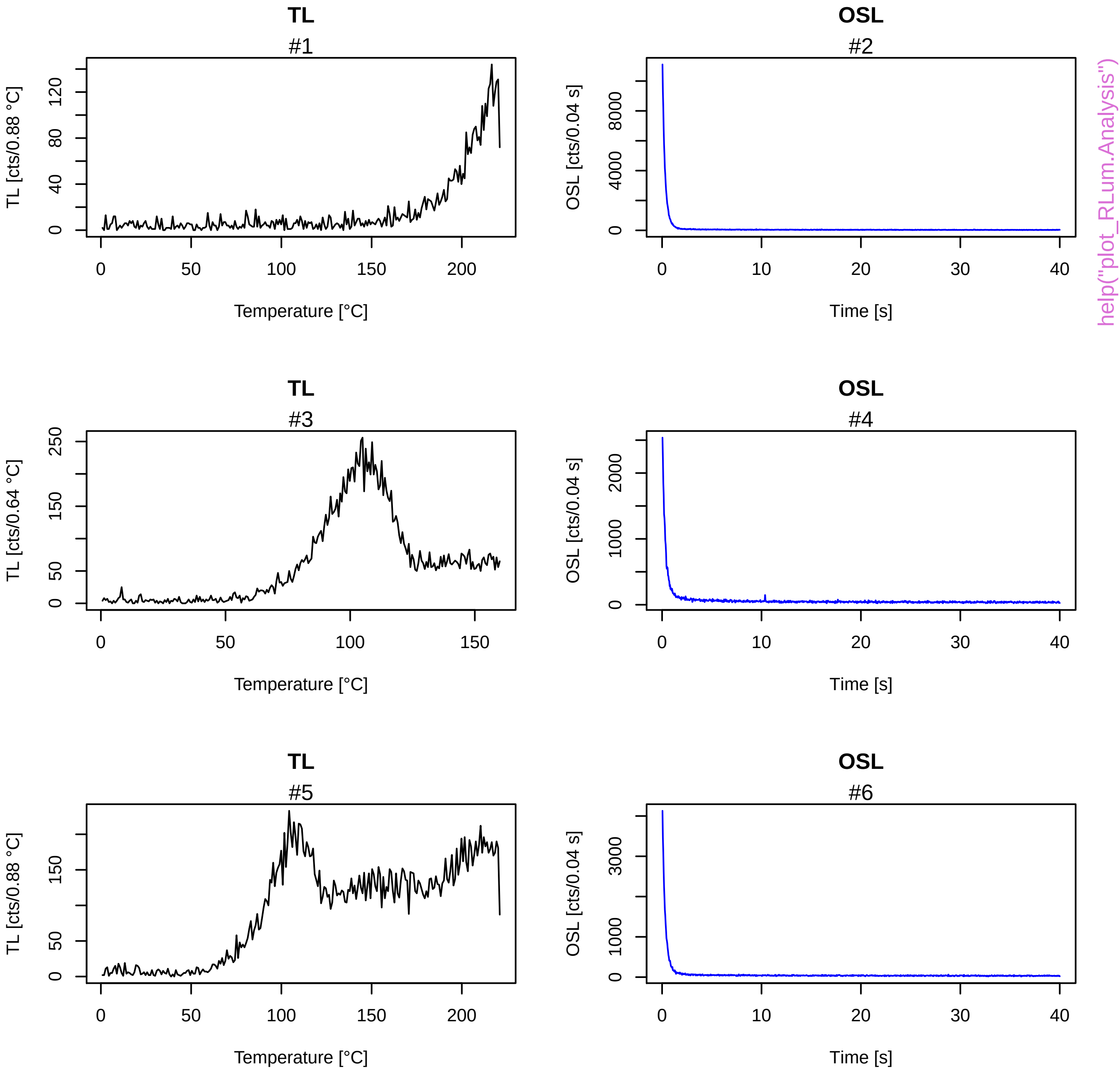

Aliquot #9
Aliquot #10
Aliquot #11
Aliquot #12
Natural signal / Regenerated signal
Time [s]
N/R1
N/R2
N/R3
N/R4
0
2
4
6
8
10
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.4
1.6
help("plot_NRt")


Aliquot #13
Aliquot #14
Aliquot #15
Aliquot #16
Natural signal / Regenerated signal
Time [s]
N/R1
N/R2
N/R3
N/R4
help("plot_NRt")

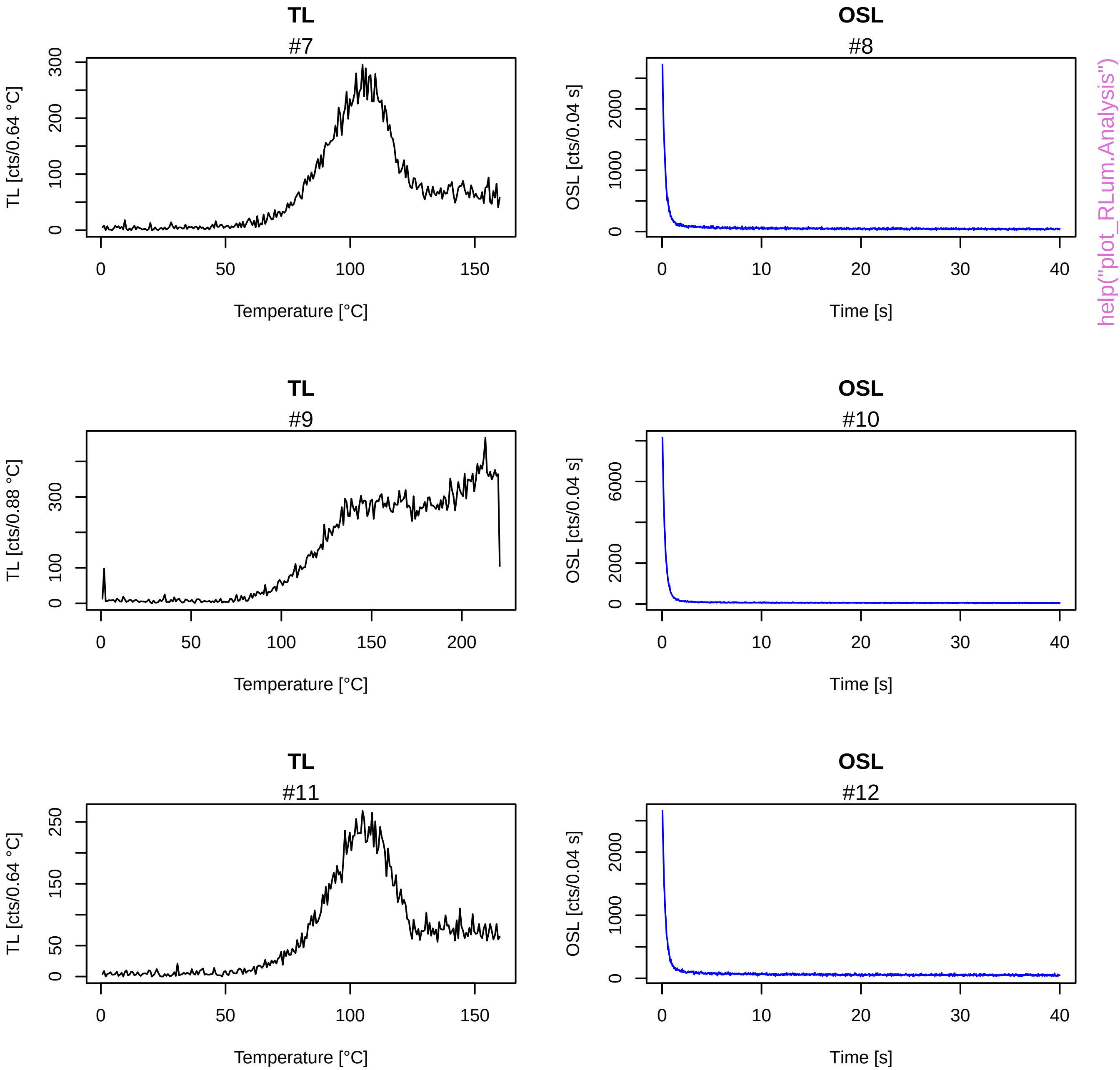


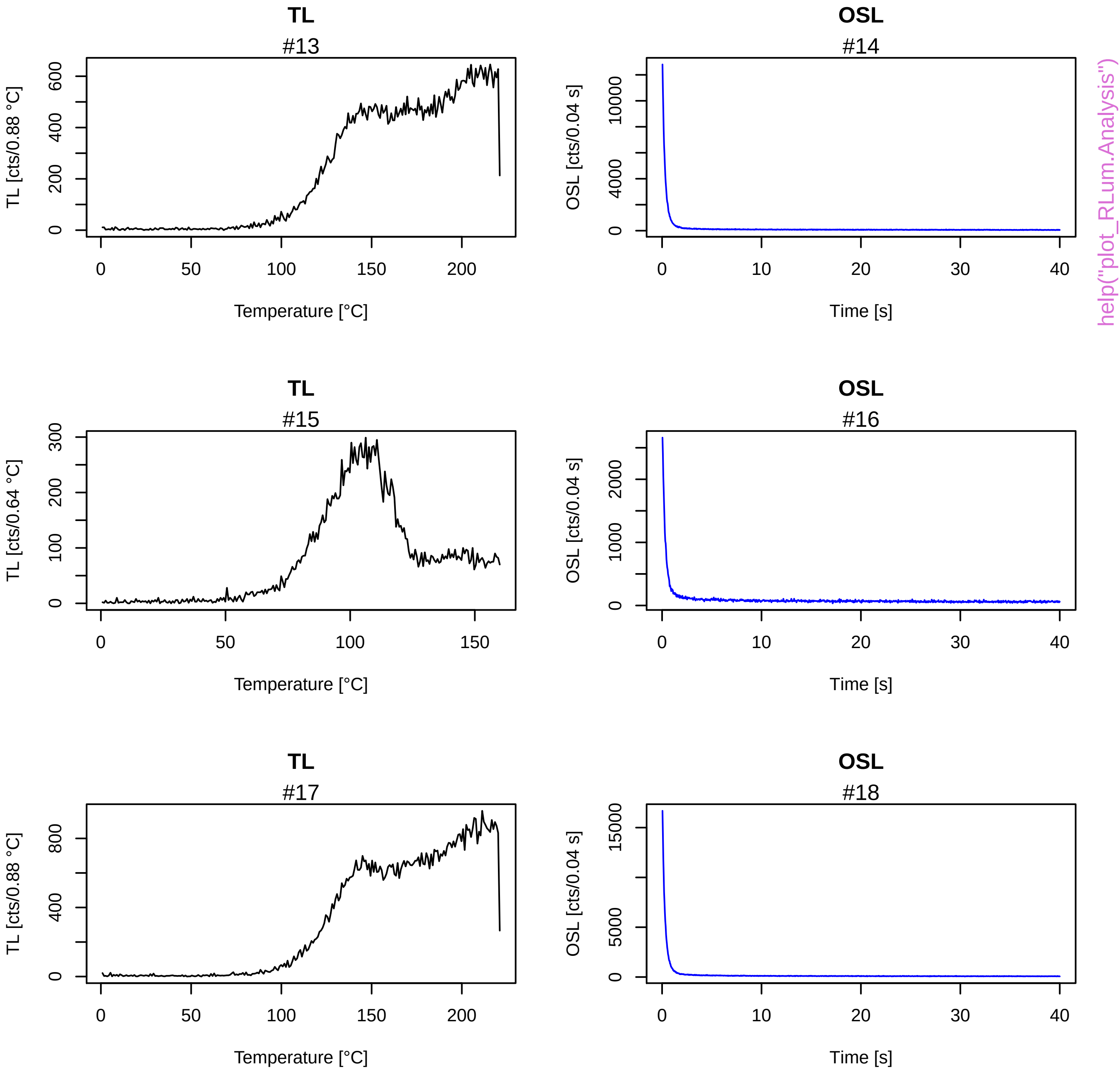
Aliquot #17
Aliquot #18
Aliquot #19
Aliquot #20
Natural signal / Regenerated signal
Time [s]
N/R1
N/R2
N/R3
N/R4
help("plot_NRt")

