

L_n, L_x curves

ALQ Pos. 1

T_n, T_x curves



Cutheat – TL curves



IRSLT

IRSL/BOSL = 0.88%



IRSL curve (10 s)



help("Analyse_SAR_OSLdata")

unkown measurement





Fig. 4 – Bos & Wallinga (2012)





help("CW2pLM")



Fig. 4 – Bos & Wallinga (2012)





Fig. 4 – Bos & Wallinga (2012)





Histogram



Histogram



No L_x curves detected

No T_x curves detected

help("ExampleData.Fading")

Signal Fading

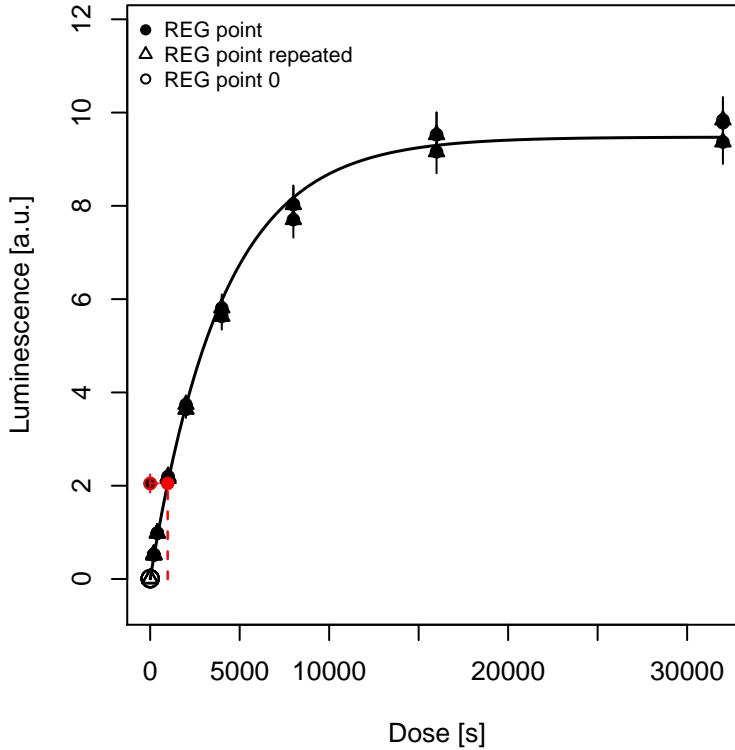


Density: g-values (%/decade)



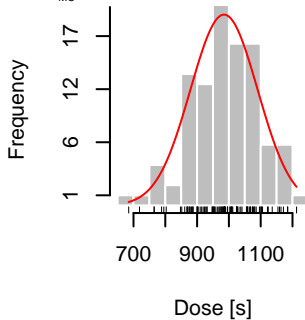
Growth curve

$D_e = 977.38 \pm 105.65$ | fit: EXP



D_e from MC simulation

$D_{eMC} = 984.66 \pm 105.65$ | quality = 99.3 %



Test dose response





`help("ExampleData.FittingLM")`



`help("ExampleData.LxTxData")`



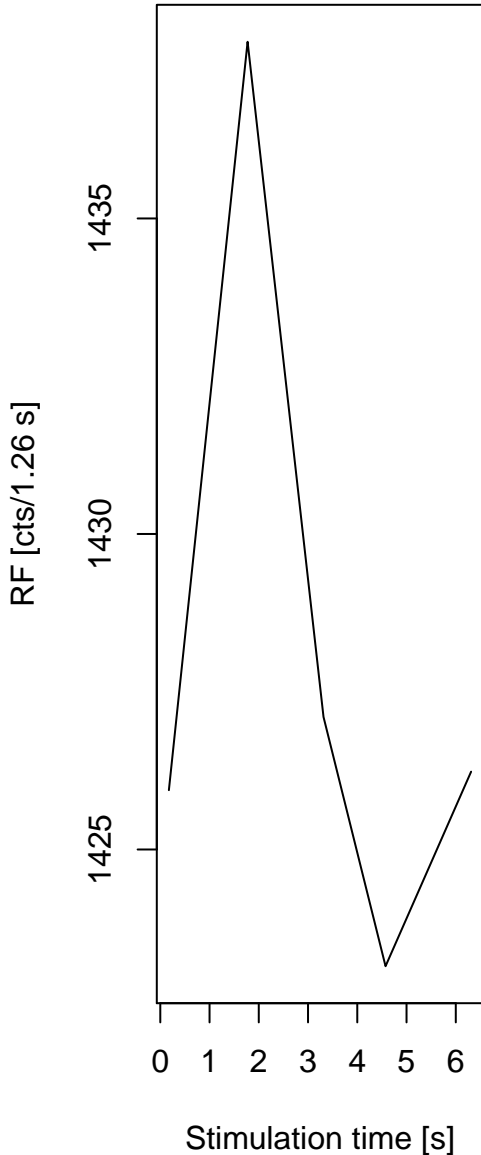
`help("ExampleData.LxTxOSLData")`



`help("ExampleData.LxTxOSLData")`

RF

#1



RF

#2



[help\("ExampleData.RLum.Analysis"\)](#)

RLum.Data.Image



OSL (UVVIS)



help("ExampleData.XSYG")

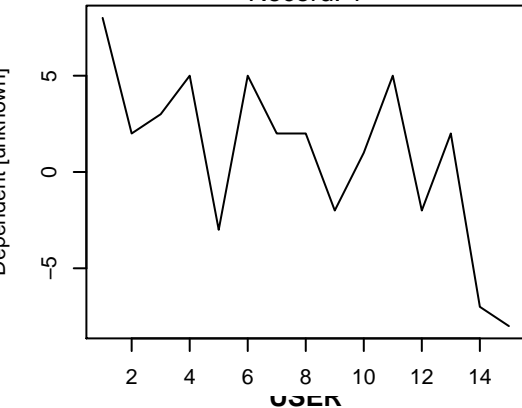
RLum.Data.Spectrum



help("ExampleData.XSYG")

USER

Record: 1



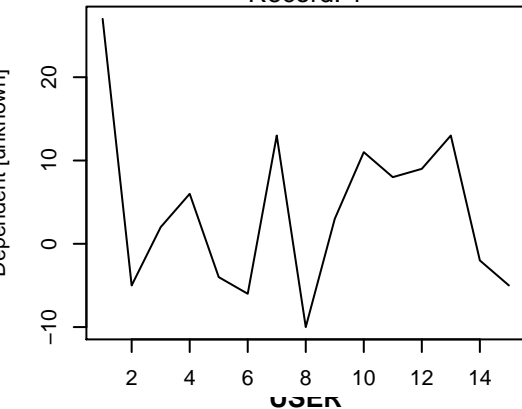
IRSL

Record: 1



help("ExampleData.portableOSL")

Record: 1



Record: 1



USER

Record: 2



IRSL

Record: 2



help("ExampleData.portableOSL")

Record: 2



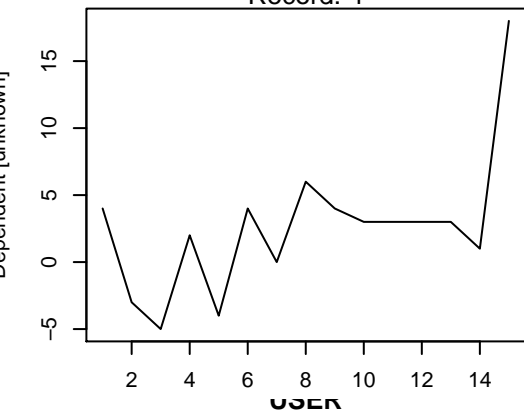
Record: 2





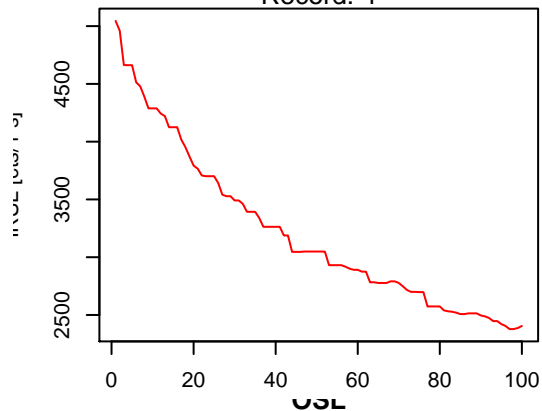
USER

Record: 4



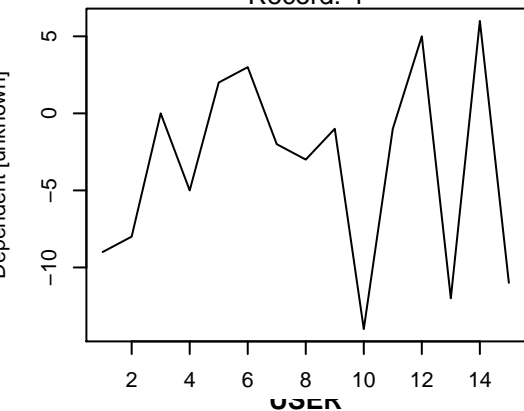
IRSL

Record: 4

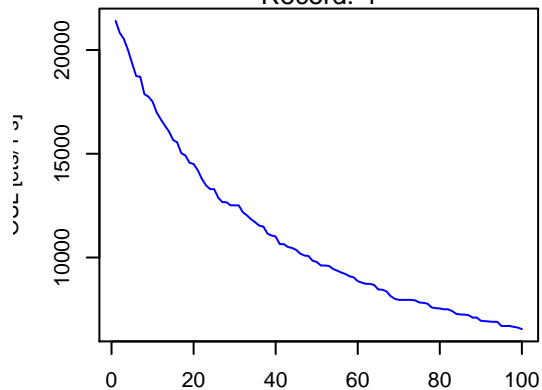


help("ExampleData.portableOSL")

Record: 4



Record: 4





USER

Record: 6



IRSL

Record: 6



help("ExampleData.portableOSL")

Record: 6



Record: 6



Record: 6



USER

Record: 7



IRSL

Record: 7



help("ExampleData.portableOSL")

Record: 7



Record: 7





USER

Record: 9



IRSL

Record: 9



help("ExampleData.portableOSL")

Record: 9



Record: 9



USER

Record: 10



IRSL

Record: 10

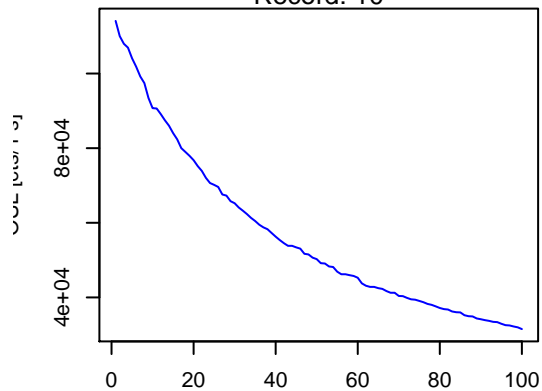


help("ExampleData.portableOSL")

Record: 10



Record: 10





USER

Record: 12



IRSL

Record: 12



help("ExampleData.portableOSL")

Record: 12



Record: 12

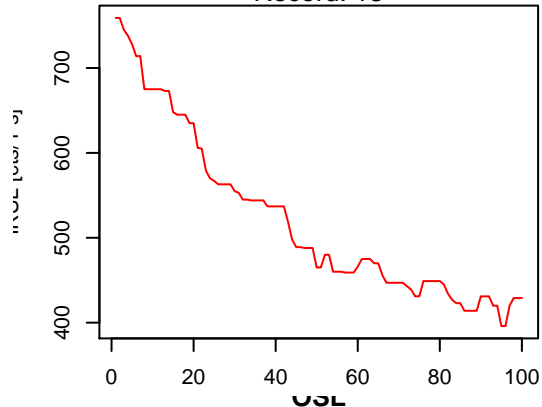


USER

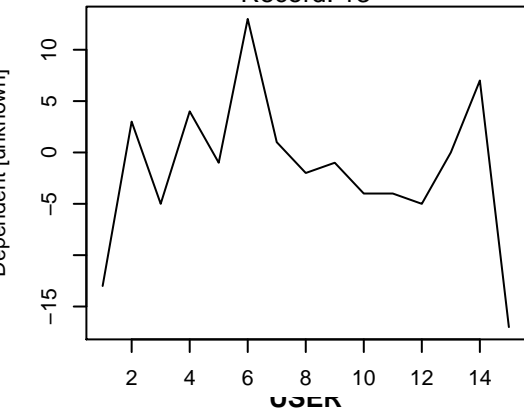
Record: 13



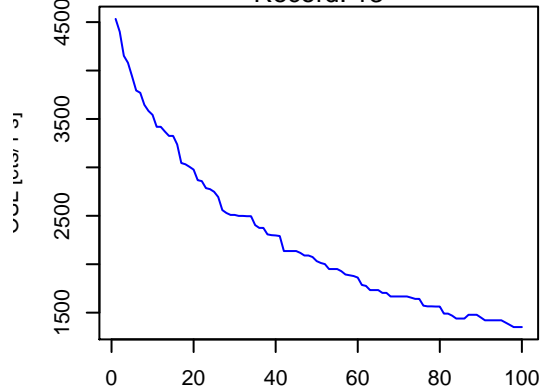
Record: 13



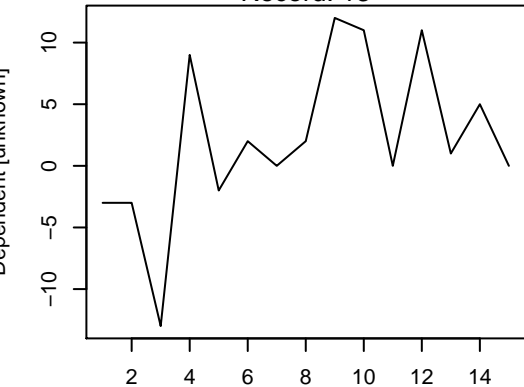
Record: 13



Record: 13



Record: 13



help("ExampleData.portableOSL")

USER

Record: 14



IRSL

Record: 14



help("ExampleData.portableOSL")

Record: 14



Record: 14



USER

Record: 1



IRSL

Record: 1



help("PSL2Riseo.BinfileData")

Record: 1



Record: 1



USER

Record: 2



IRSL

Record: 2



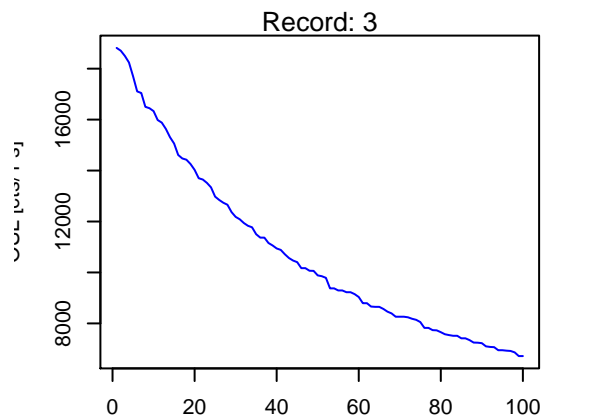
help("PSL2Riseo.BinfileData")