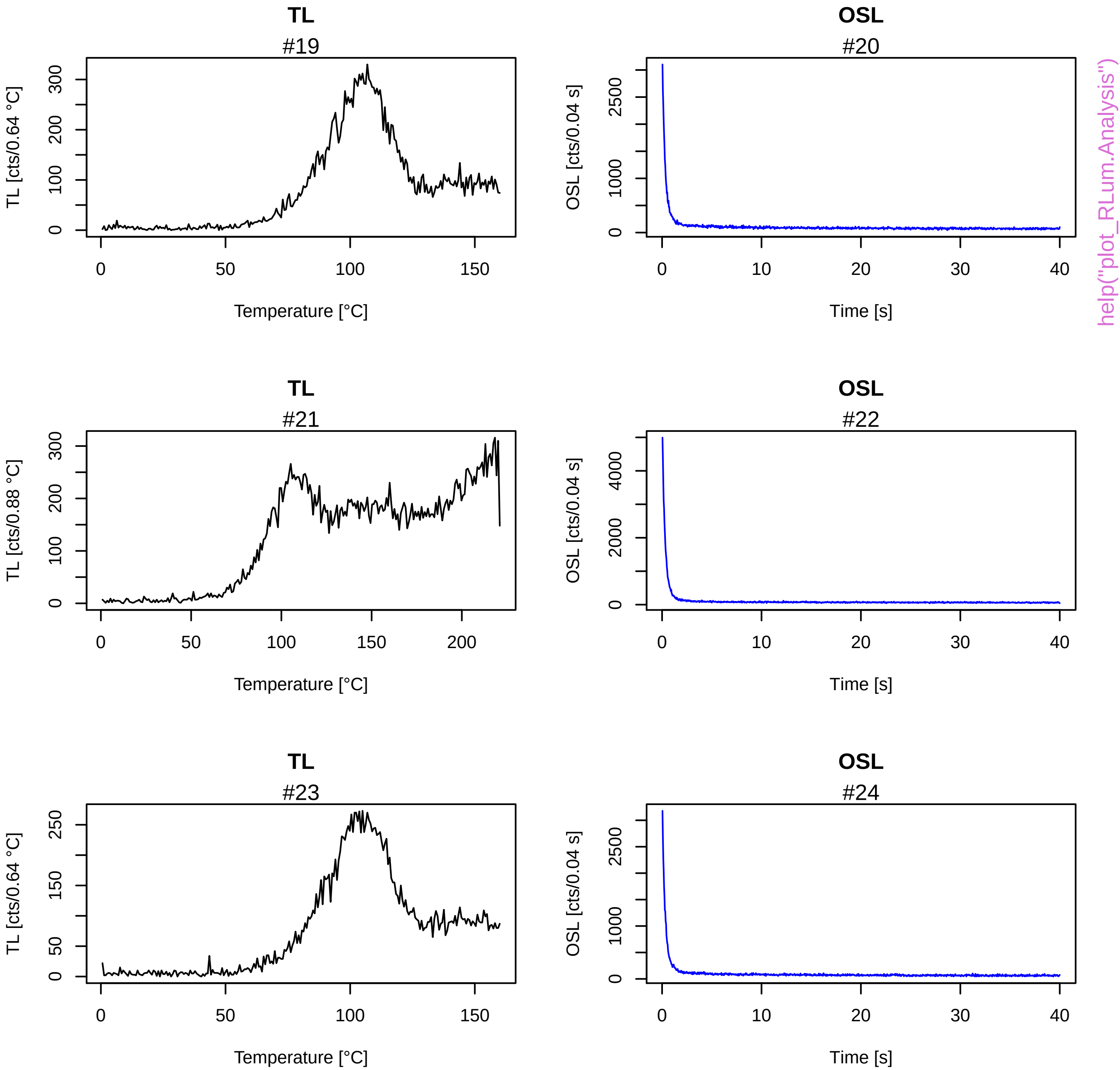

Aliquot #21
Aliquot #22
Aliquot #23
Aliquot #24
Natural signal / Regenerated signal
Time [s]
N/R1
N/R2
N/R3
N/R4
help("plot_NRt")
0
2
4
6
8
10
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0.2
1.2



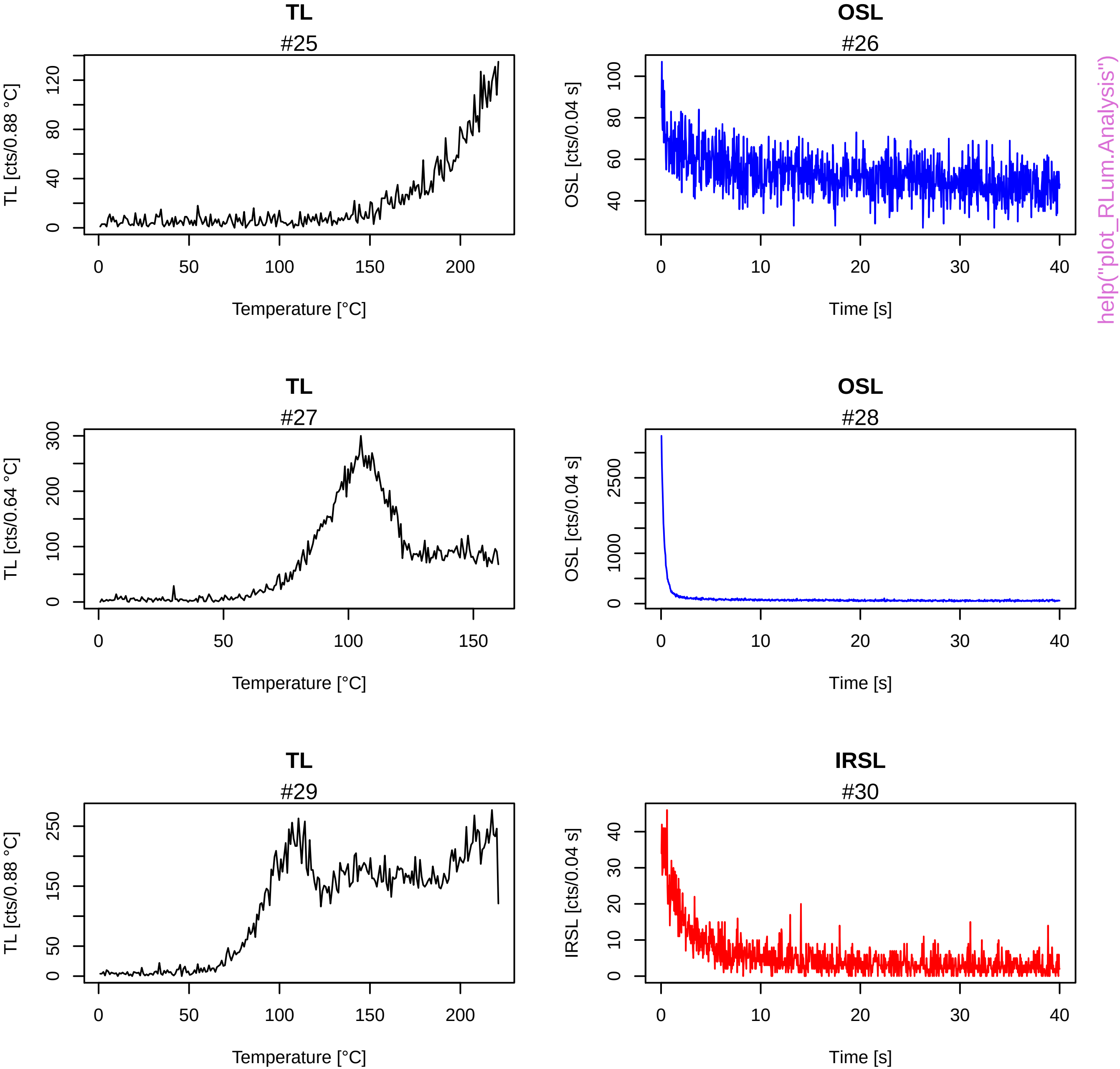
TL
#1
TL [cts/0.88 °C]
Temperature [°C]
OSL
#2
OSL [cts/0.04 s]
Time [s]
help("plot_RLum.Analysis")
TL
#3
TL [cts/0.64 °C]
Temperature [°C]
OSL
#4
OSL [cts/0.04 s]
Time [s]
TL
#5
TL [cts/0.88 °C]
Temperature [°C]
OSL
#6
OSL [cts/0.04 s]
Time [s]


TL
#7
TL [cts/0.64 °C]
Temperature [°C]
OSL
#8
OSL [cts/0.04 s]
Time [s]
TL
#9
TL [cts/0.88 °C]
Temperature [°C]
OSL
#10
OSL [cts/0.04 s]
Time [s]
TL
#11
TL [cts/0.64 °C]
Temperature [°C]
OSL
#12
OSL [cts/0.04 s]
Time [s]
help("plot_RLum.Analysis")

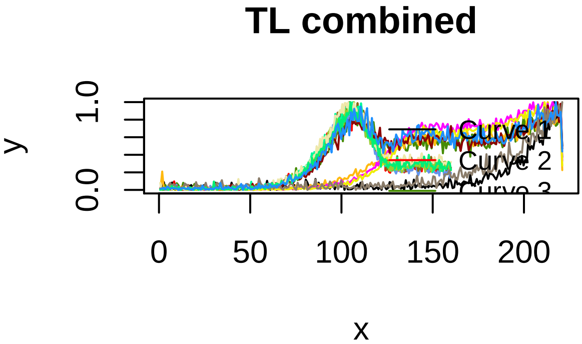

TL
#13
TL [cts/0.88 °C]
0
200
400
600
0
50
100
150
200
Temperature [°C]
OSL
#14
OSL [cts/0.04 s]
0
4000
10000
0
10
20
30
40
Time [s]
help("plot_RLum.Analysis")
TL
#15
TL [cts/0.64 °C]
0
100
200
300
0
50
100
150
Temperature [°C]
OSL
#16
OSL [cts/0.04 s]
0
1000
2000
0
10
20
30
40
Time [s]
TL
#17
TL [cts/0.88 °C]
0
400
800
0
50
100
150
200
Temperature [°C]
OSL
#18
OSL [cts/0.04 s]
0
5000
15000
0
10
20
30
40
Time [s]

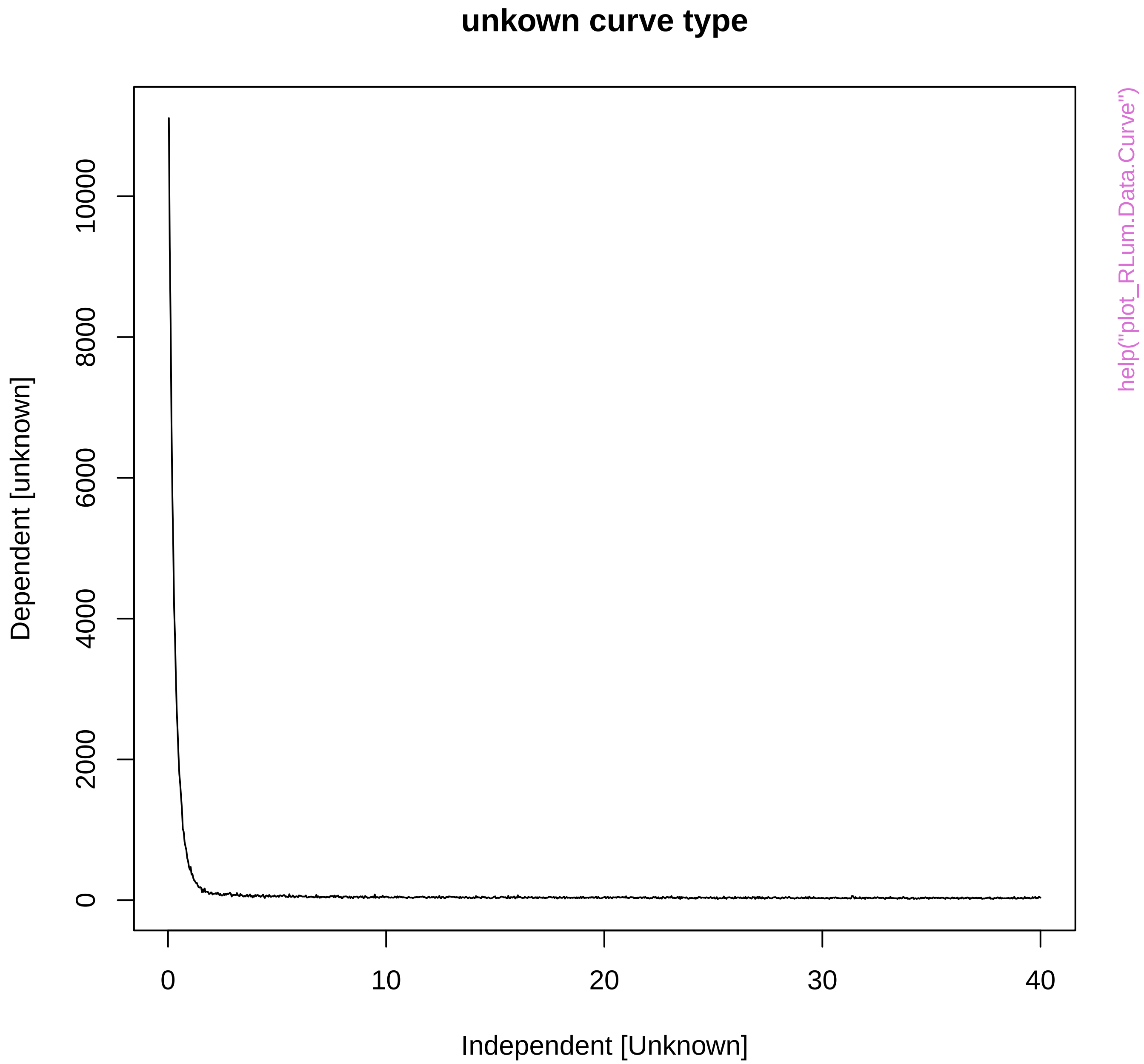


TL
#19
TL [cts/0.64 °C]
0
100
200
300
0
50
100
150
Temperature [°C]
OSL
#20
OSL [cts/0.04 s]
0
1000
2500
0
10
20
30
40
Time [s]
help("plot_RLum.Analysis")
TL
#21
TL [cts/0.88 °C]
0
100
200
300
0
50
100
150
200
Temperature [°C]
OSL
#22
OSL [cts/0.04 s]
0
2000
4000
0
10
20
30
40
Time [s]
TL
#23
TL [cts/0.64 °C]
0
50
150
250
0
50
100
150
Temperature [°C]
OSL
#24
OSL [cts/0.04 s]
0
1000
2500
0
10
20
30
40
Time [s]

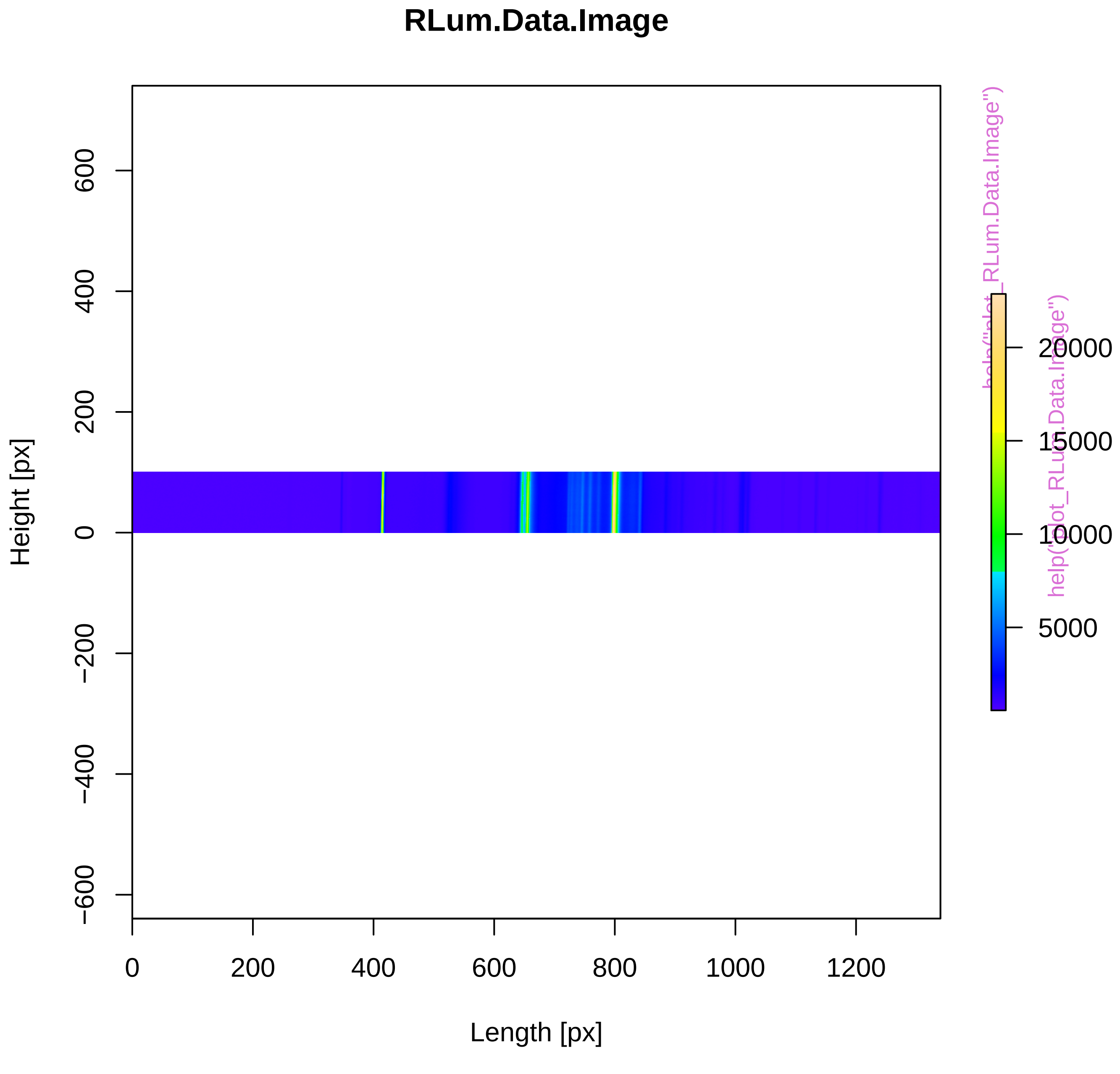


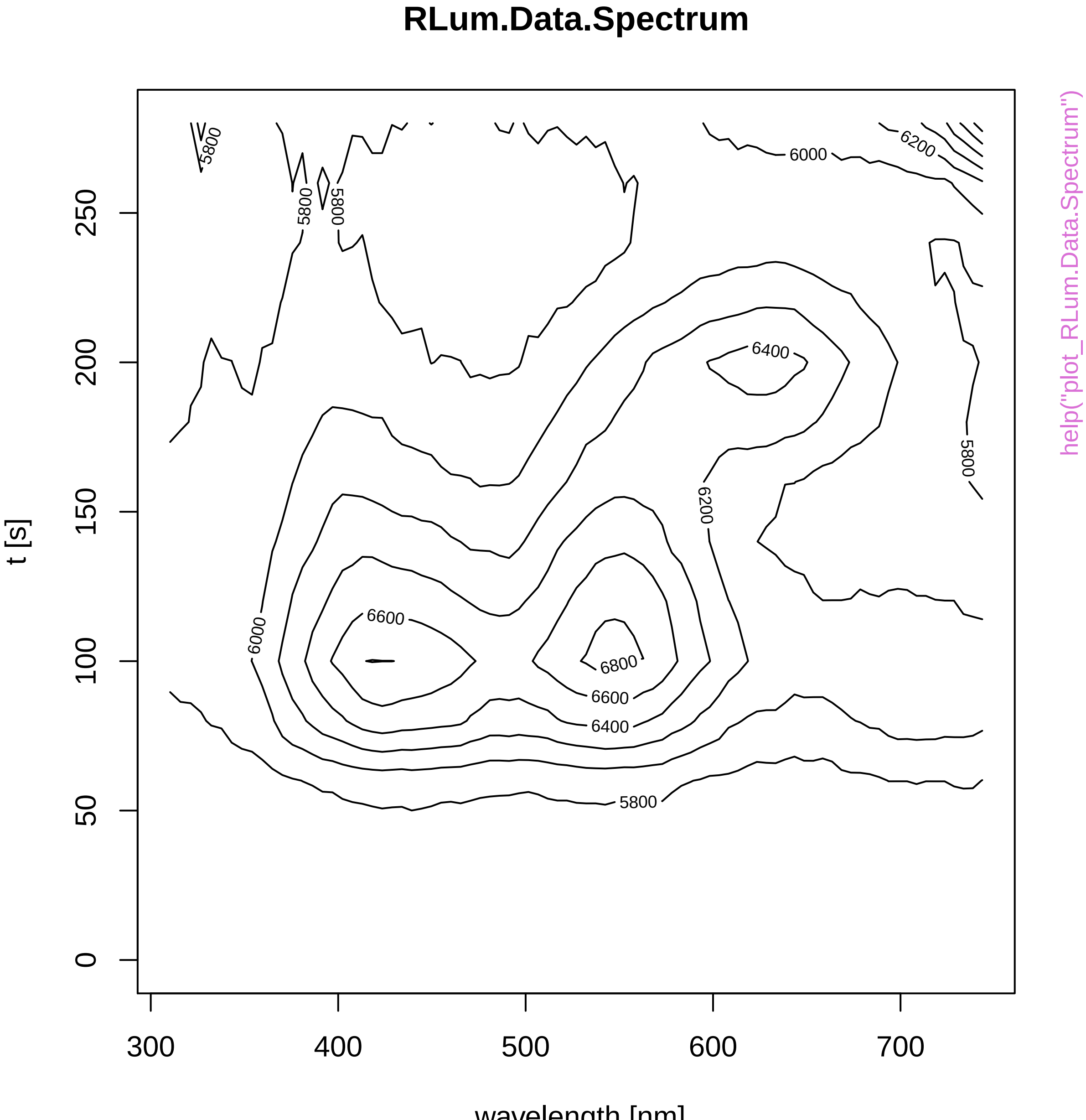
TL
#25
TL [cts/0.88 °C]
0
40
80
120
0
50
100
150
200
Temperature [°C]
OSL
#26
OSL [cts/0.04 s]
40
60
80
100
0
10
20
30
40
Time [s]
help("plot_RLum.Analysis")
TL
#27
TL [cts/0.64 °C]
0
100
200
300
0
50
100
150
Temperature [°C]
OSL
#28
OSL [cts/0.04 s]
0
1000
2500
0
10
20
30
40
Time [s]
TL
#29
TL [cts/0.88 °C]
0
50
150
250
0
50
100
150
200
Temperature [°C]
IRSL
#30
IRSL [cts/0.04 s]
0
10
20
30
40
0
10
20
30
40
Time [s]