Record: 2



Record: 2



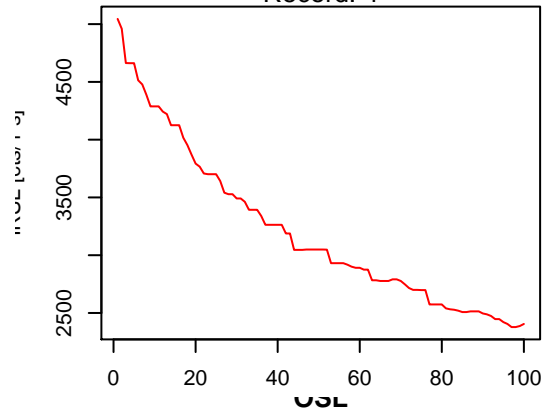


USER

Record: 4

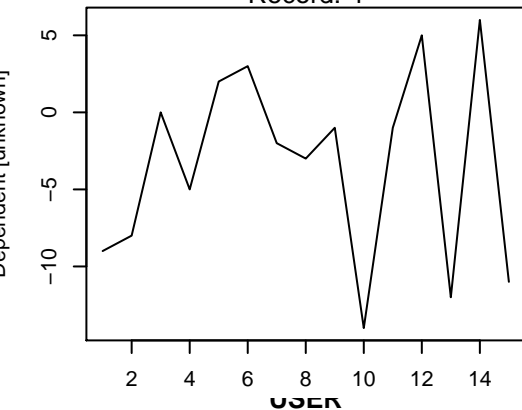


Record: 4

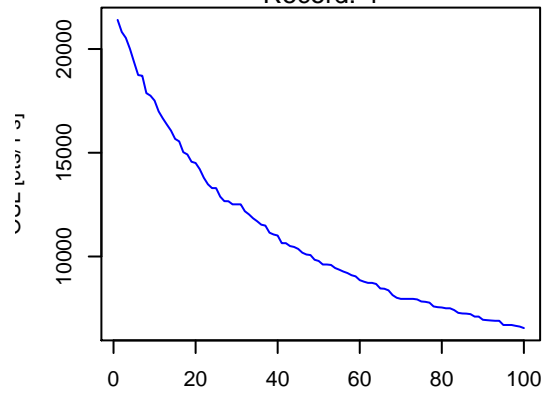


help("PSL2Risee.BINfileData")

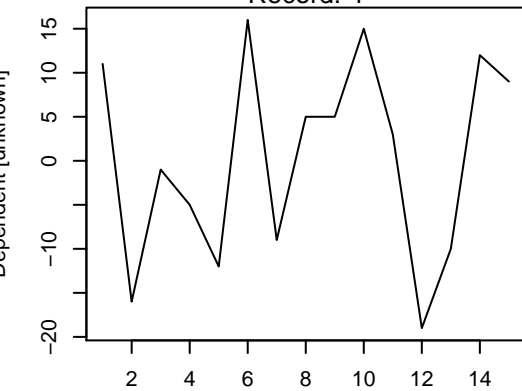
Record: 4



Record: 4



Record: 4







USER

Record: 7



IRSL

Record: 7



help("PSL2Riseo.BinfileData")

Record: 7



Record: 7









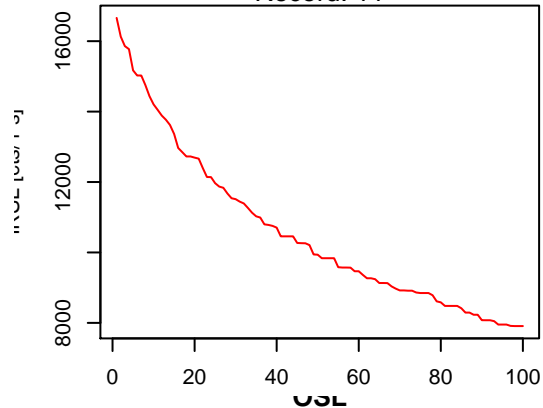
USER

Record: 11



IRSL

Record: 11

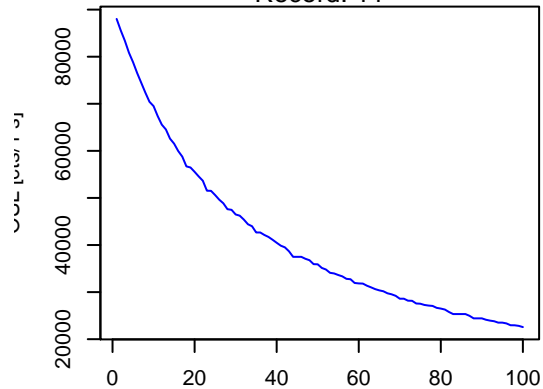


help("PSL2Riseo.BinfileData")

Record: 11



Record: 11



USER

Record: 12



IRSL

Record: 12



Record: 12



Record: 12



Record: 12



USER

Record: 13



Record: 13

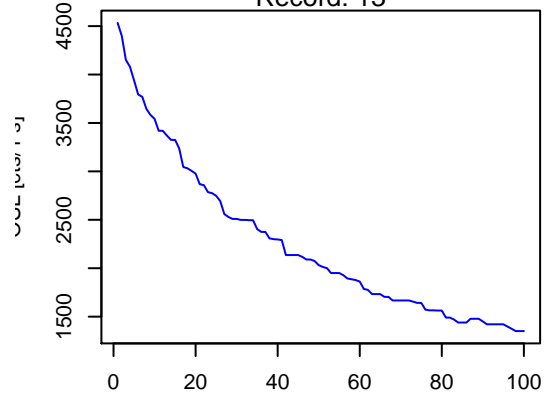


help("PSL2Riseo.BinfileData")

Record: 13



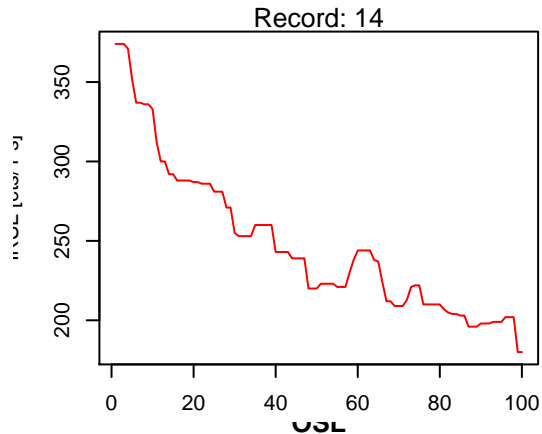
Record: 13



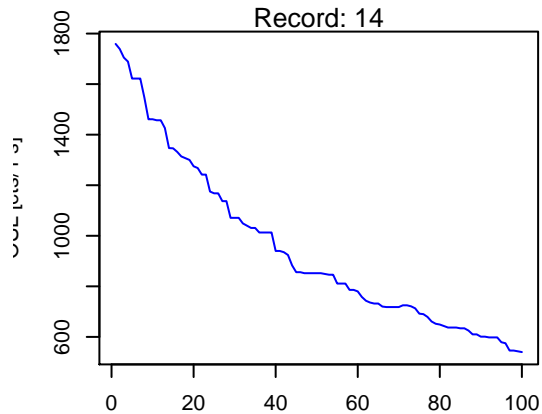
USER



IRSL



help("PSL2Riseo.BINfileData")



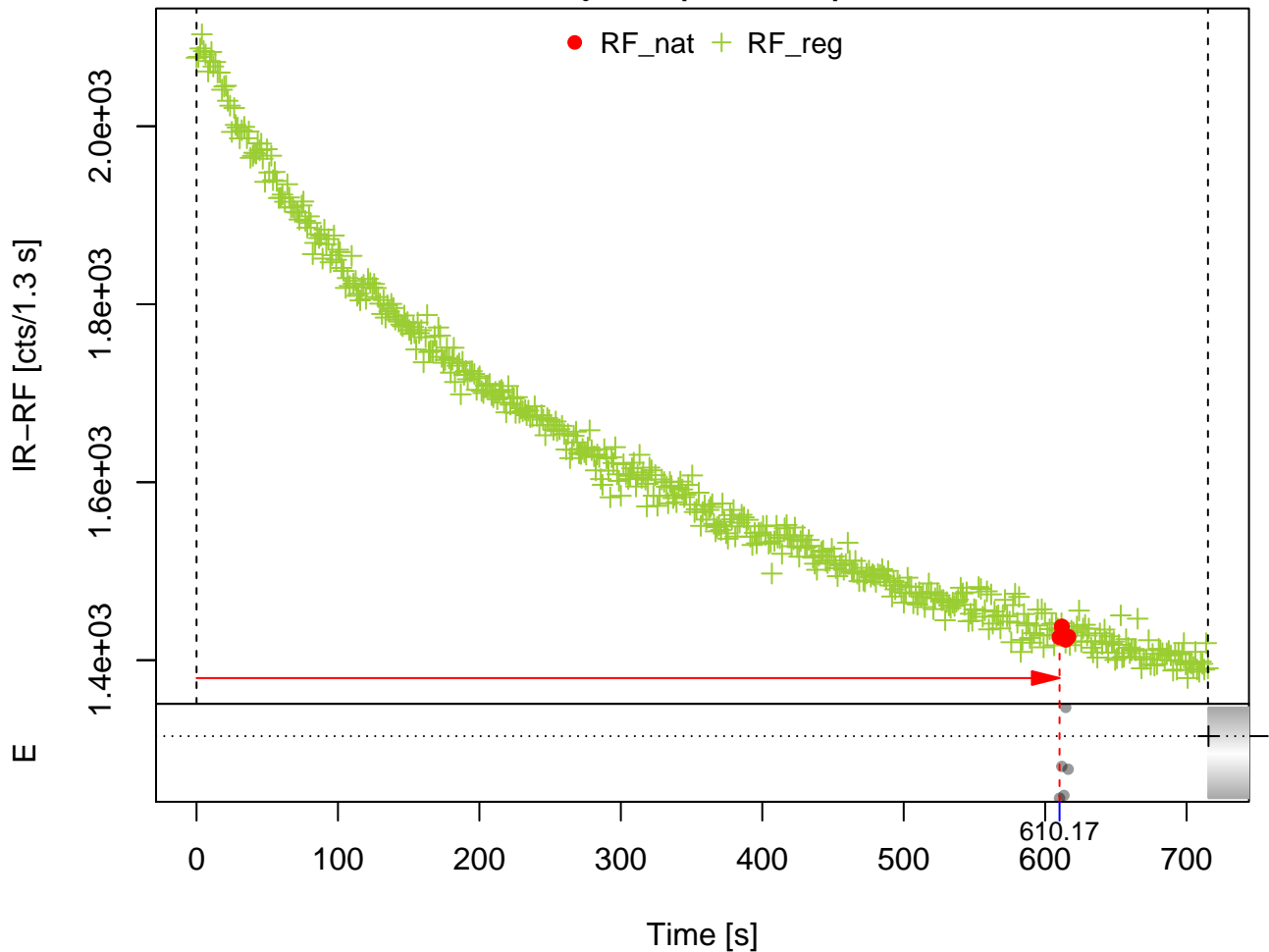
IR-RF

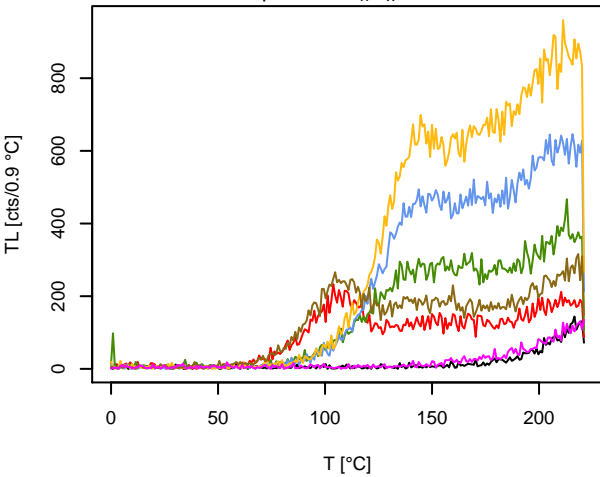
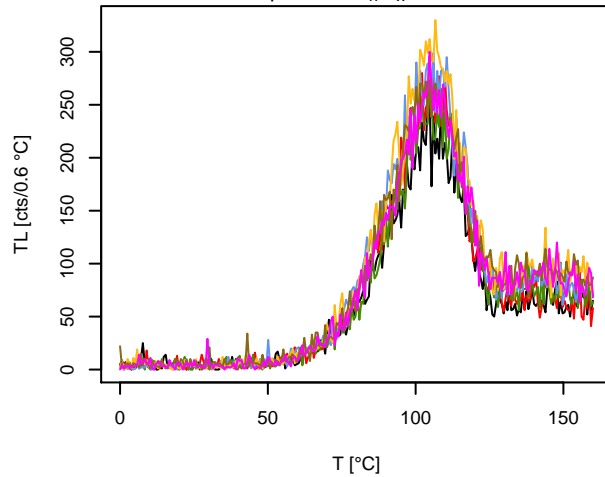
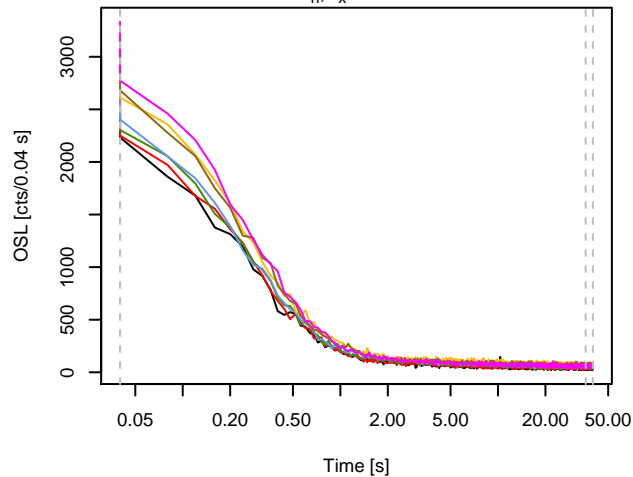
$D_e = 623.25$ [600.63 ; 635.8]



IR-RF

$D_e = 610.17$ [567.19 ; 653.15]



TL previous L_n, L_x curvesTL previous T_n, T_x curves L_n, L_x curves T_n, T_x curves

●
Natural
(0)

●
R1
(450)

●
R2
(1050)

●
R3
(2000)

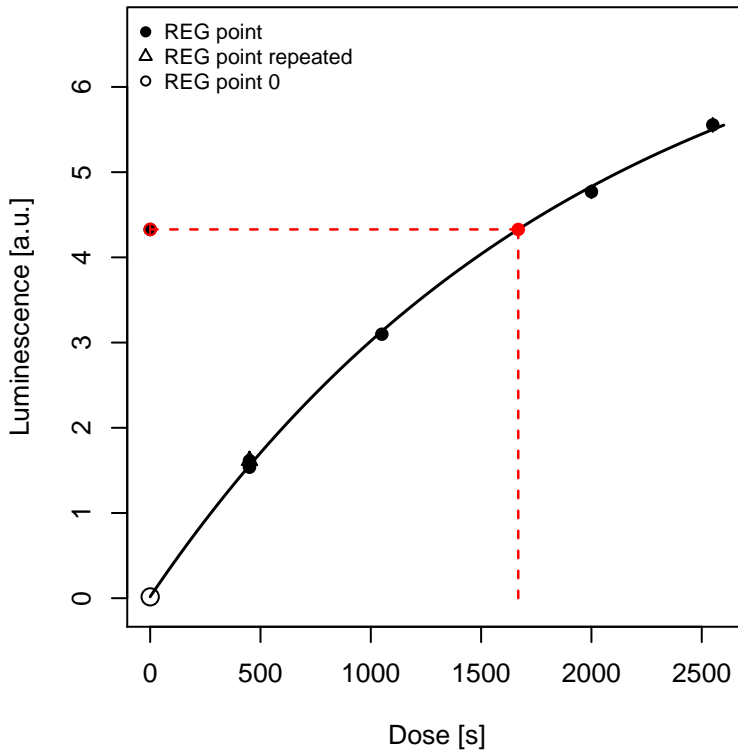
●
R4
(2550)