TL combined
y
x
0.0
1.0
0
50
100
150
200
Curve 1
Curve 2

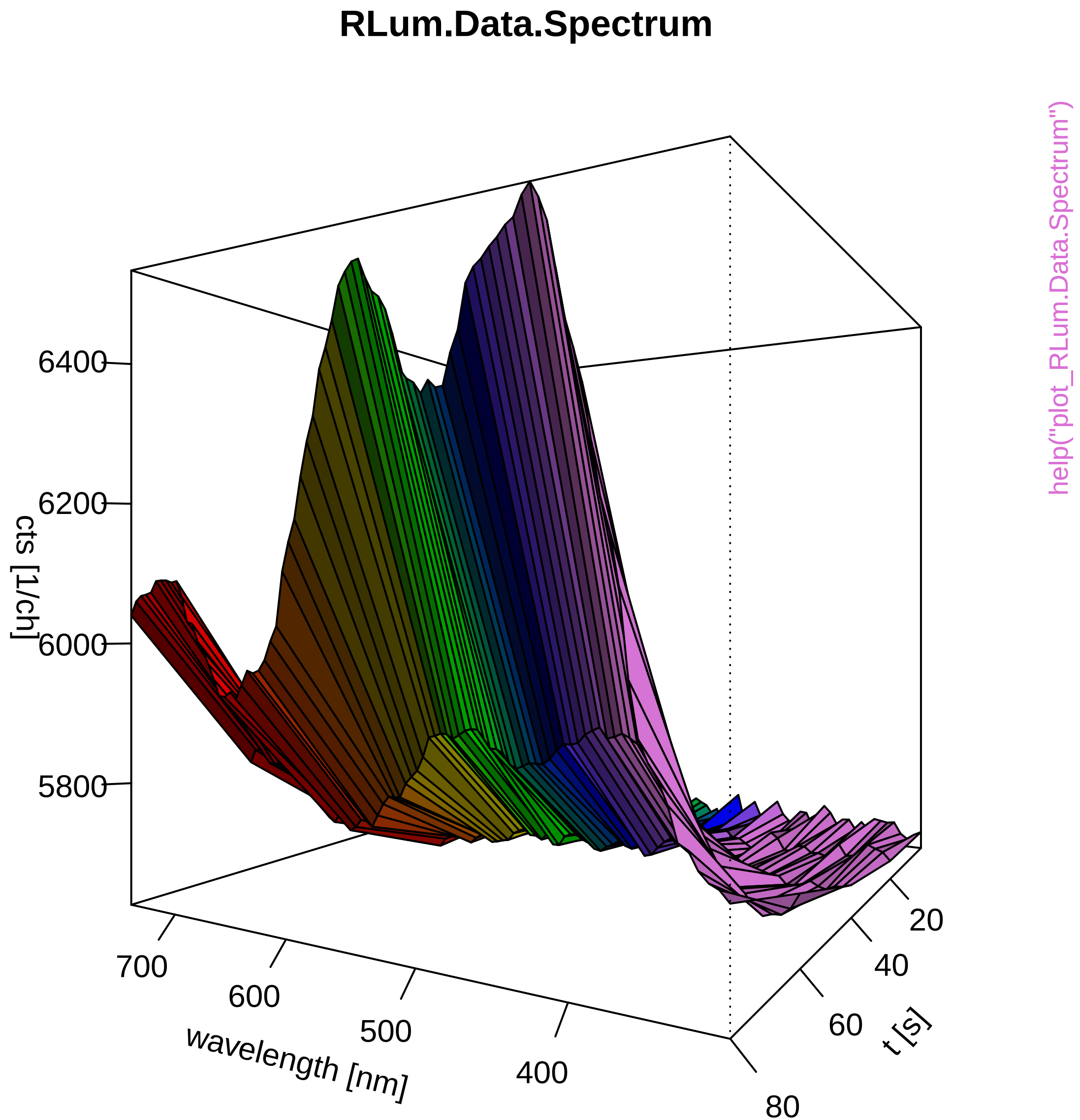


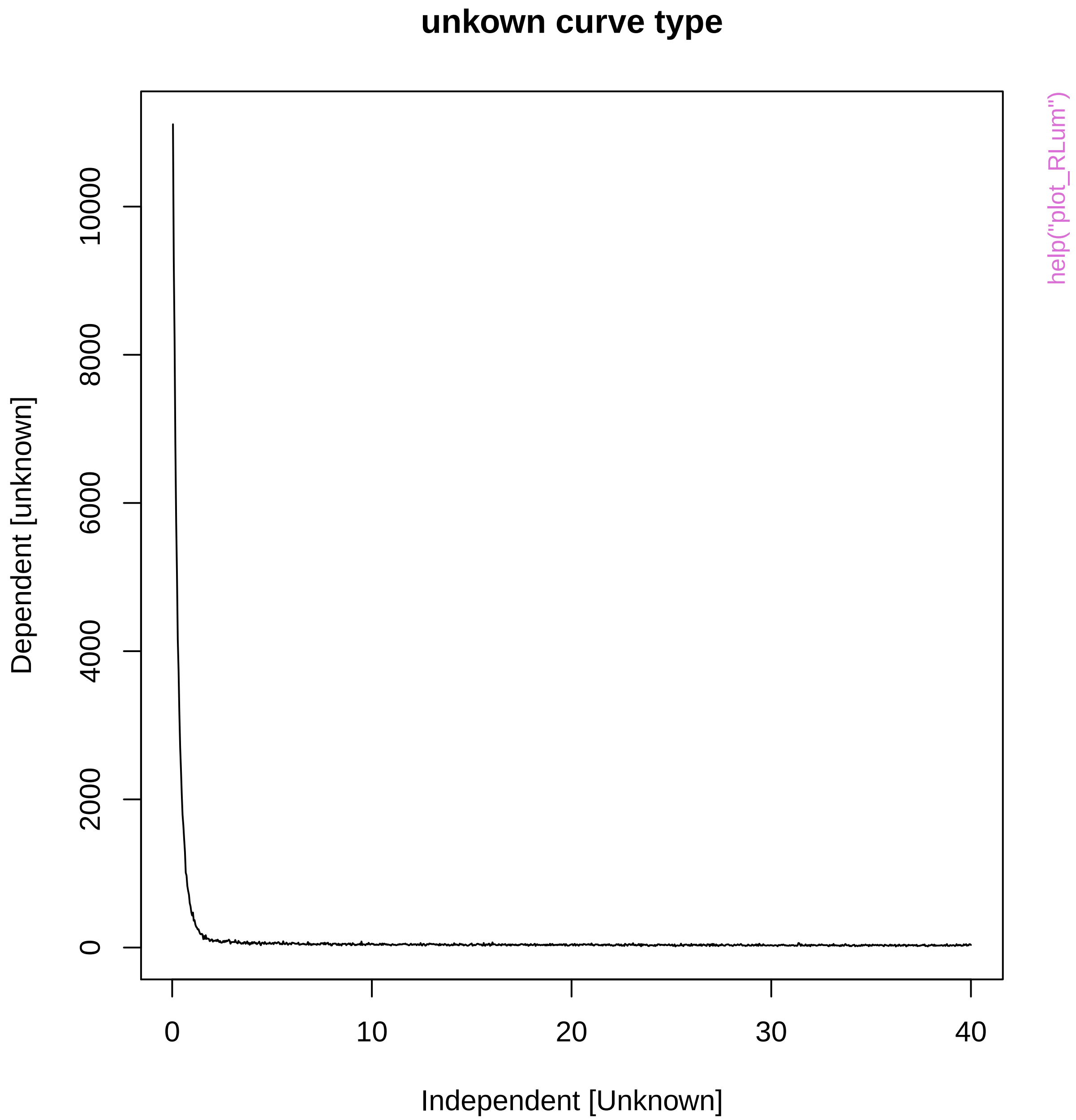
unkown curve type
Dependent [unknown]
Independent [Unknown]
0
2000
4000
6000
8000
10000
0
10
20
30
40
help("plot_RLum.Data.Curve")

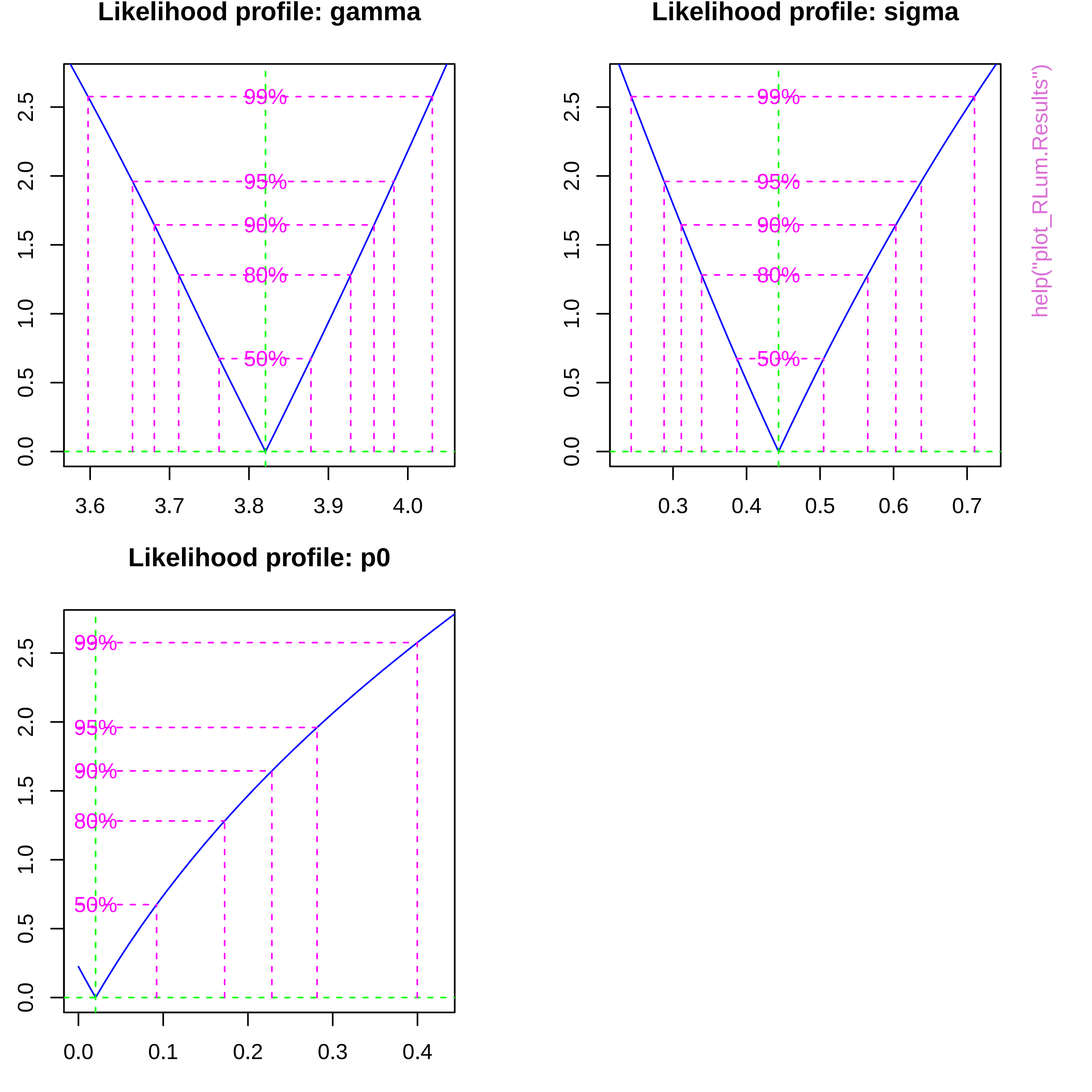

RLum.Data.Image
Height [px]
Length [px]
600
400
200
0
−200
−400
−600
0
200
400
600
800
1000
1200
20000
15000
10000
5000
help("plot_RLum.Data.Image")
help("plot_RLum.Data.Image")