●
R5
(450)

●
R0
(0)

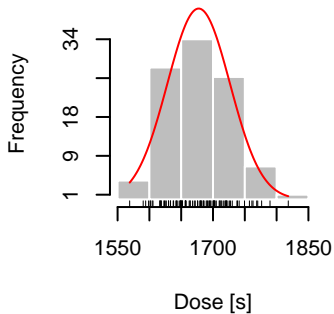
Growth curve

$D_e = 1668.25 \pm 49.22$ | fit: EXP

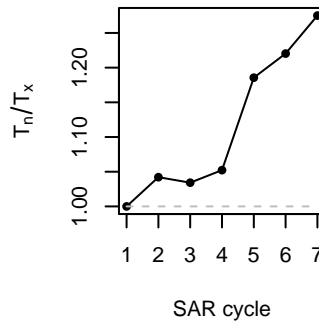


D_e from MC simulation

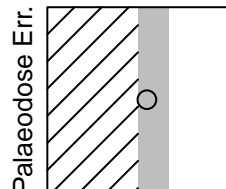
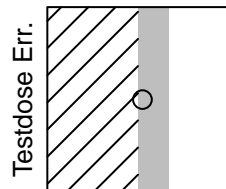
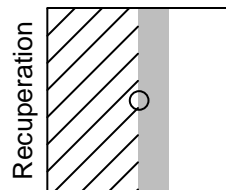
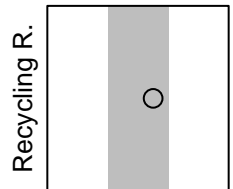
$D_{eMC} = 1677.48 \pm 49.22$ | quality = 99.4 %



Test dose response



Rejection criteria



- 0.2 + 0.2

IRSL



[help\("analyse_SAR.CWOSL"\)](#)

L_n, L_x curves



T_n, T_x curves



Plateau test L_n, L_x curves



plateau Test T_n, T_x curves



Natural
(0)

Natural
(136)

Natural
(317)

Natural
(544)

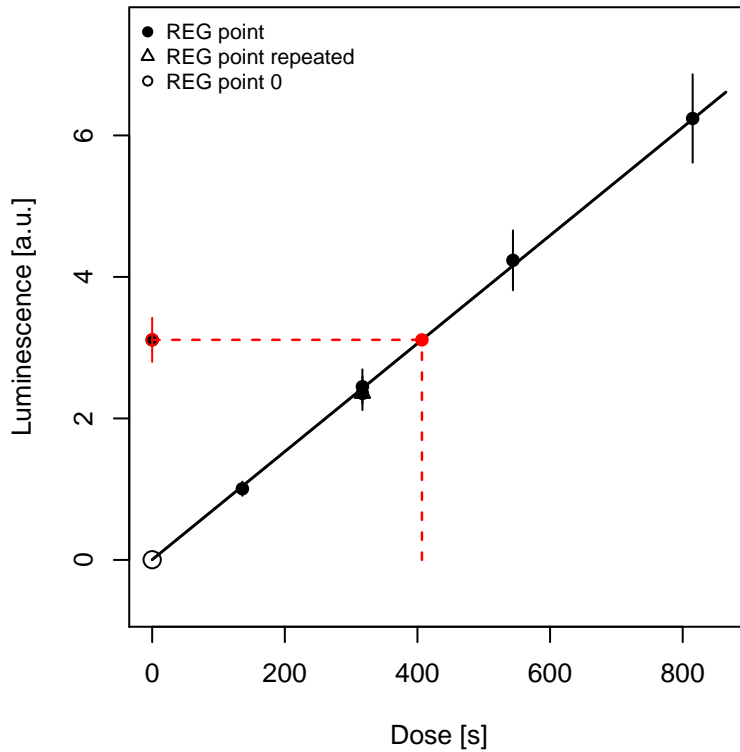
Natural
(815)

Natural
(0)

Natural
(317)

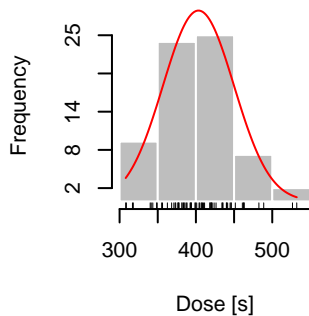
Growth curve

$D_e = 406.8 \pm 46.54$ | fit: EXP

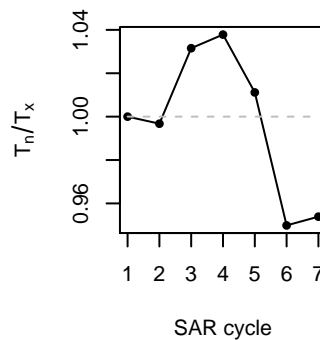


D_e from MC simulation

$D_{eMC} = 403.34 \pm 46.54$ | quality = 99.1 %



Test dose response



Pseudo pIRIR data set based on quartz OSL

TL
pseudolRSL1
pseudolRSL2

help("analyse_pIRIRSequence")

Pseudo pIRIR data set based on quartz OSL



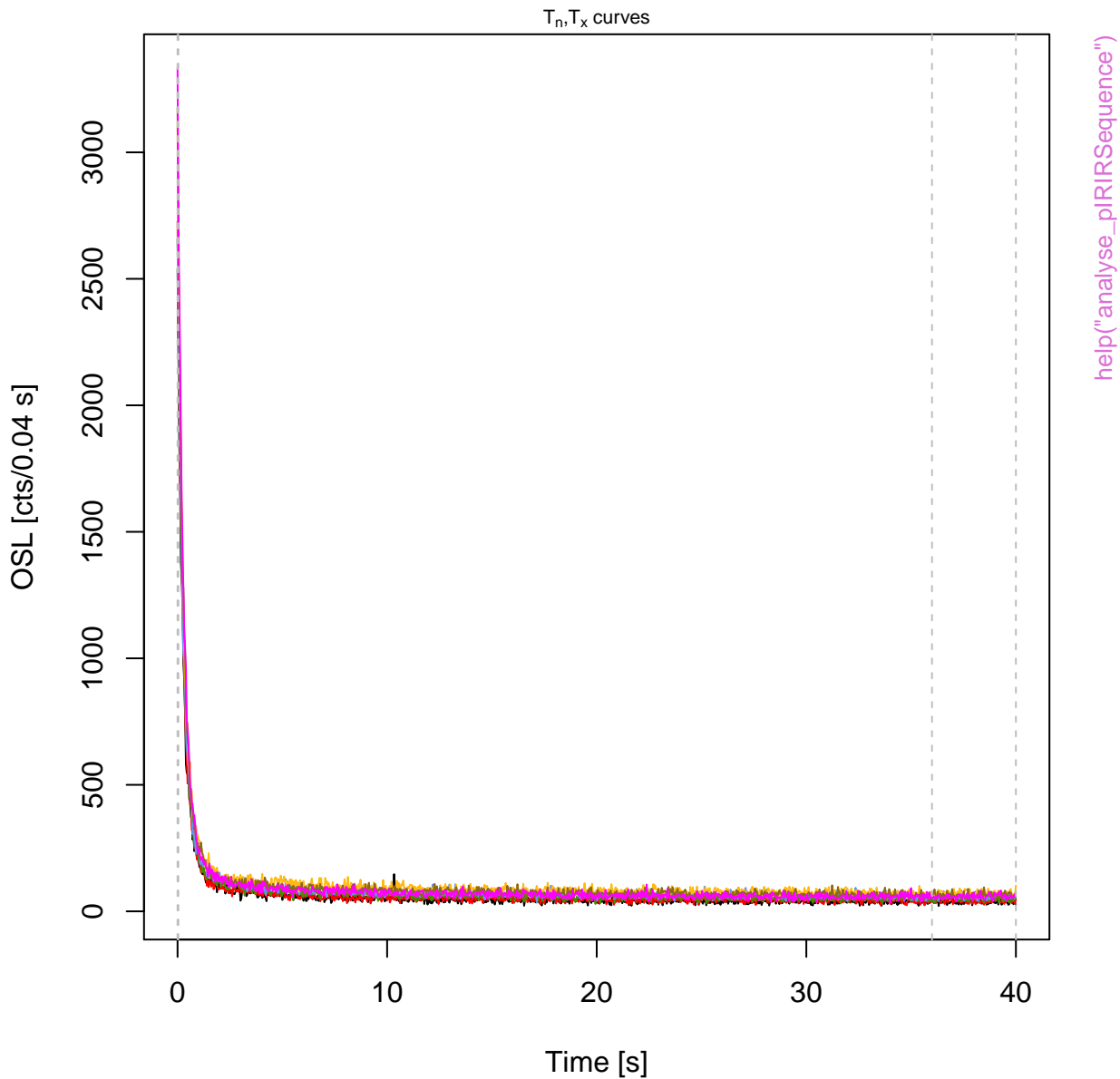
Pseudo pIRIR data set based on quartz OSL



Pseudo pIRIR data set based on quartz OSL

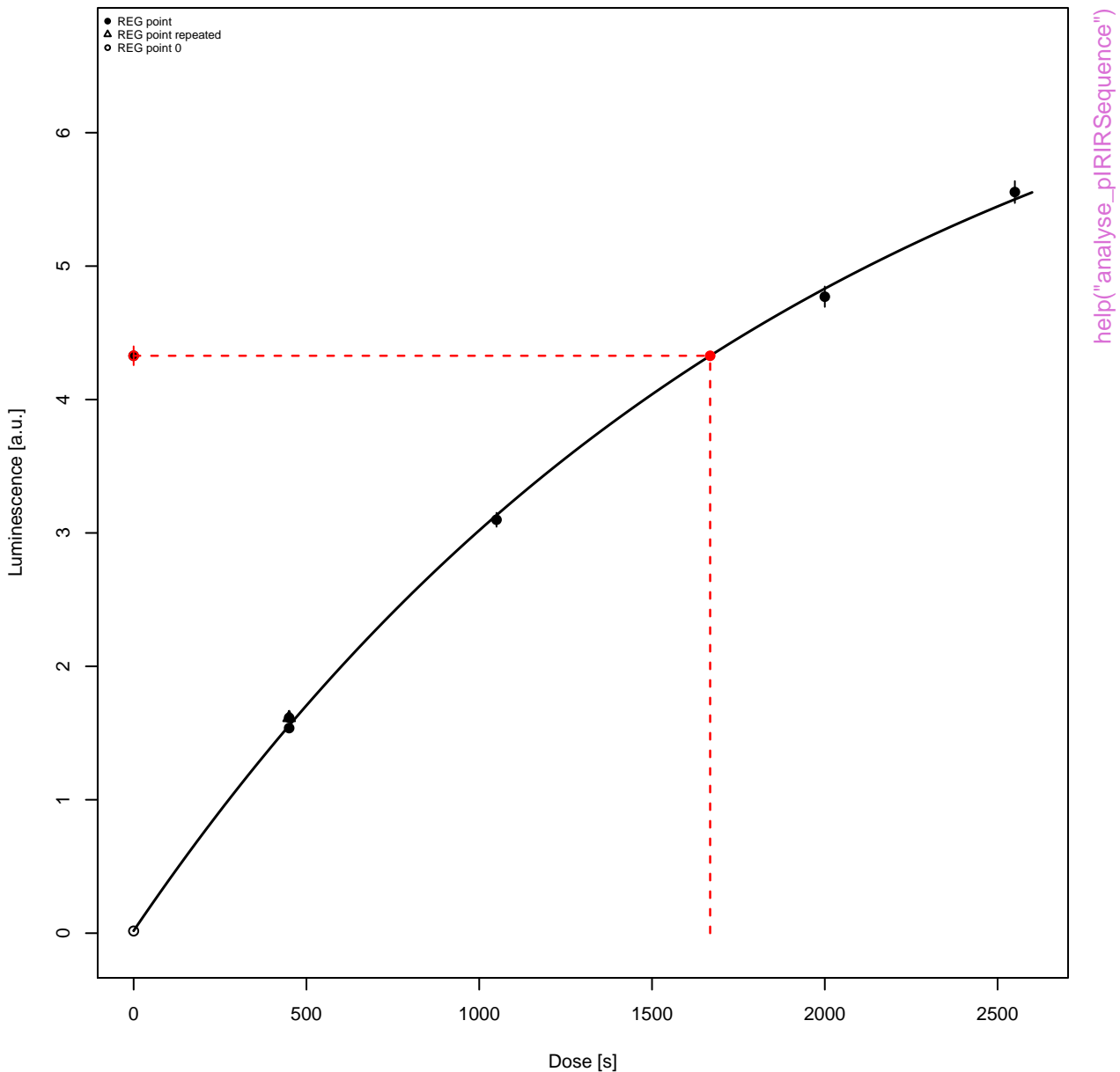


Pseudo pIRIR data set based on quartz OSL



Pseudo pIRIR data set based on quartz OSL

$D_e = 1668.25 \pm 41.38$ | fit: EXP



D_e from MC simulation

D_{eMC} = 1666.57 ± 41.38 | quality = 99.9 %



help("analyse_pIRIRSequence")