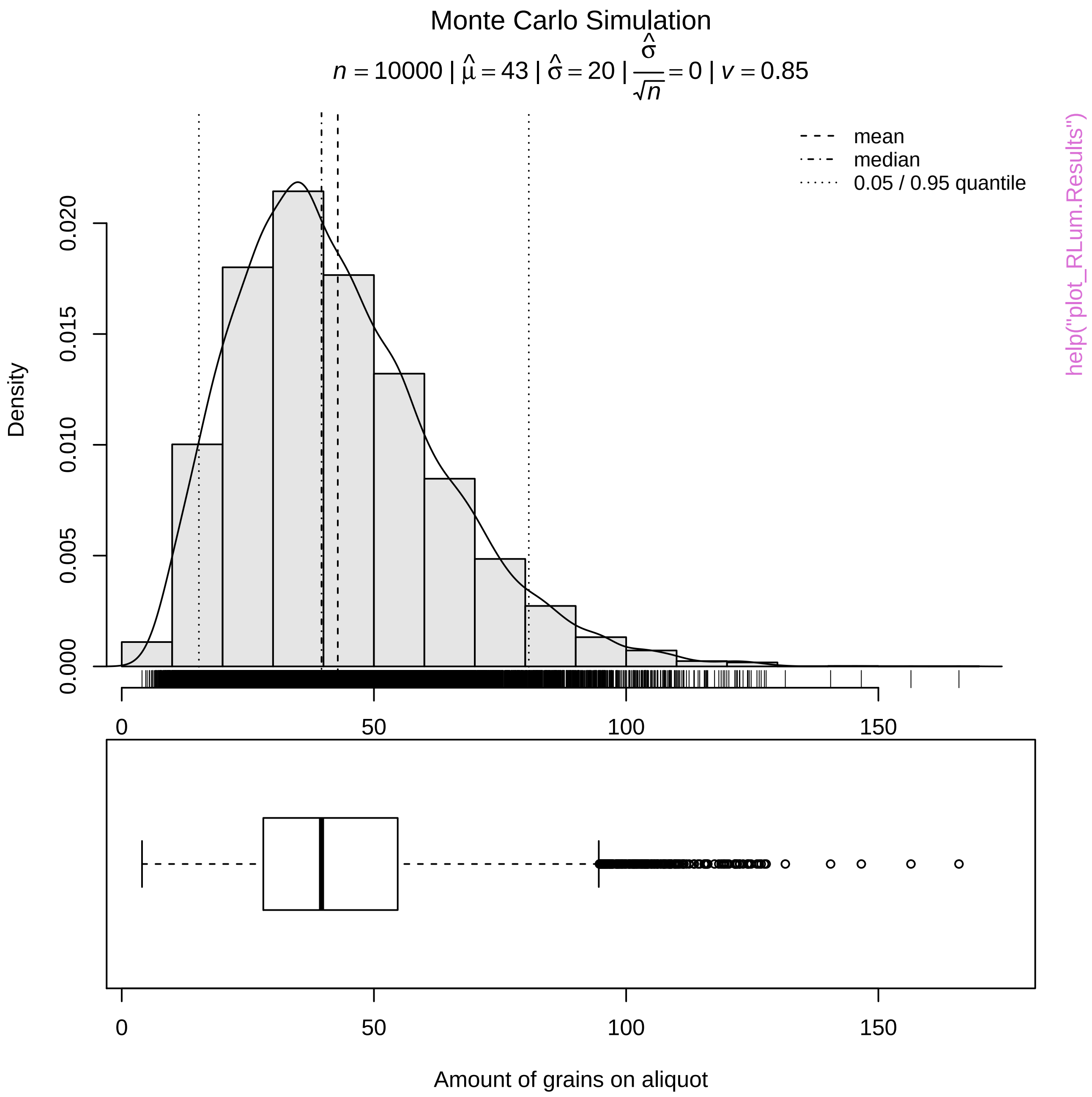


RLum.Data.Spectrum
help("plot_RLum.Data.Spectrum")
t [s]
wavelength [nm]
0
50
100
150
200
250
300
400
500
600
700
5800
6000
6200
6400
6600
6800

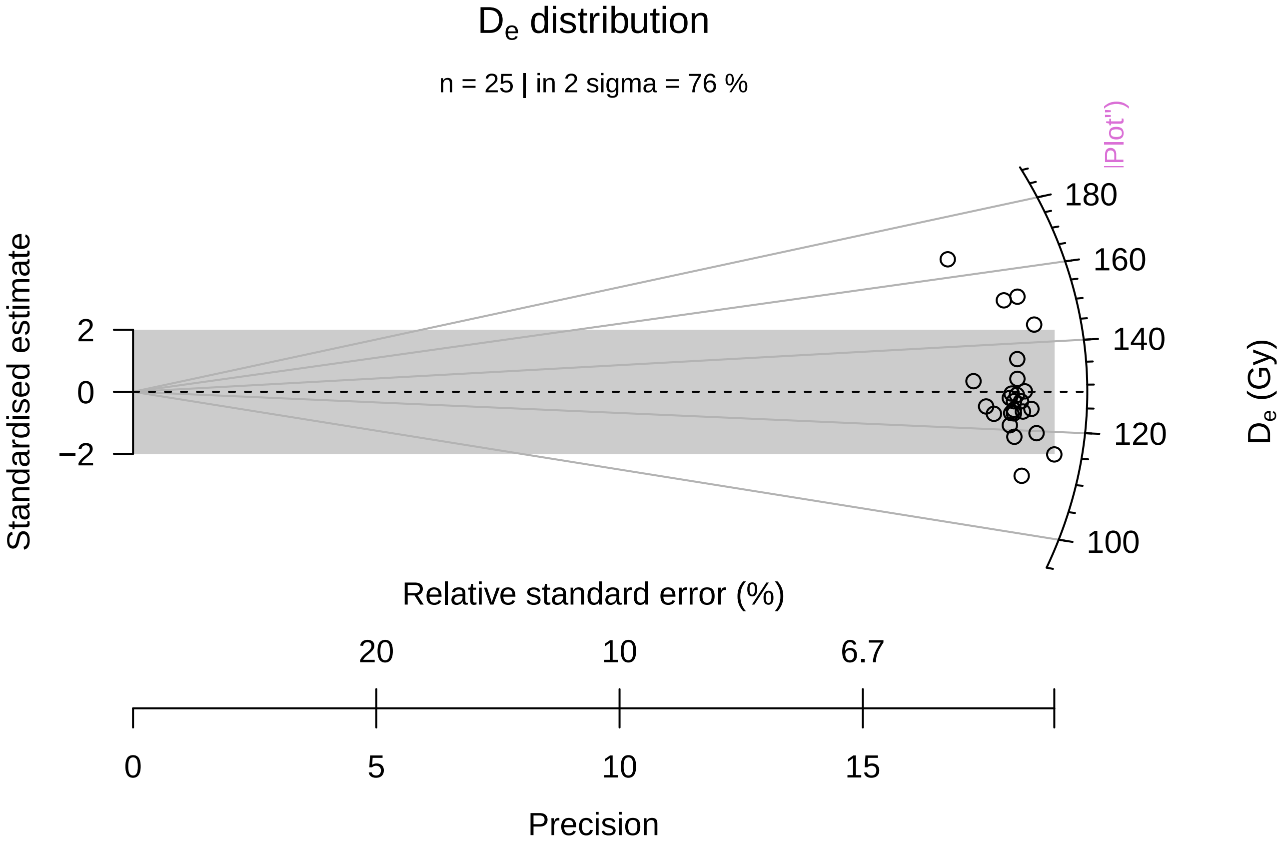

RLum.Data.Spectrum
help("plot_RLum.Data.Spectrum")
6400
6200
6000
5800
cts [1/ch]
700
600
500
400
wavelength [nm]
20
40
60
80
t [s]

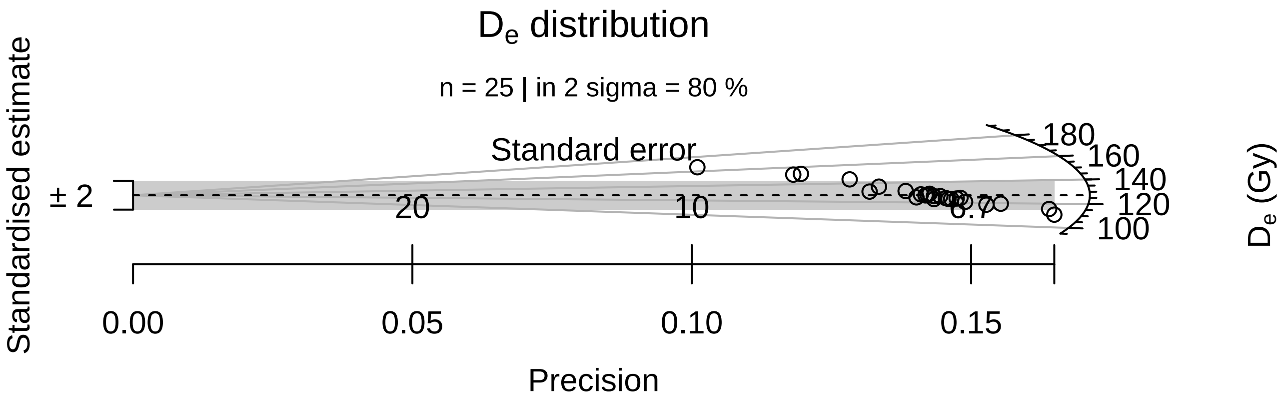

unkown curve type
Dependent [unknown]
Independent [Unknown]
0
2000
4000
6000
8000
10000
0
10
20
30
40
help("plot_RLum")