Test dose response



Pseudo pIRIR data set based on quartz OSL



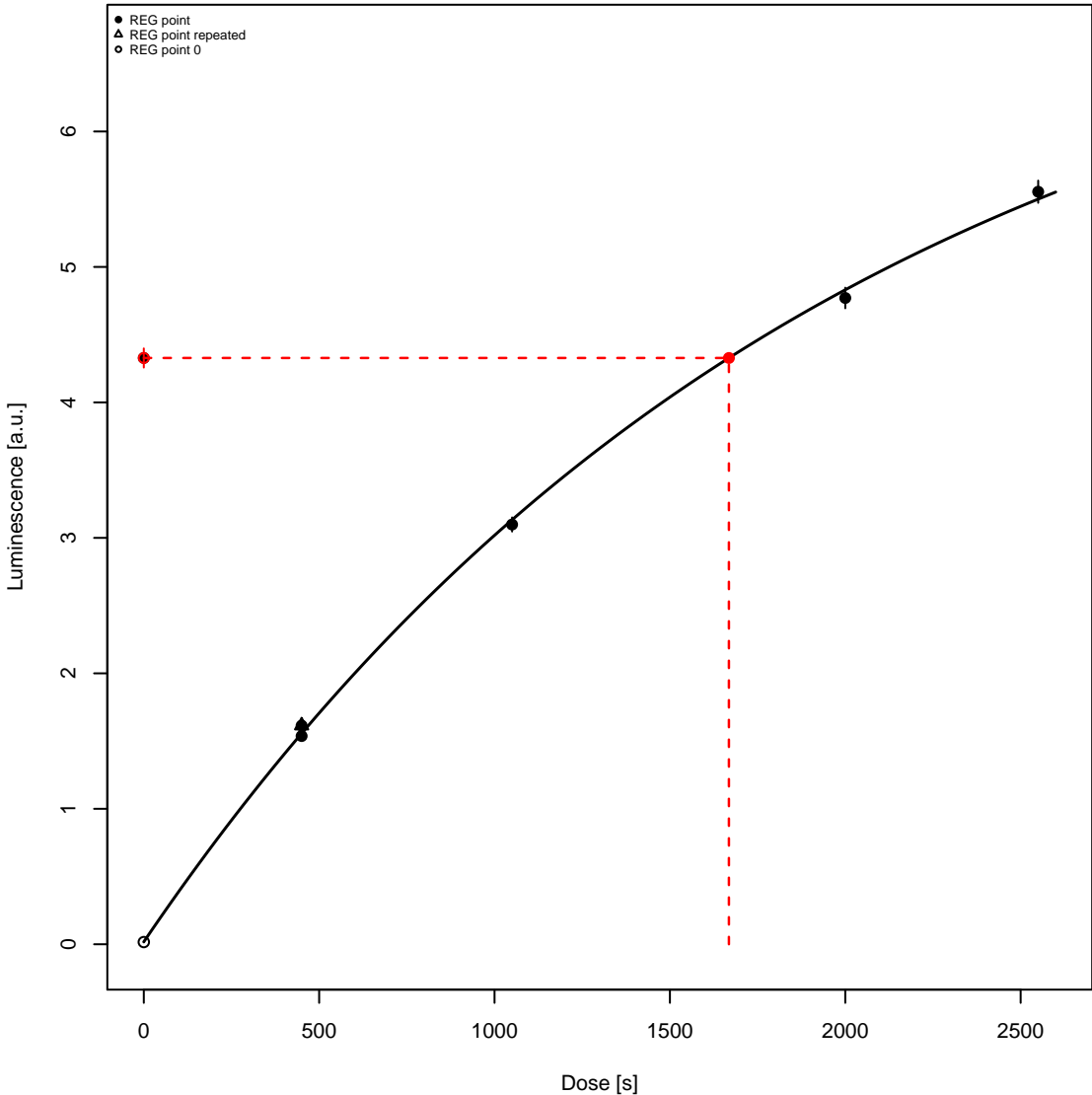
Pseudo pIRIR data set based on quartz OSL





Pseudo pIRIR data set based on quartz OSL

$D_e = 1668.25 \pm 47.59$ | fit: EXP



help("analyse_pIRIRSequence")

D_e from MC simulation

D_{e,MC} = 1669.37 ± 47.59 | quality = 99.9 %



Dose [s]

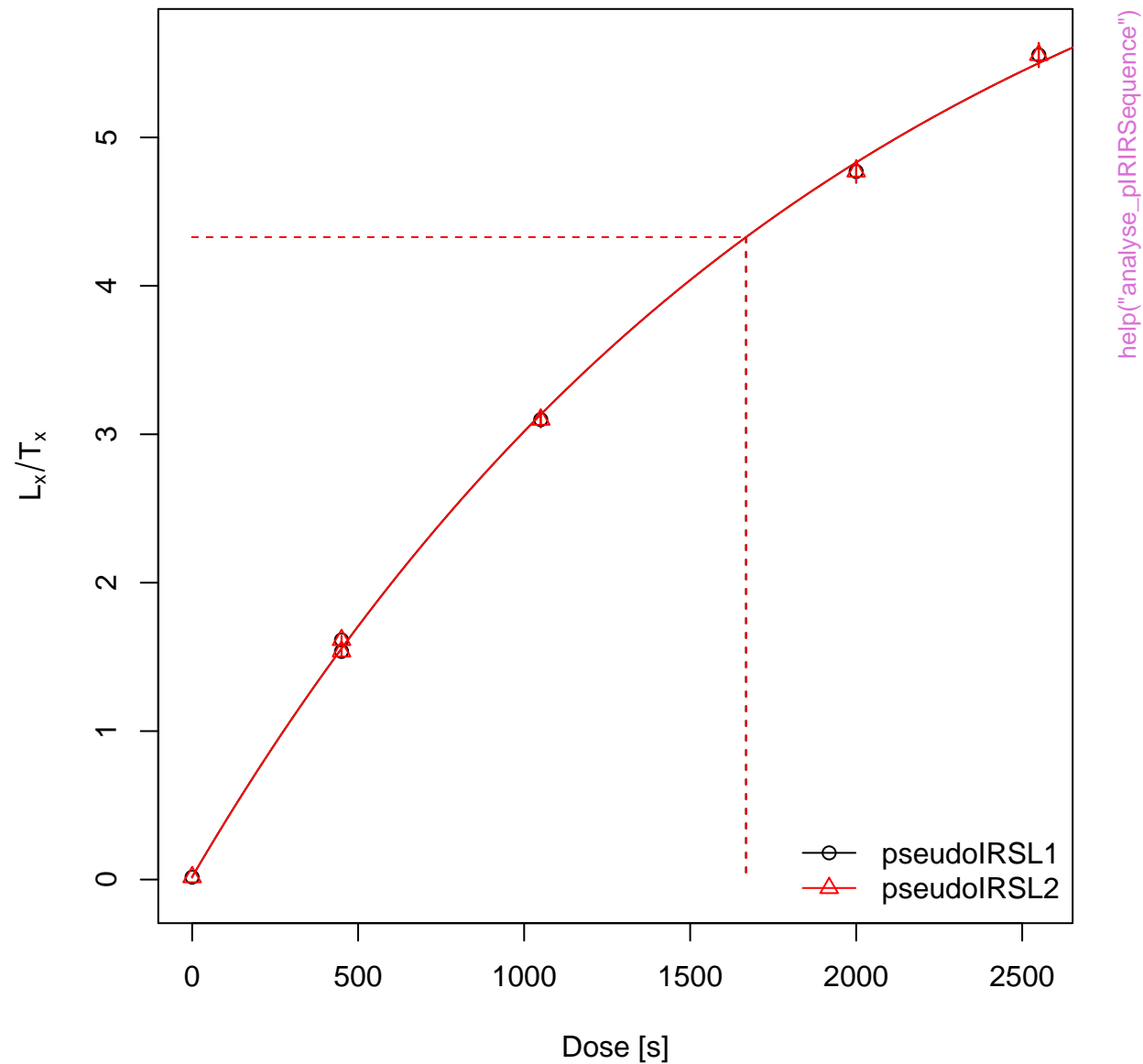
n = 100 , valid fits = 100

help("analyse_pIRSequence")

Test dose response



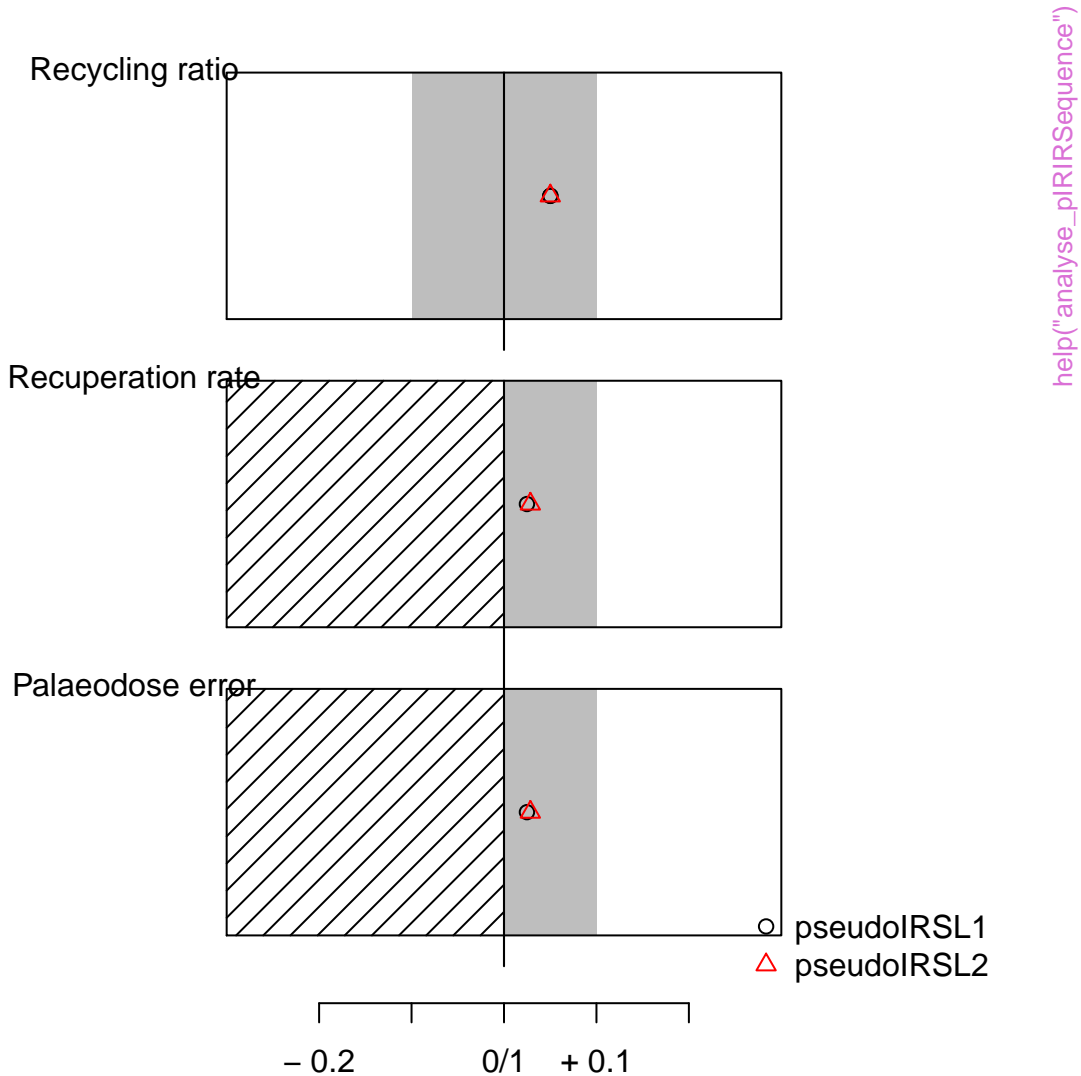
Summarised Dose Response Curves



Sensitivity change



Rejection criteria



USER combined



IRSL combined



help("analyse_portableOSL")

OSL combined



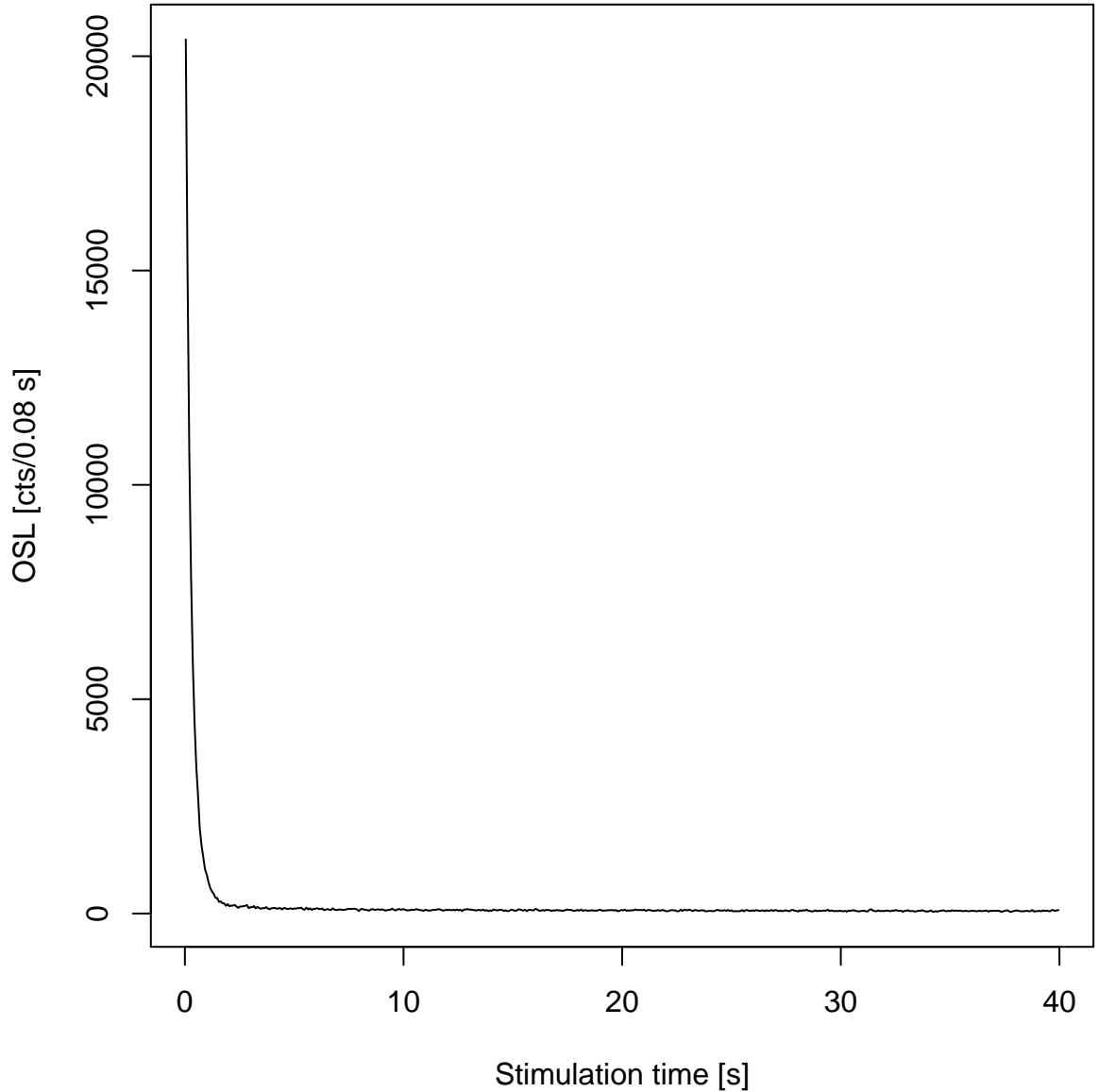


OSL



`help("bin_RLum.Data")`

OSL



help("bin_RLum.Data")

OSL



help("bin_RLum.Data")

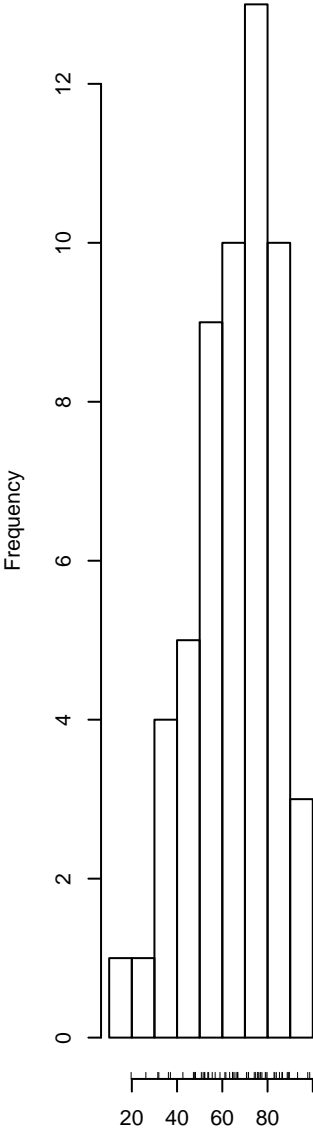
Monte Carlo Simulation

$$n = \left| \hat{\mu} = 43 \mid \hat{\sigma} = 20 \mid \frac{\hat{\sigma}}{\sqrt{n}} = 2 \mid v = 0.73 \right|$$