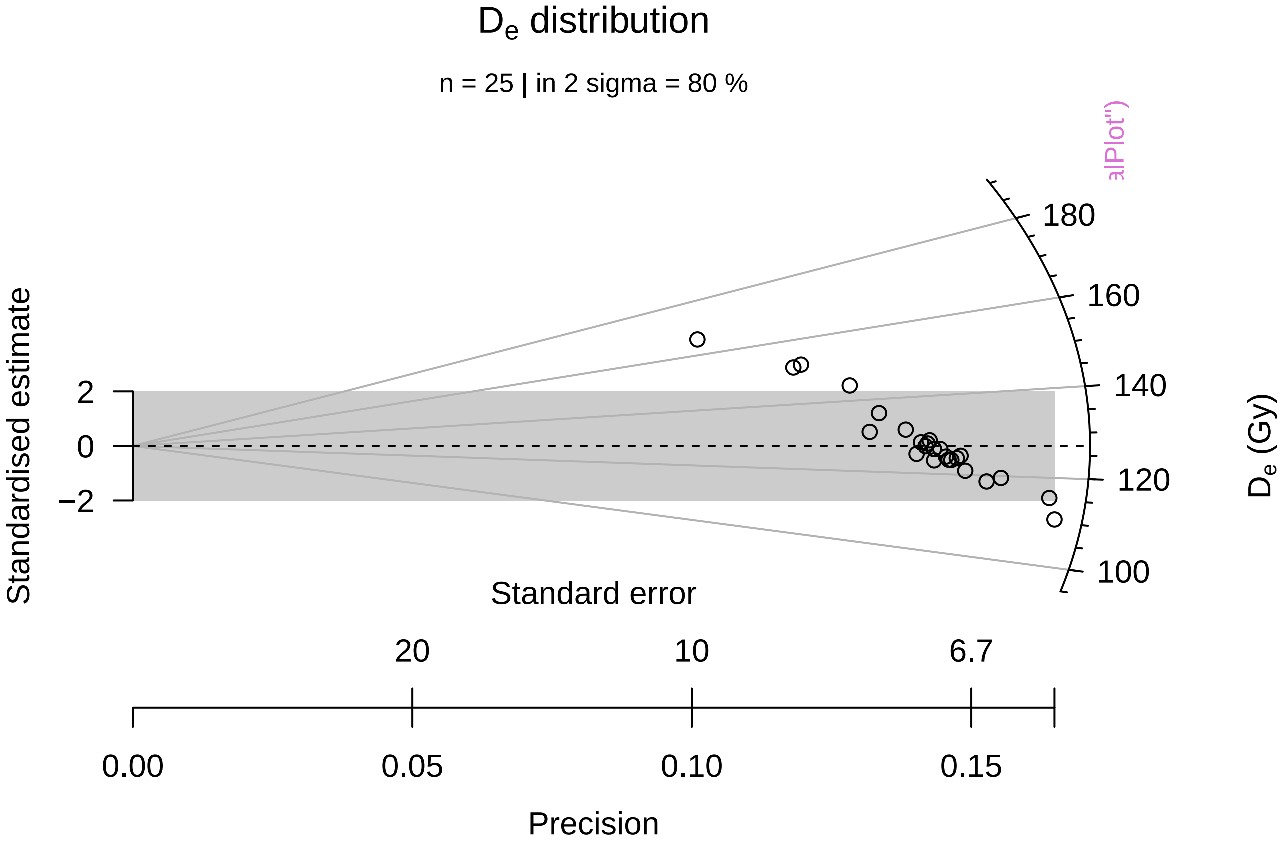

Likelihood profile: gamma
Likelihood profile: sigma
Likelihood profile: p0
99%
95%
90%
80%
50%
0.0
0.5
1.0
1.5
2.0
2.5
3.6
3.7
3.8
3.9
4.0
0.3
0.4
0.5
0.6
0.7
0.1
0.2
0.4
help("plot_RLum.Results")

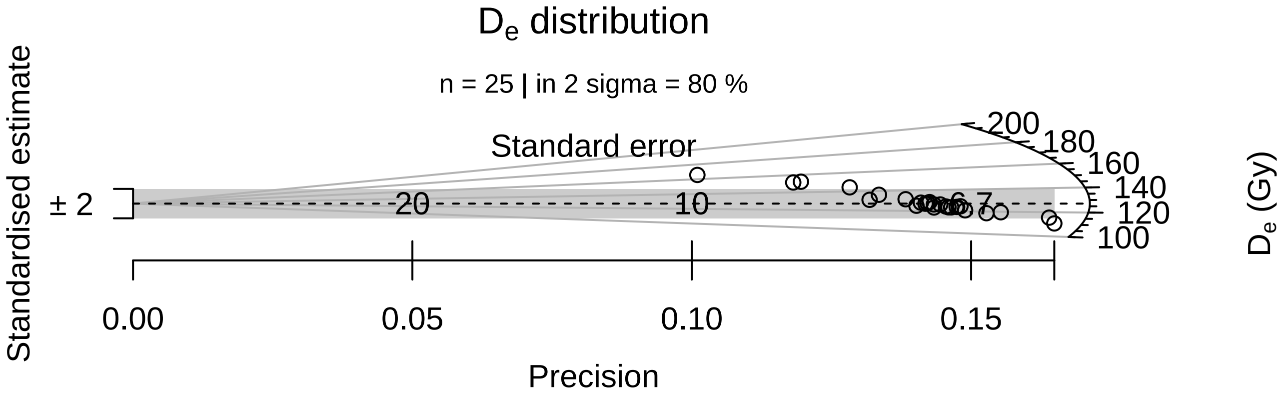


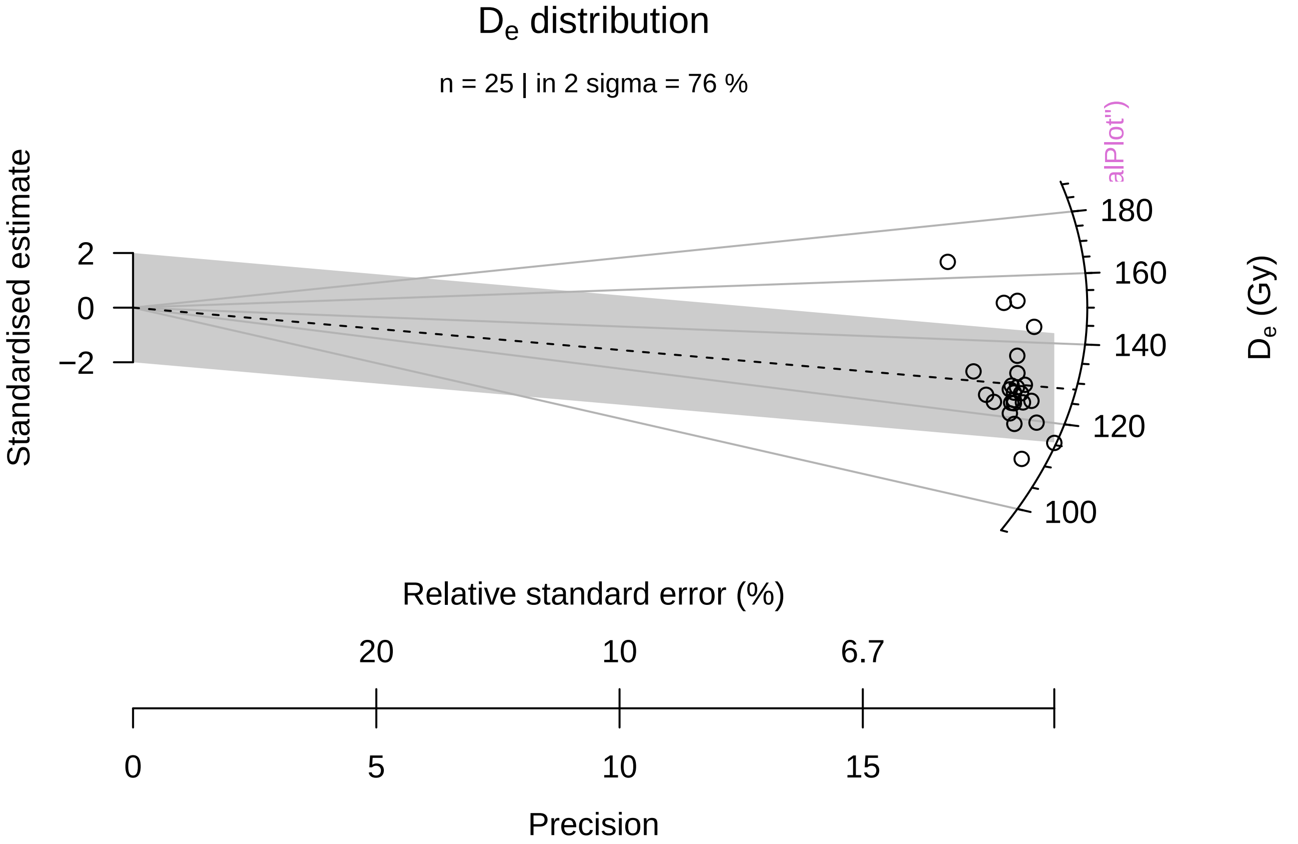
Monte Carlo Simulation
$n = 10000 \mid \hat{\mu} = 43 \mid \hat{\sigma} = 20 \mid \frac{\hat{\sigma}}{\sqrt{n}} = 0 \mid v = 0.85$
mean
median
0.05 / 0.95 quantile
help("plot_RLum.Results")
Density
0.000
0.005
0.010
0.015
0.020
0
50
100
150
Amount of grains on aliquot


De distribution
n = 25 | in 2 sigma = 76 %
|Plot")
Standardised estimate
2
0
−2
180
160
140
120
100
De (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision

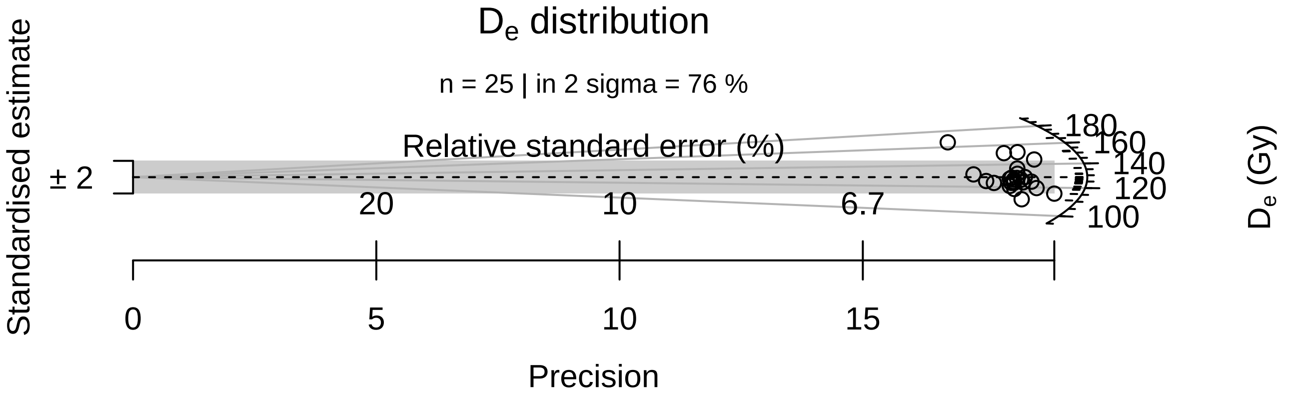

De distribution
n = 25 | in 2 sigma = 80 %
Standard error
Standardised estimate
± 2
20
10
6.7
180
160
140
120
100
De (Gy)
0.00
0.05
0.10
0.15
Precision


De distribution
n = 25 | in 2 sigma = 80 %
alPlot")
Standardised estimate
2
0
−2
180
160
140
120
100
De (Gy)
Standard error
20
10
6.7
0.00
0.05
0.10
0.15
Precision

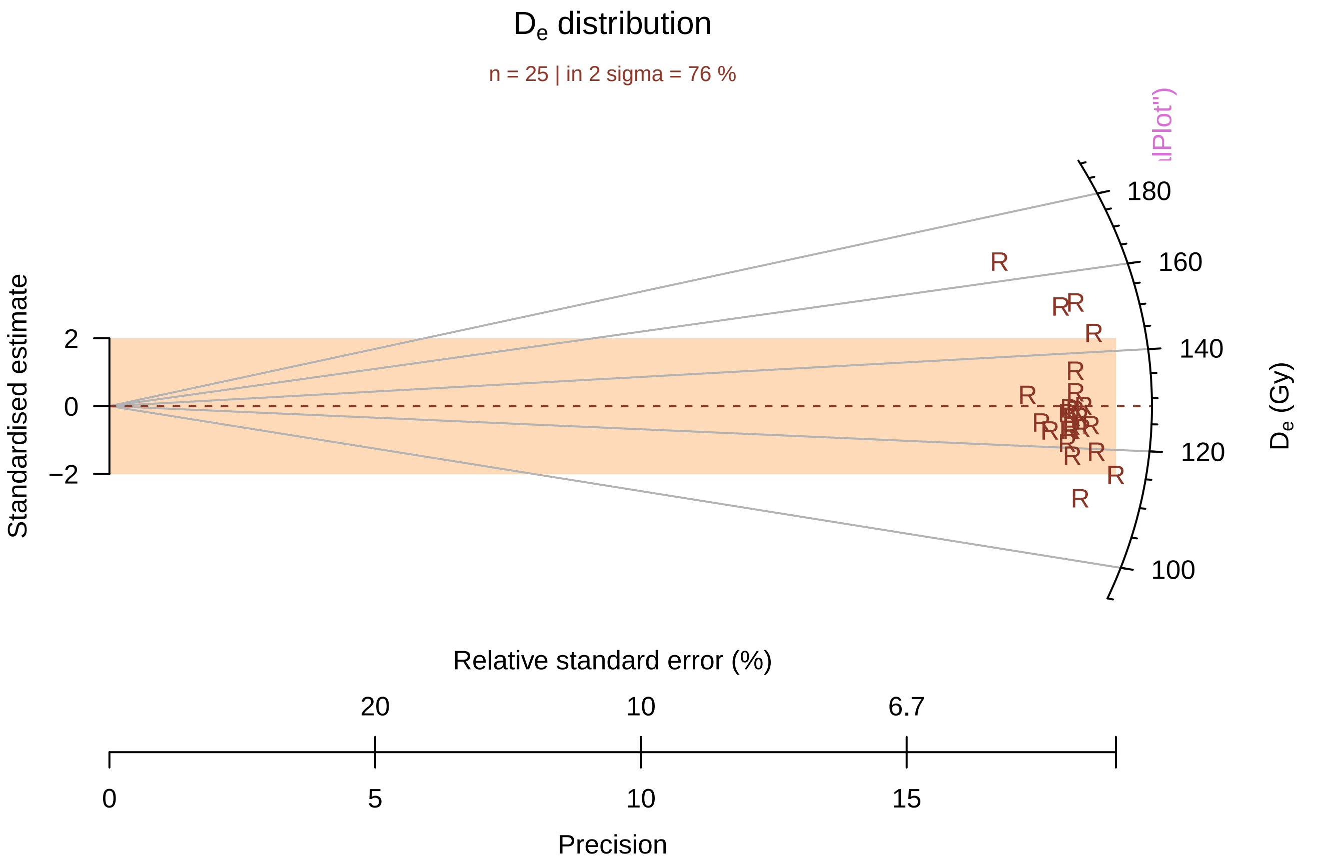

De distribution
n = 25 | in 2 sigma = 80 %
Standard error
Standardised estimate
± 2
20
10
6.7
200
180
160
140
120
100
De (Gy)
0.00
0.05
0.10
0.15
Precision



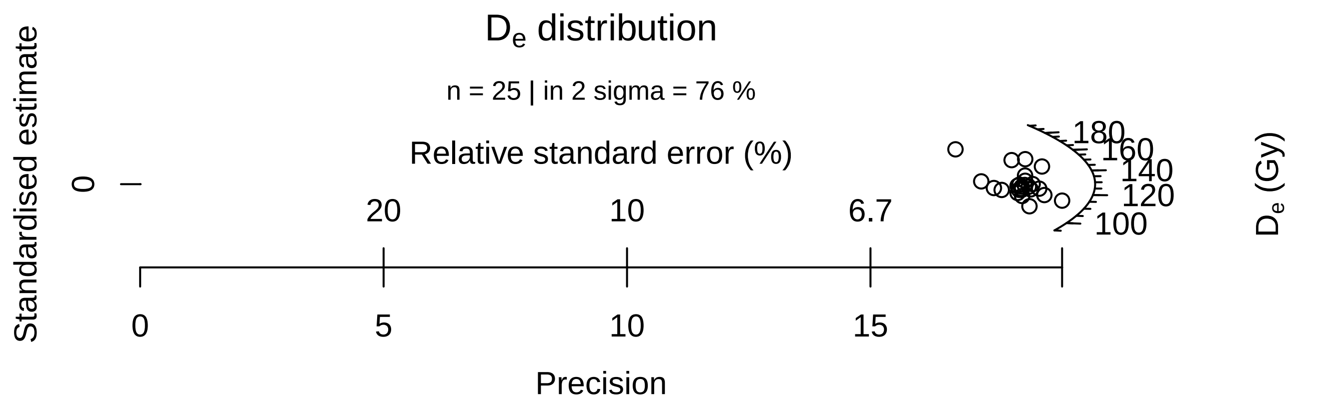
De distribution
n = 25 | in 2 sigma = 76 %
alPlot")
Standardised estimate
2
0
−2
180
160
140
120
100
De (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision



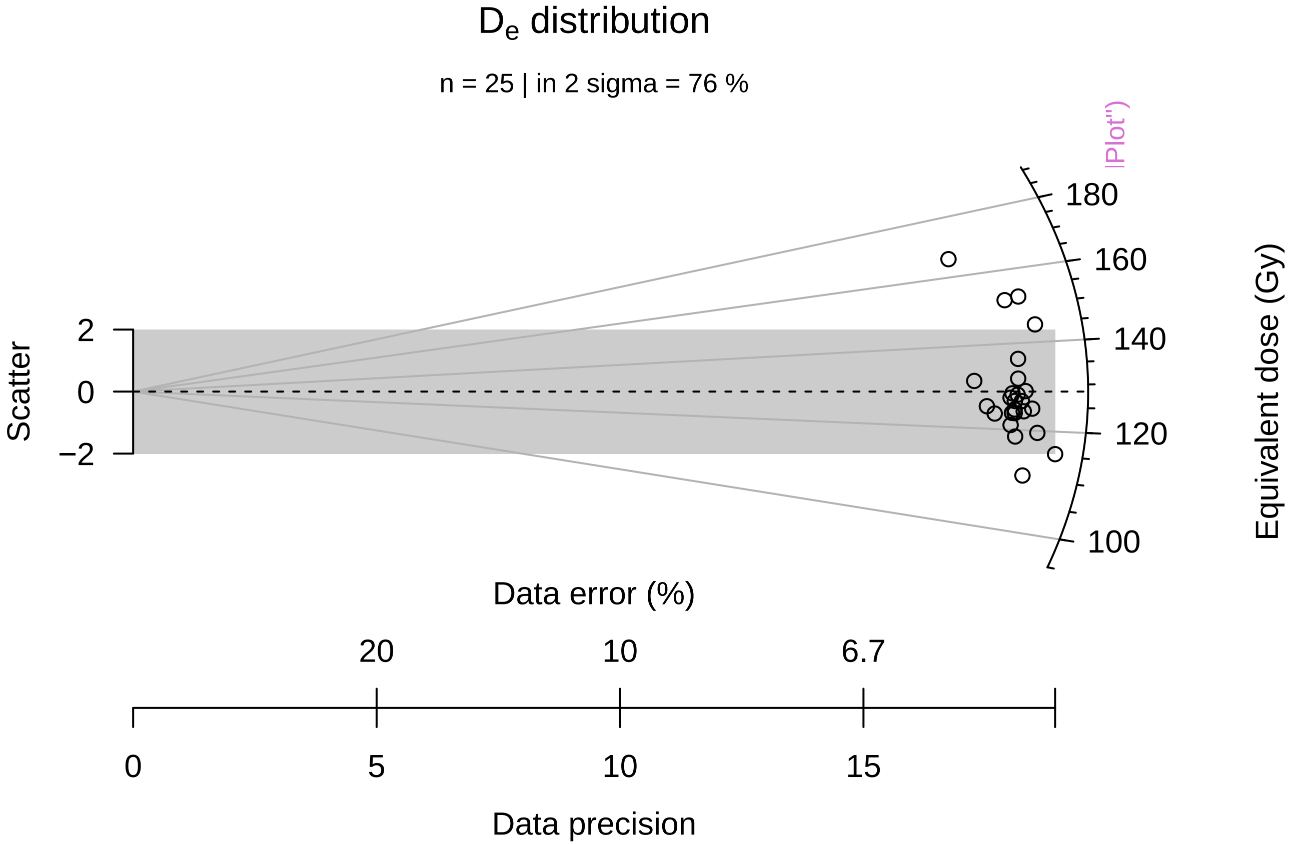
De distribution
n = 25 | in 2 sigma = 76 %
Standardised estimate
± 2
Relative standard error (%)
180
160
140
120
100
20
10
6.7
De (Gy)
0
5
10
15
Precision