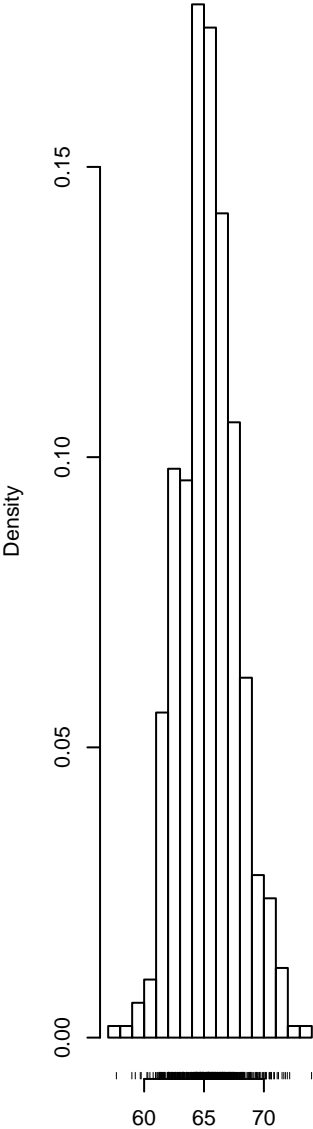
Observed: Equivalent dose

n = 56



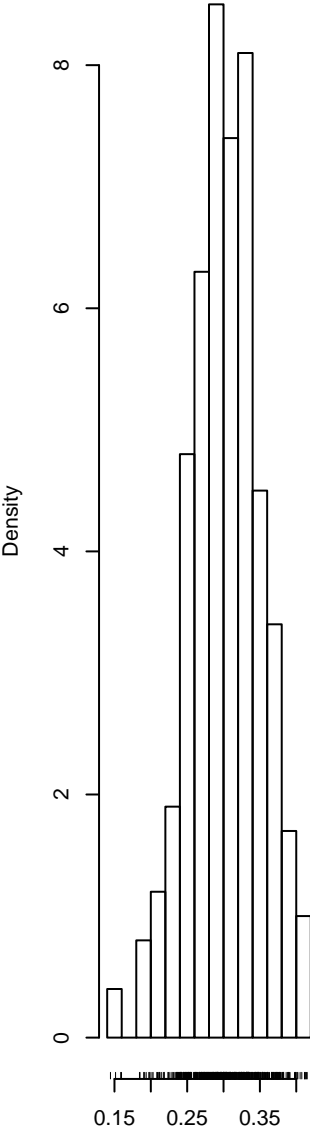
Bootstrapping: Average Dose

n = 500



Bootstrapping: Sigma_d

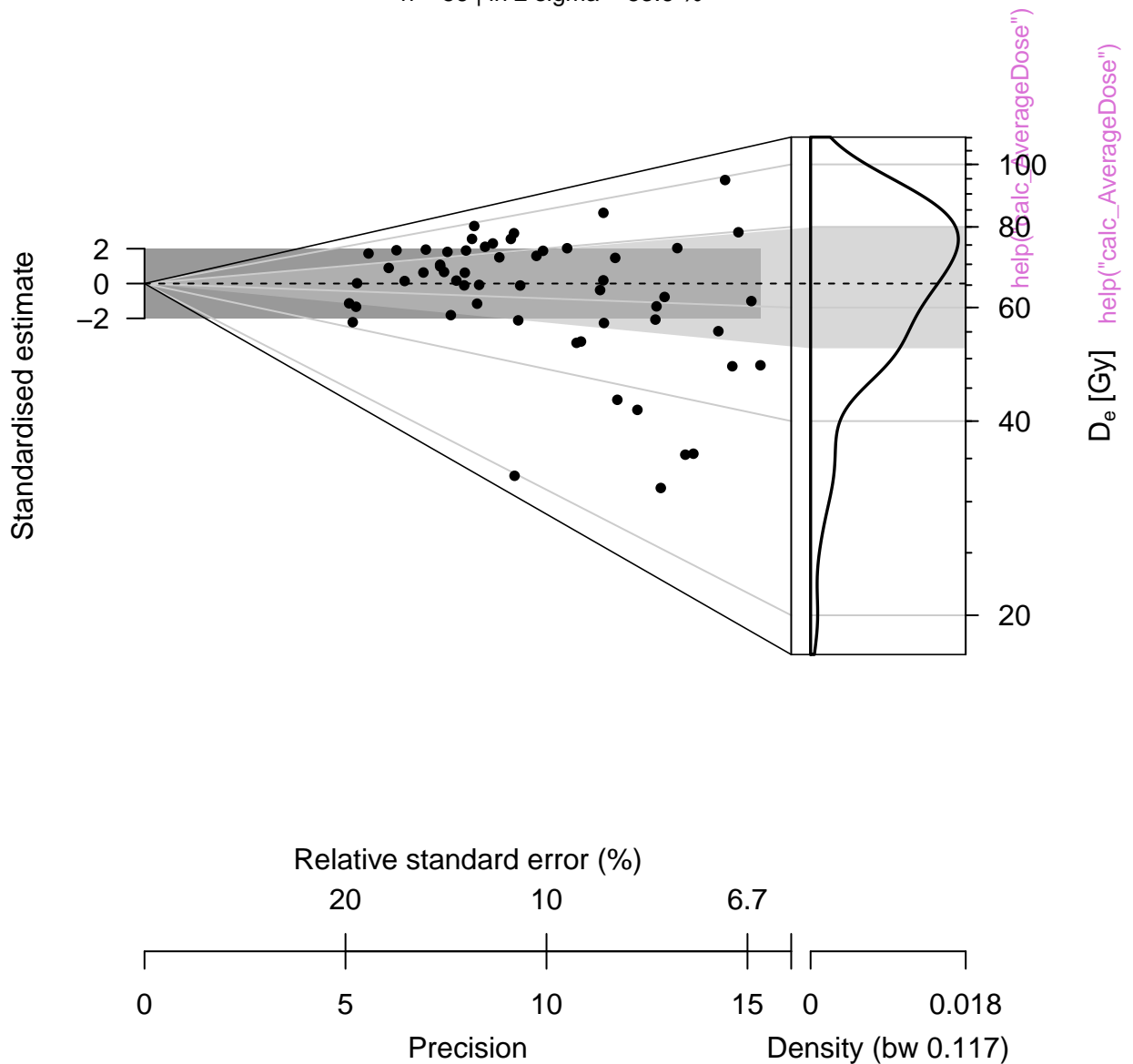
n = 500



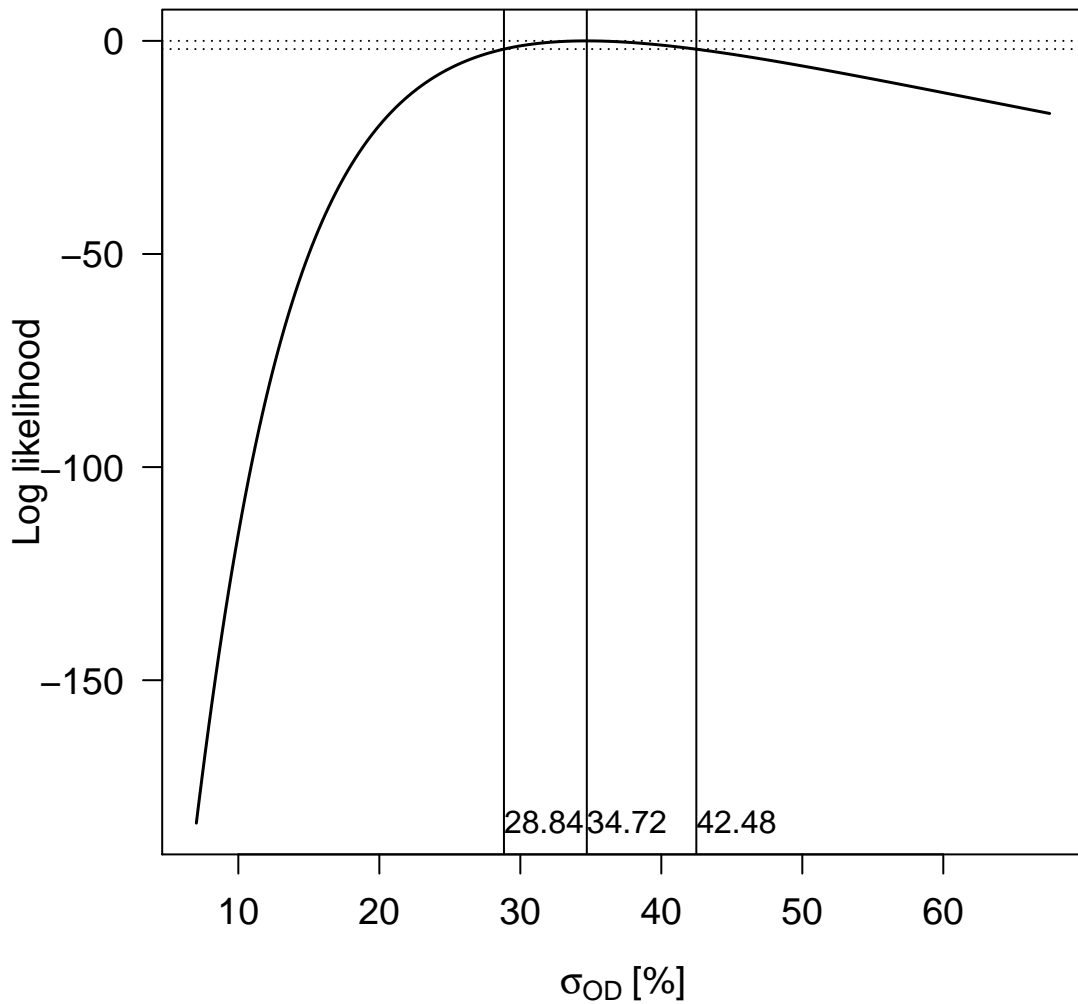
help("calc_AverageDose")

D_e distribution

n = 56 | in 2 sigma = 53.6 %



Profile log likelihood for σ_{OD}



Fast Ratio

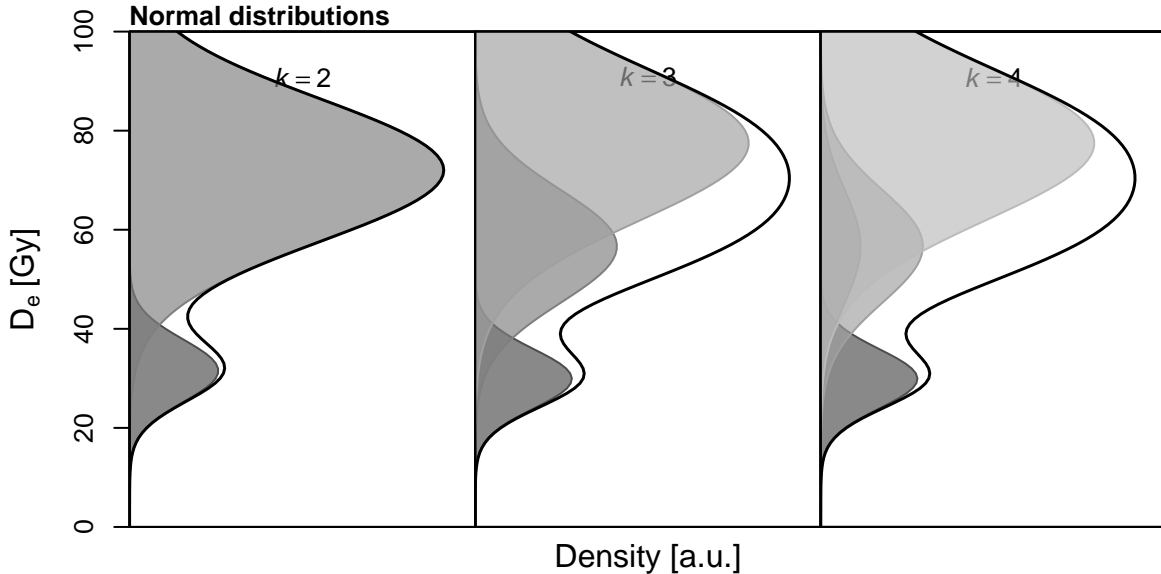


help("calc_FastRatio")