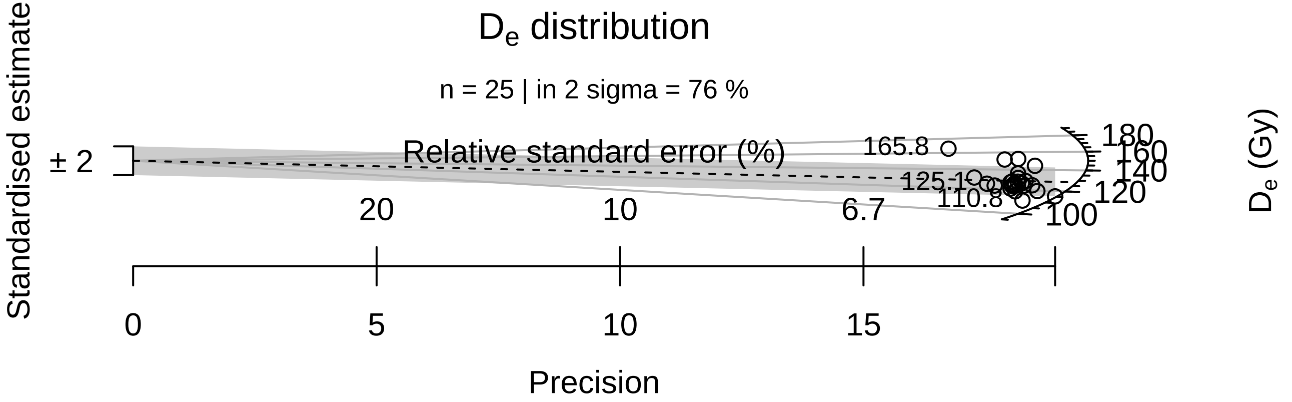


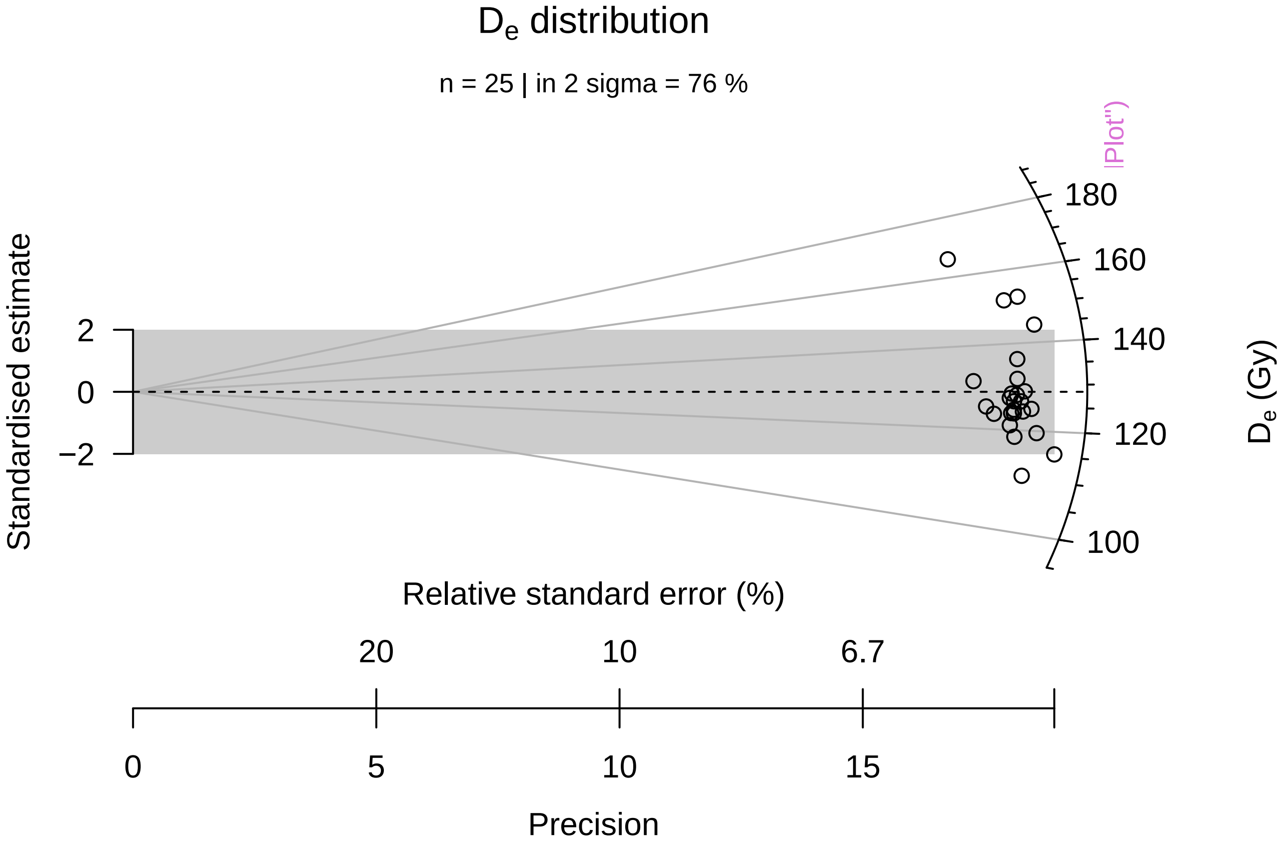
De distribution
n = 25 | in 2 sigma = 76 %
lPlot")
Standardised estimate
2
0
−2
180
160
140
120
100
De (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision

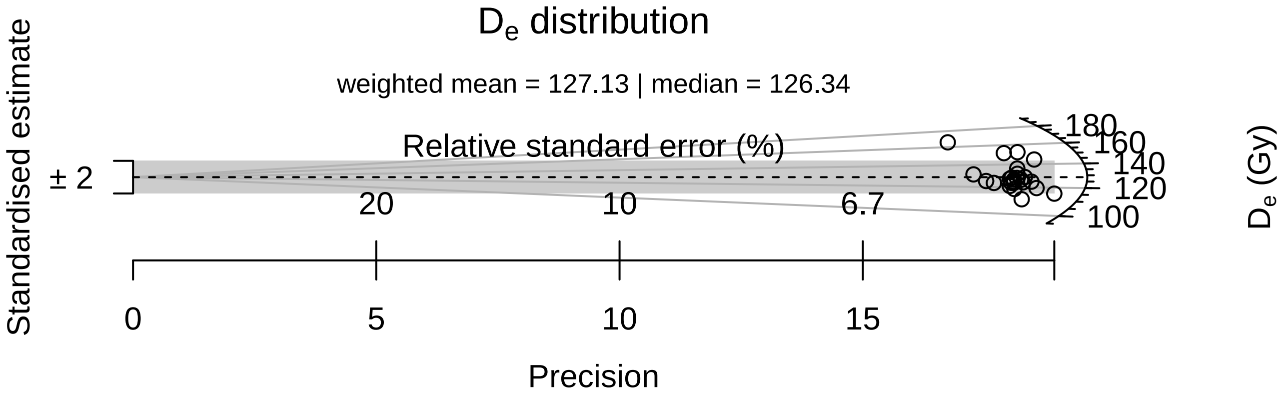


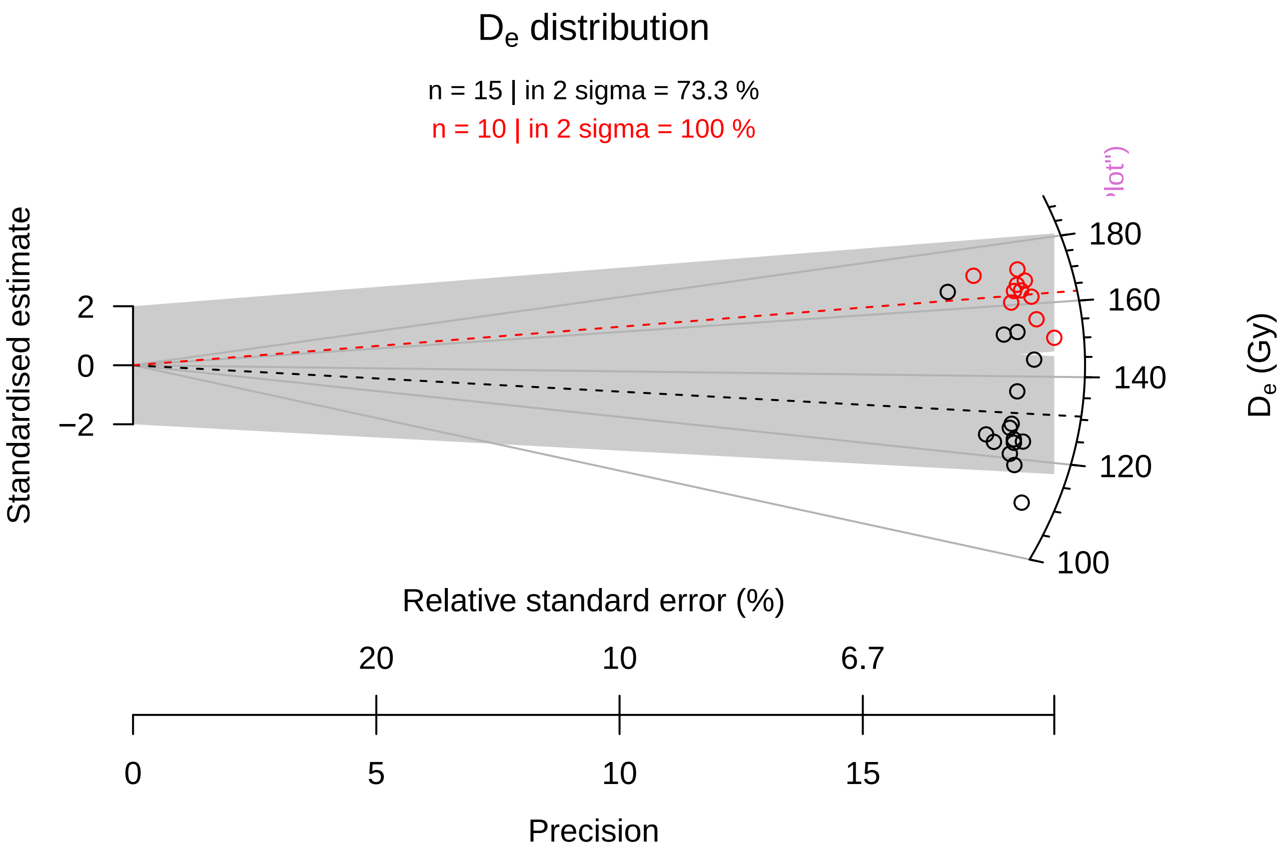
De distribution
n = 25 | in 2 sigma = 76 %
Standardised estimate
0
Relative standard error (%)
180
160
140
120
100
De (Gy)
20
10
6.7
0
5
10
15
Precision


De distribution
n = 25 | in 2 sigma = 76 %
|Plot")
Scatter
2
0
−2
180
160
140
120
100
Equivalent dose (Gy)
Data error (%)
20
10
6.7
0
5
10
15
Data precision

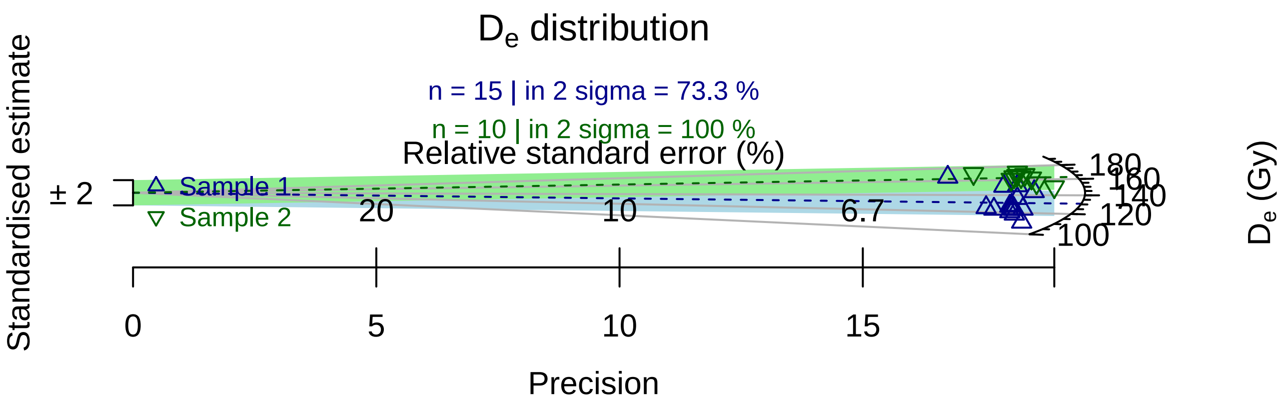

De distribution
n = 25 | in 2 sigma = 76 %
Standardised estimate
± 2
Relative standard error (%)
165.8
125.1
110.8
180
160
140
120
100
De (Gy)
20
10
6.7
0
5
10
15
Precision


De distribution
n = 25 | in 2 sigma = 76 %
|Plot")
Standardised estimate
2
0
−2
180
160
140
120
100
De (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision


De distribution
weighted mean = 127.13 | median = 126.34
Relative standard error (%)
Standardised estimate
± 2
180
160
140
120
100
De (Gy)
20
10
6.7
0
5
10
15
Precision



D_e distribution
n = 15 | in 2 sigma = 73.3 %
n = 10 | in 2 sigma = 100 %
Standardised estimate
2
0
−2
180
160
140
120
100
D_e (Gy)
Relative standard error (%)
20
10
6.7
0
5
10
15
Precision



D_e distribution
n = 15 | in 2 sigma = 73.3 %
n = 10 | in 2 sigma = 100 %
Relative standard error (%)
Standardised estimate
± 2
Sample 1
Sample 2
20
10
6.7
180
160
140
120
100
D_e (Gy)
0
5
10
15
Precision