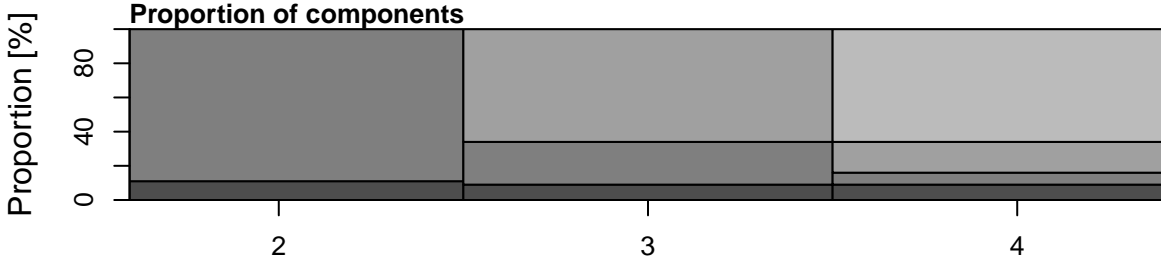
Finite Mixture Model

$\sigma_b = 0.2 \mid n = 62$

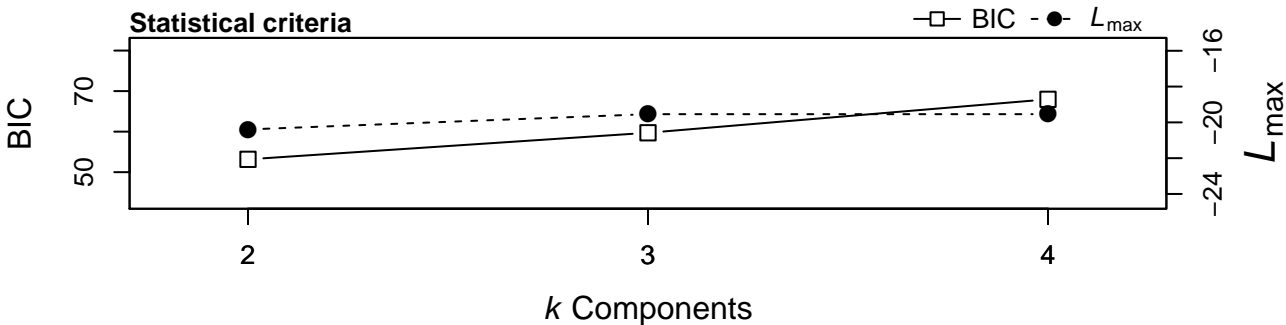
Normal distributions



Proportion of components

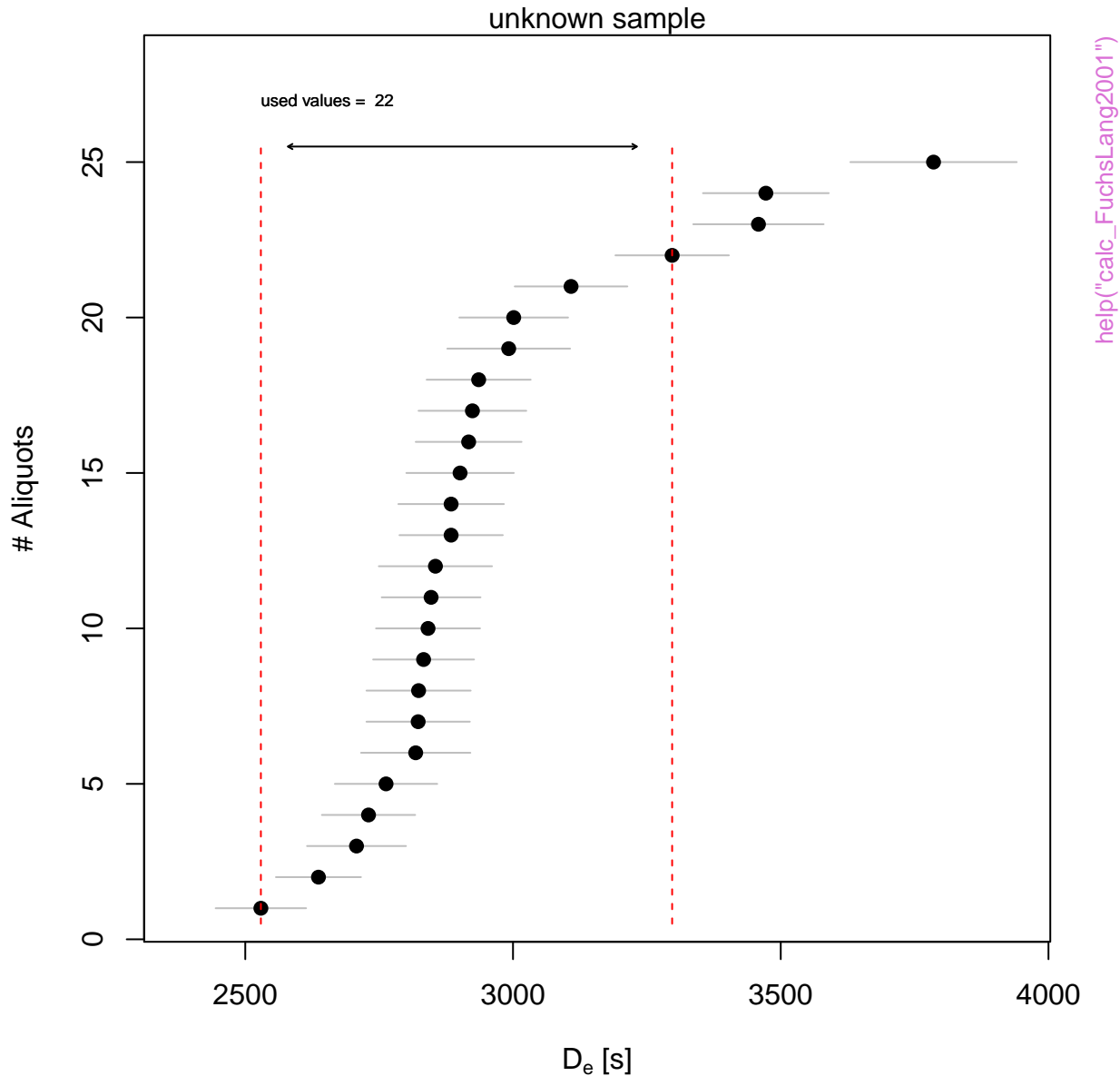


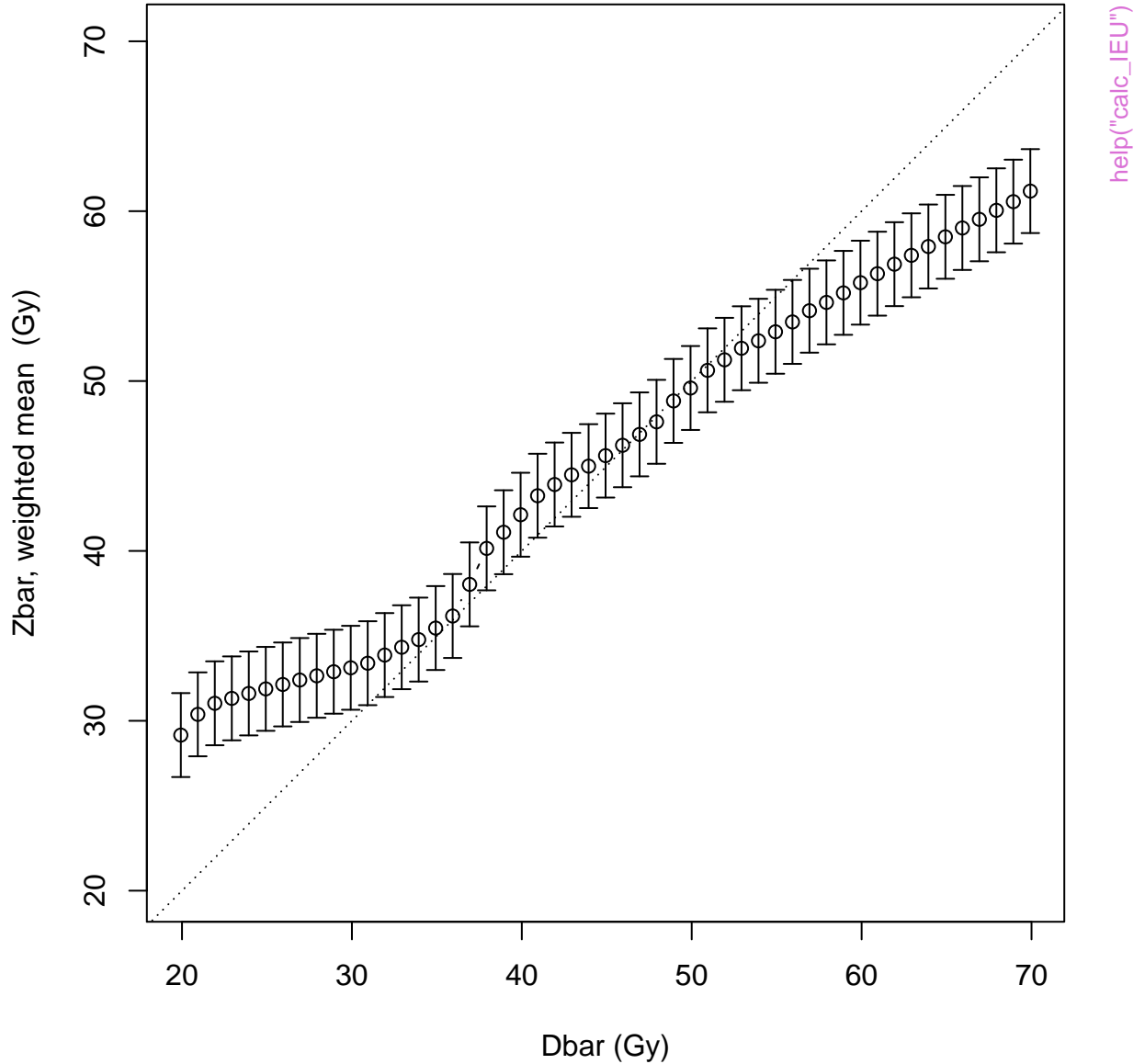
Statistical criteria



help("calc_FiniteMixture")

Fuchs & Lang (2001)







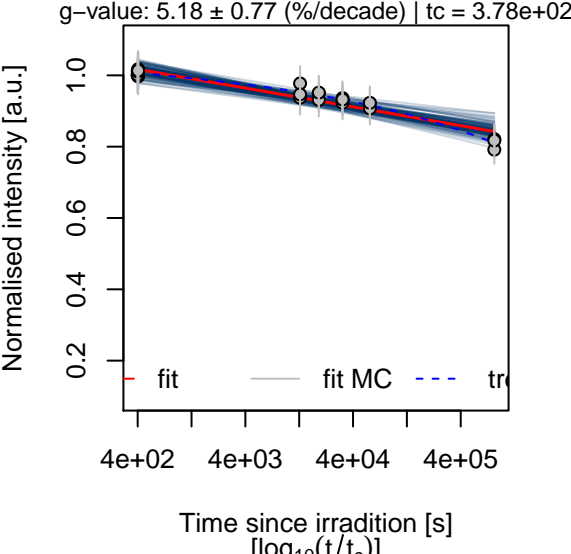
help("calc_I EU")

No L_x curves detected

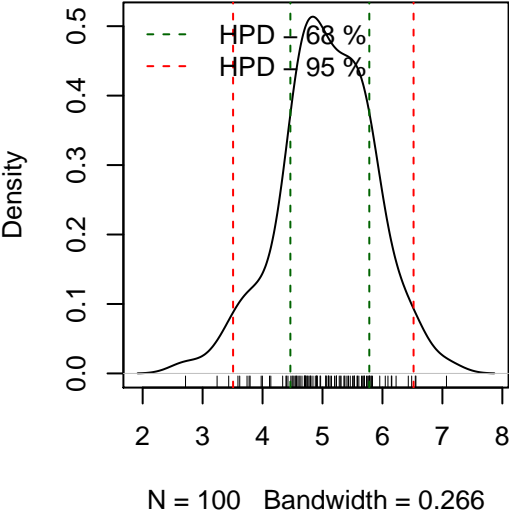
No T_x curves detected

help("calc_Kars2008")

Signal Fading



Density: g-values (%/decade)



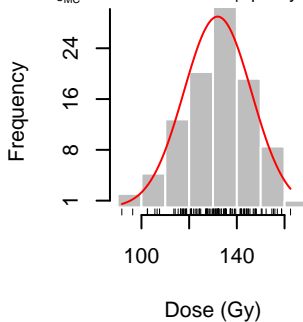
Measured dose response curve

$D_e = 130.97 \pm 14.16$ | fit: EXP

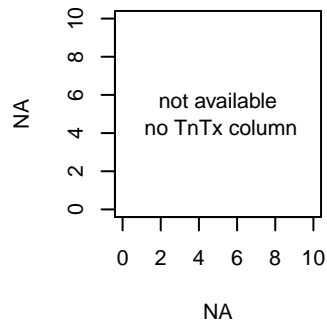


D_e from MC simulation

$D_{eMC} = 131.95 \pm 14.16$ | quality = 99.3 %

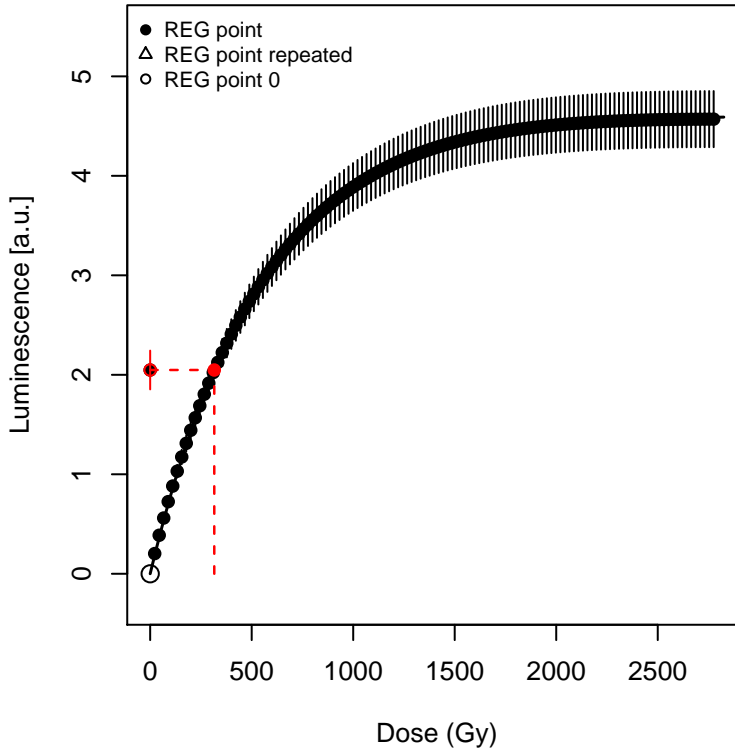


Test dose response



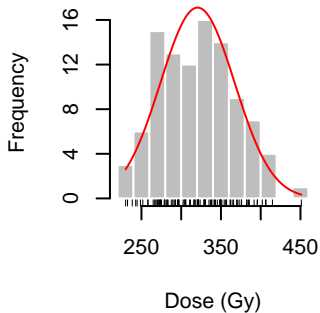
Simulated dose response curve

$D_e = 315.72 \pm 46.64$ | fit: EXP

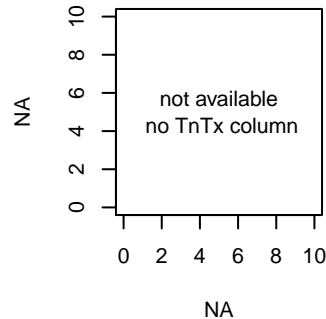


D_e from MC simulation

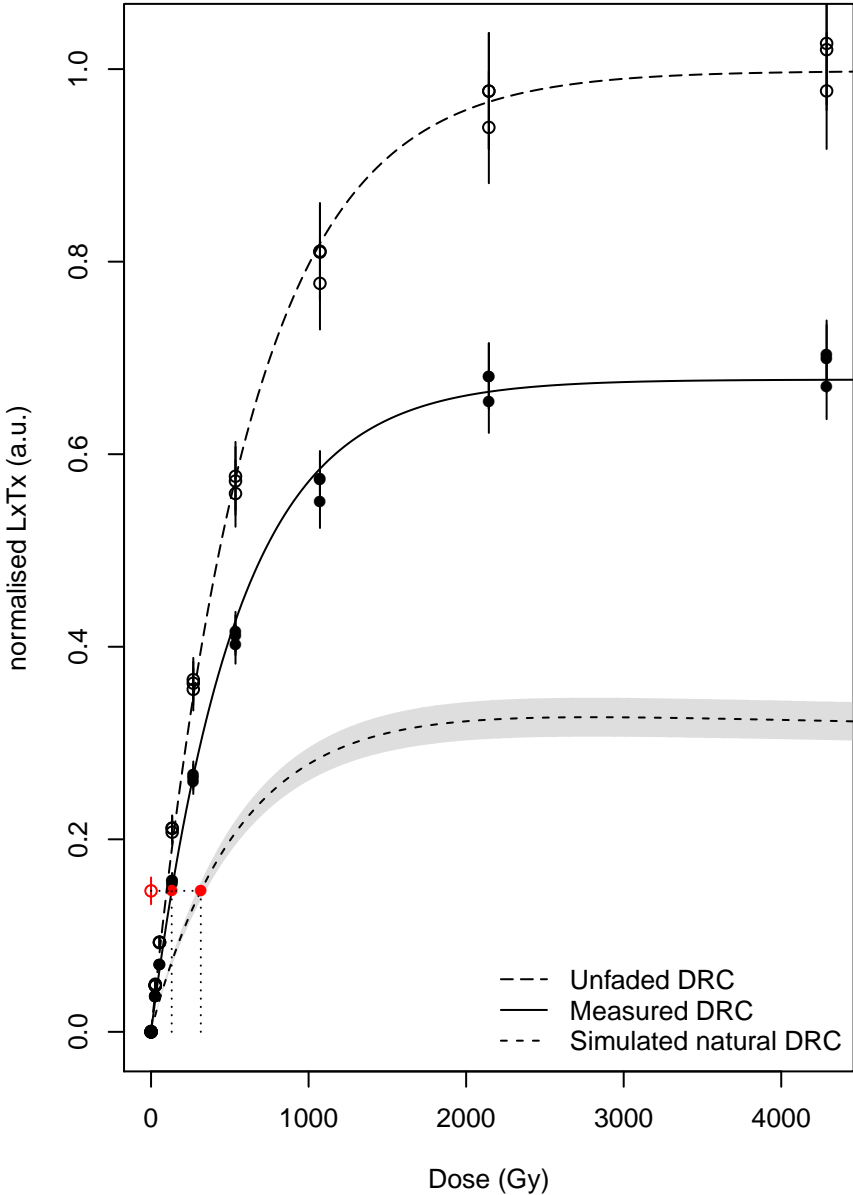
$D_{eMC} = 320.57 \pm 46.64$ | quality = 98.5 %



Test dose response



Dose response curves



$$\dot{D} = 7 \pm 0 \frac{\text{Gy}}{\text{ka}}$$

$$\dot{D}_{\text{Reader}} = 0.134 \pm 0.007 \frac{\text{Gy}}{\text{s}}$$

$$\log_{10}(\rho') = -5.41 \pm -0.89$$

$$\left(\frac{n}{N}\right) = 0.15 \pm 0.11$$

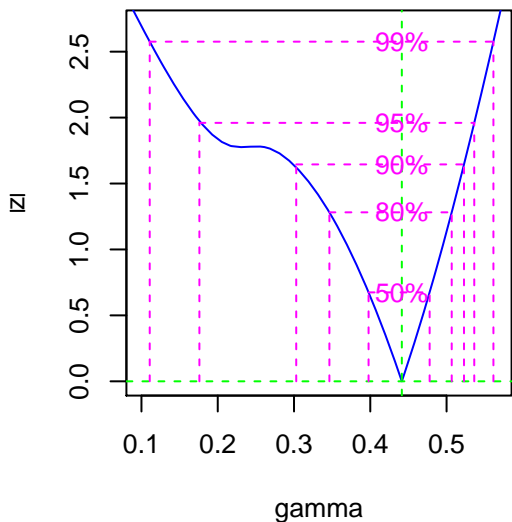
$$\left(\frac{n}{N}\right)_{\text{SS}} = 0.36 \pm 0.06$$

$$D_{\text{E,sim}} = 315.72 \pm 46.64 \text{ Gy}$$

$$D_{0,\text{sim}} = 622.48 \pm 32.22 \text{ Gy}$$

$$\text{Age}_{\text{sim}} = 45.1 \pm 7.03 \text{ ka}$$

Likelihood profile: gamma

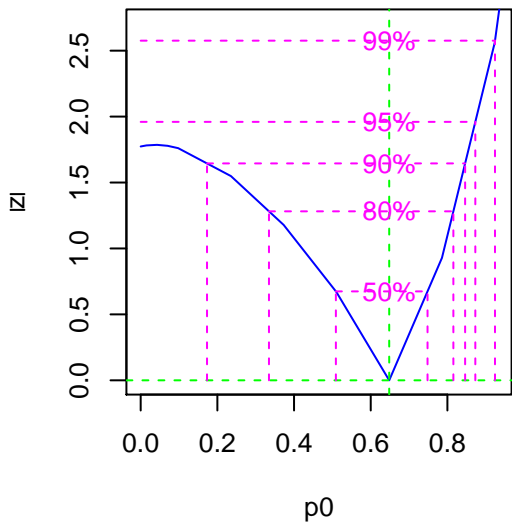


Likelihood profile: sigma



help("calc_MaxDose")

Likelihood profile: p0



Likelihood profile: gamma



Likelihood profile: sigma



help("calc_MinDose")

Likelihood profile: p0



Likelihood profile: gamma



Likelihood profile: sigma



help("calc_MinDose")

Likelihood profile: p0



3-parameter Minimum Age Model

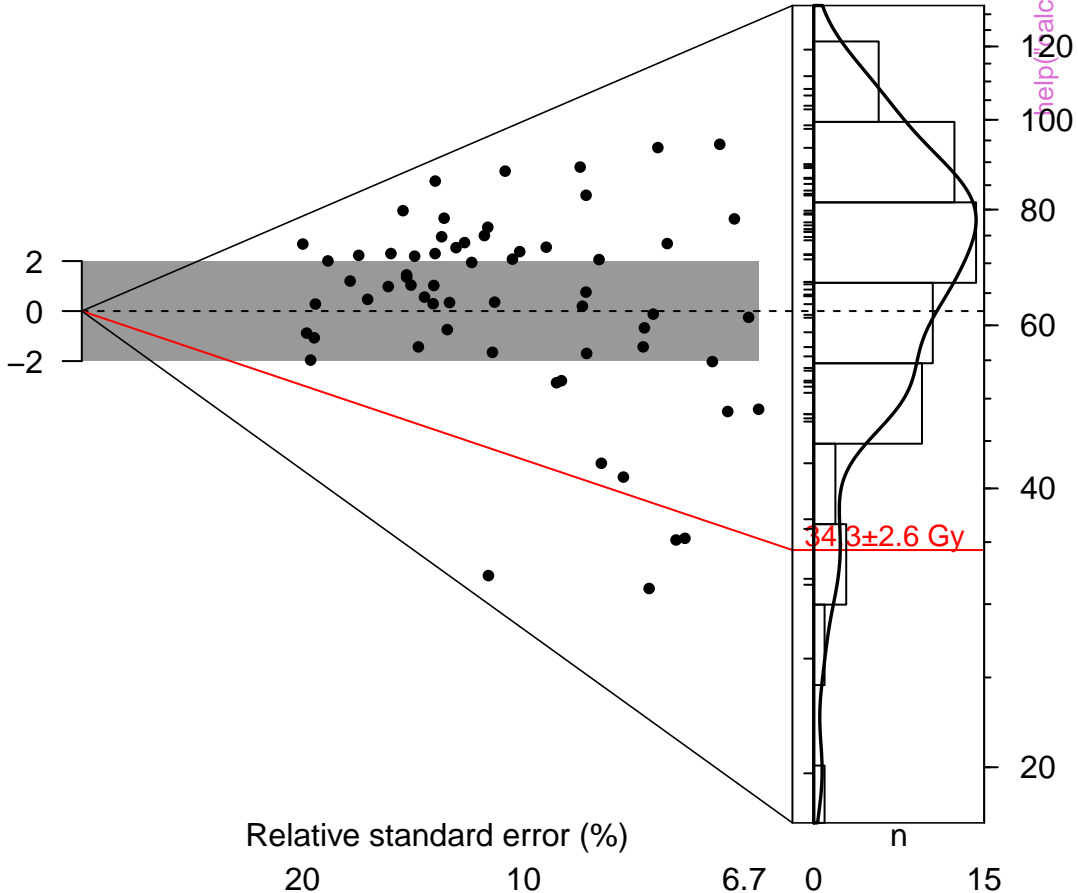
Parameters: $\sigma_b = 0.1$, $\gamma = 3.5$, $\sigma = 0.7$, $\rho = 0.01$

n = 62

mean = 65.99

median = 69.64

Standardised estimate



D_e [Gy]

help("calc_MinDose")

help("calc_MinDose")

Precision

Density (bw 0.1)

Source Dose Rate Prediction

source type: Sr-90 | half-life: 28.9 a



help("calc_SourceDoseRate")

D_e distribution



Thermal Lifetime Contour Plot

(values quoted in Ma)



help("calc_ThermalLifetime")

Thermal Lifetime Density Plot



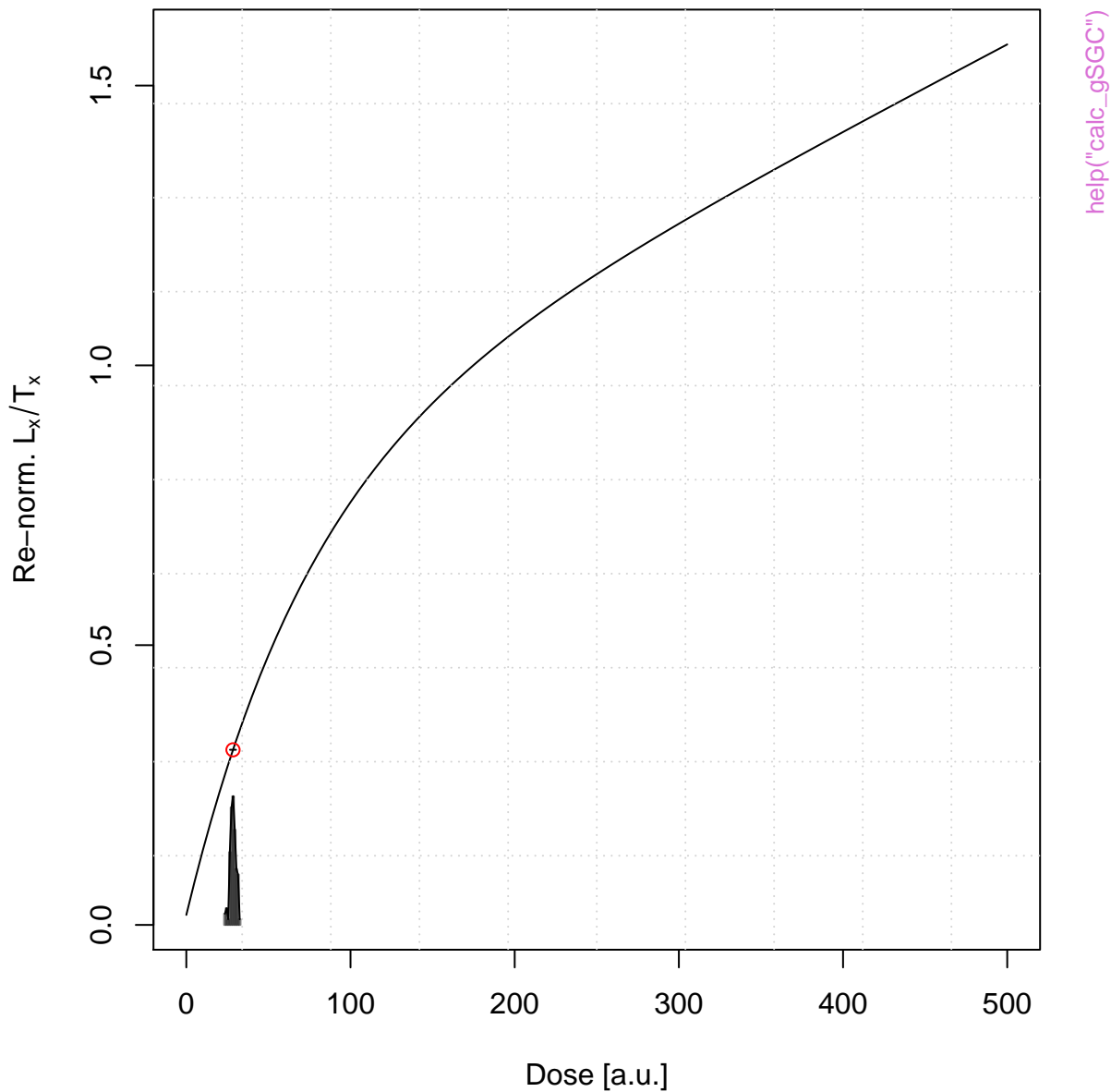
help("calc_ThermalLifetime")

D_e estimation applying Woda and Fuchs (2008)



help("calc_WodaFuchs2008")

gSGC and resulting De



CW Curve Fit

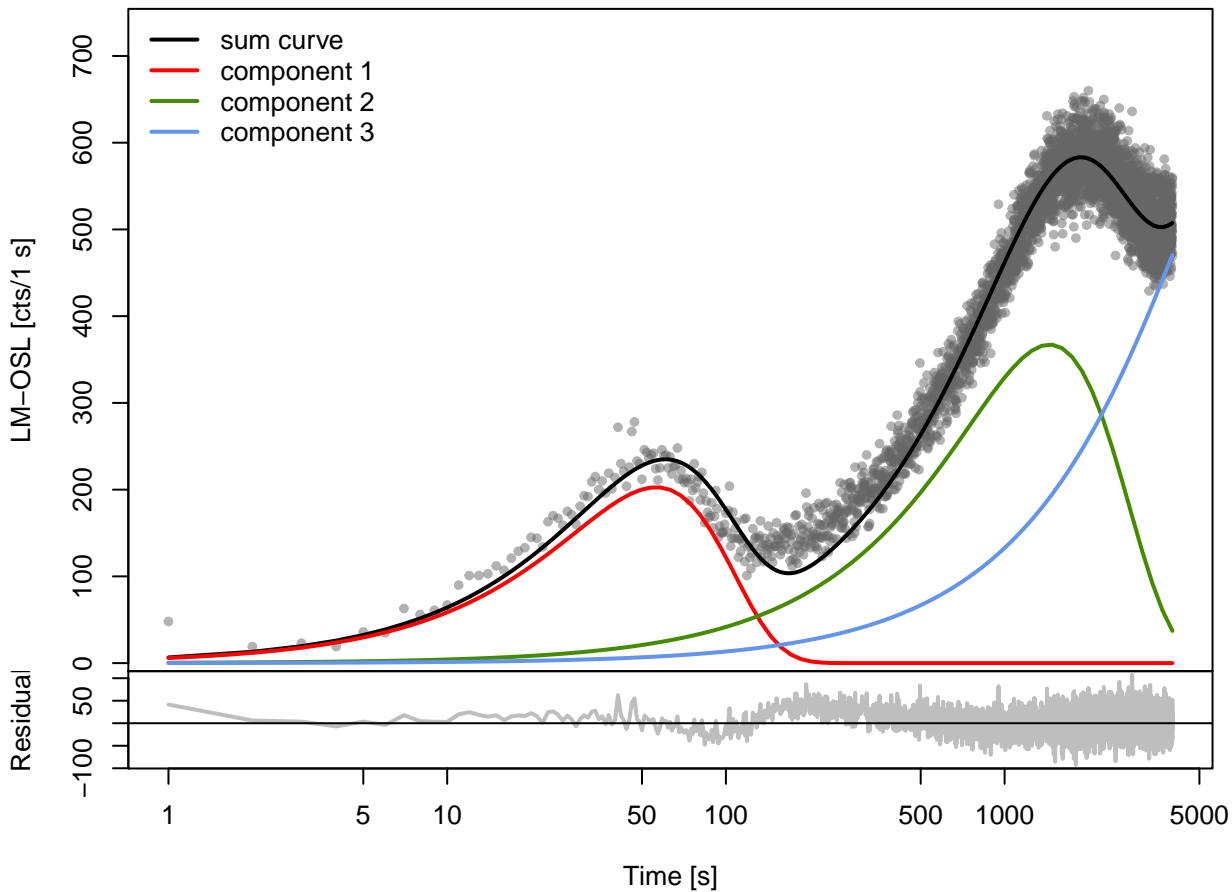
Default



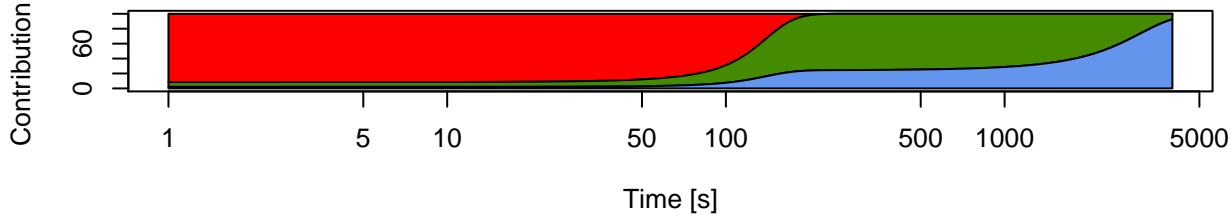
Component contribution to sum curve



Default



Component contribution to sum curve



Background



Default



Component contribution to sum curve



Default



Component contribution to sum curve

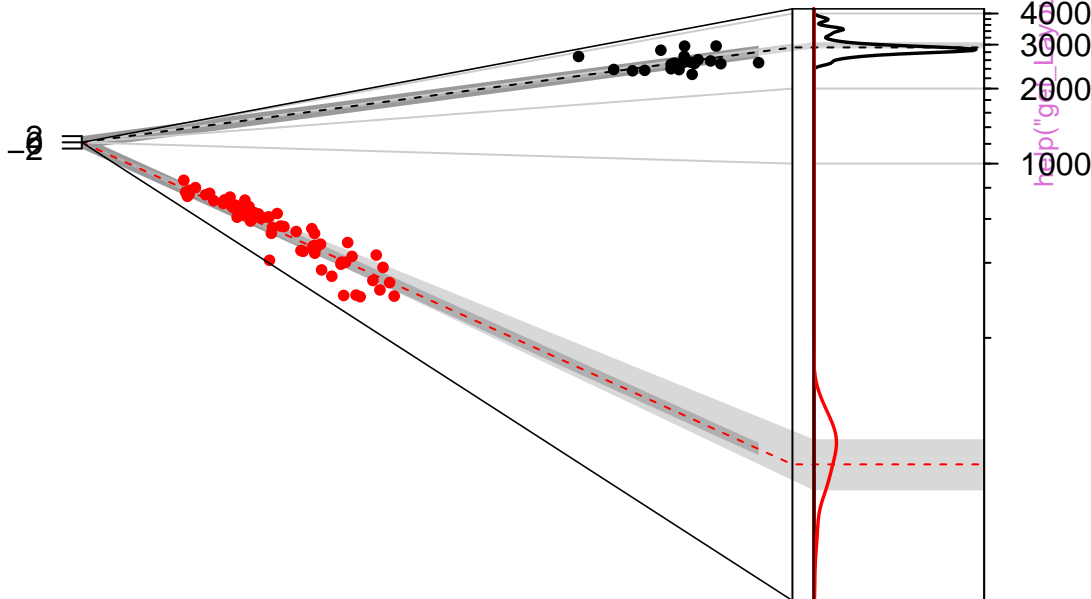


D_e distribution

n = 25 | in 2 sigma = 68 %

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



Relative standard error (%)

10

5

3.3

0

10

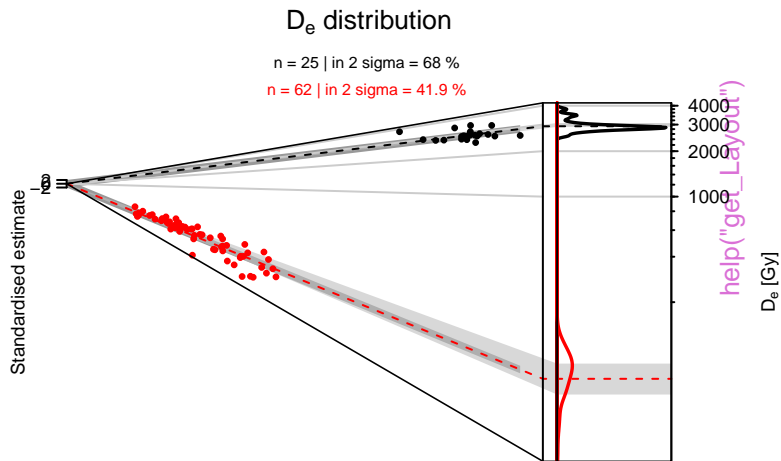
20

30

0.015

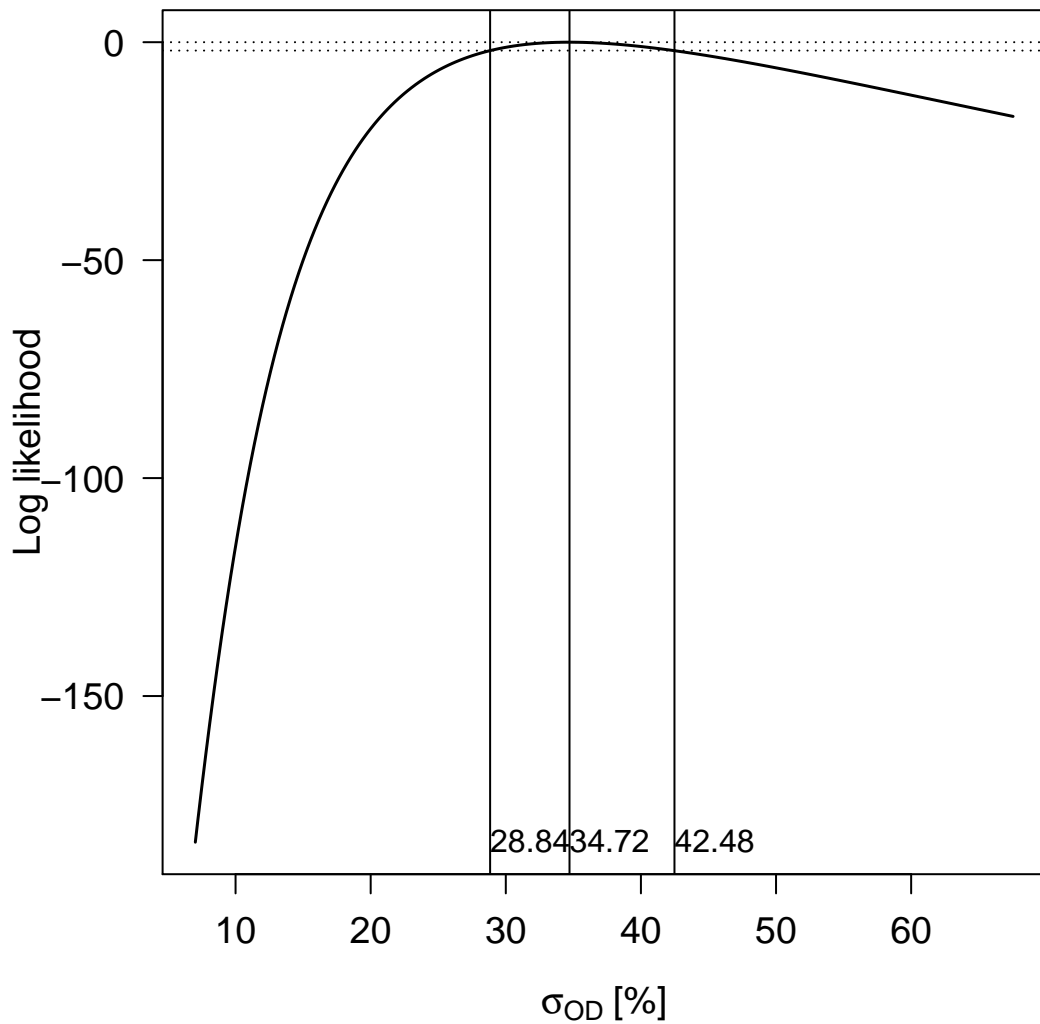
Precision

Density (bw 0.085)



help("get_Layout")

Profile log likelihood for σ_{OD}

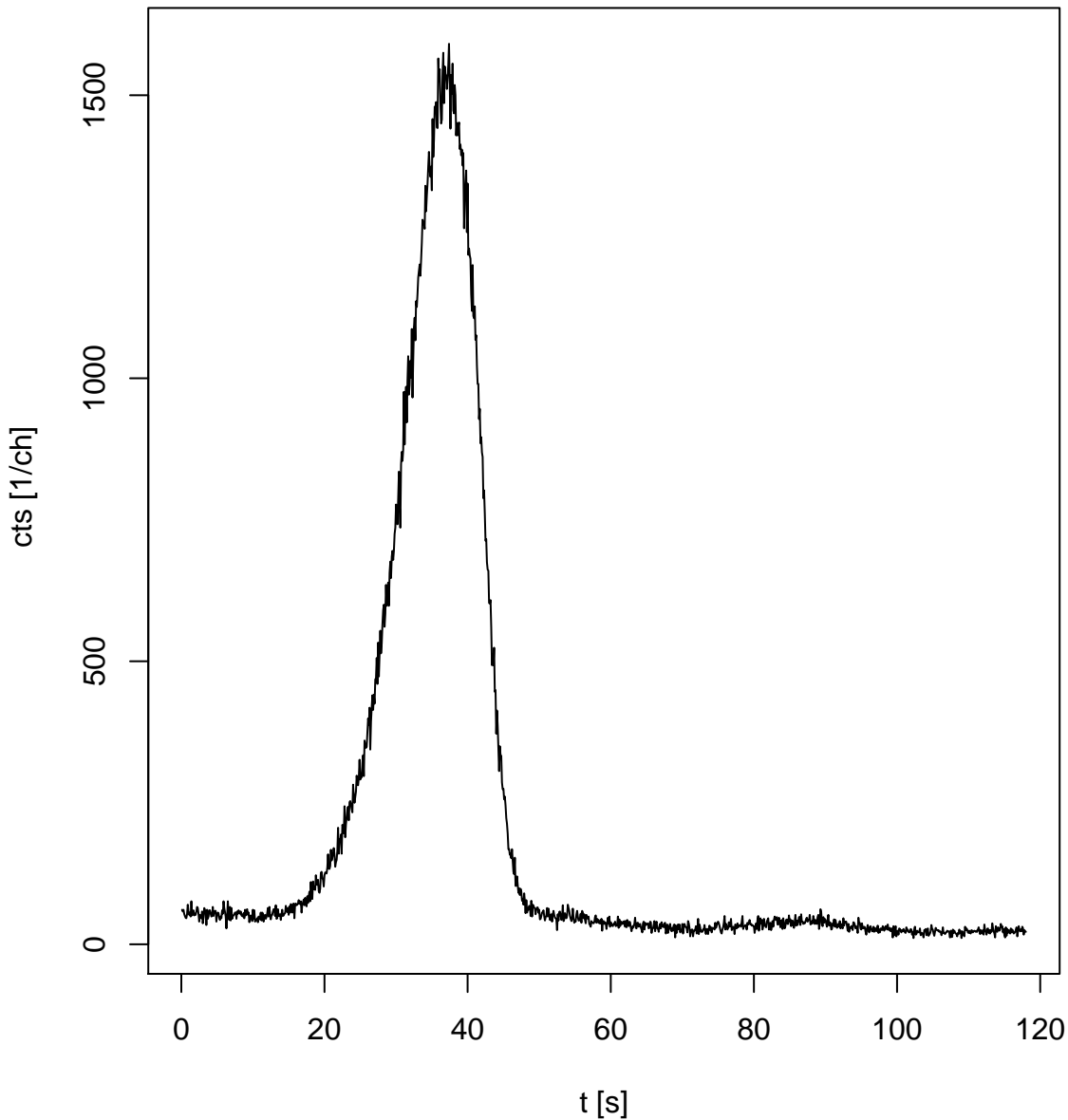


TL (UVVIS)



help("merge_RLum.Data.Curve")

TL (UVVIS)



help("merge_RLum.Data.Curve")

TL (UVVIS)



help("merge_RLum.Data.Curve")

Profile log likelihood for σ_{OD}



Profile log likelihood for σ_{OD}



D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

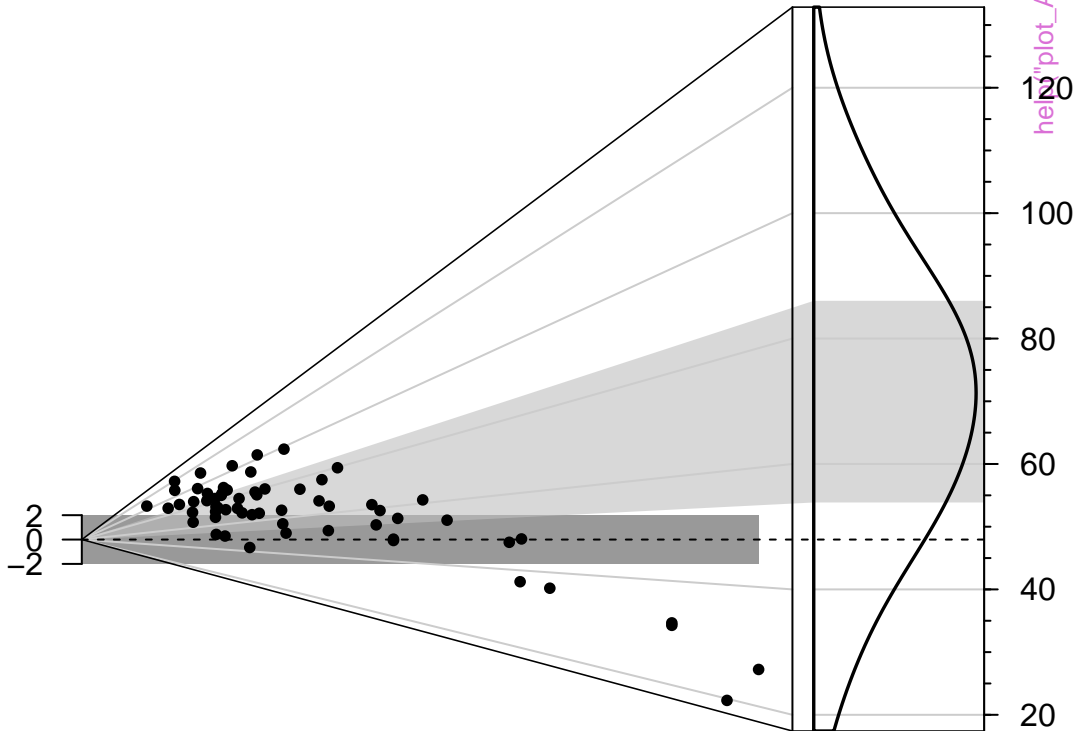
Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 24.2 %

Standardised estimate



help("plot_AbanicoPlot")

help("plot_AbanicoPlot")

Standard error

10

5

3.3

2.5

2

0.0

0.1

0.2

0.3

0.4

0.5

0

0.016

Precision

Density (bw 11.795)

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



Relative standard error (%)

20

10

6.7

5

0

5

10

15

200

0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



D_e [Gy]

Relative standard error (%)

20

10

6.7

0

5

10

15

0

0.264

Precision

Density (bw 0.04)

D_e distribution

n = 62 | in 2 sigma = 41.9 %

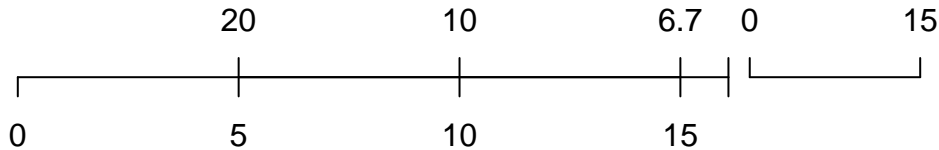
Standardised estimate



D_e [Gy]

Relative standard error (%)

n



Precision

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



D_e [Gy]

Relative standard error (%)

n

20

10

6.7

0

10

0

5

10

15

0

0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



Relative standard error (%)

20

10

6.7

0

5

10

15

0

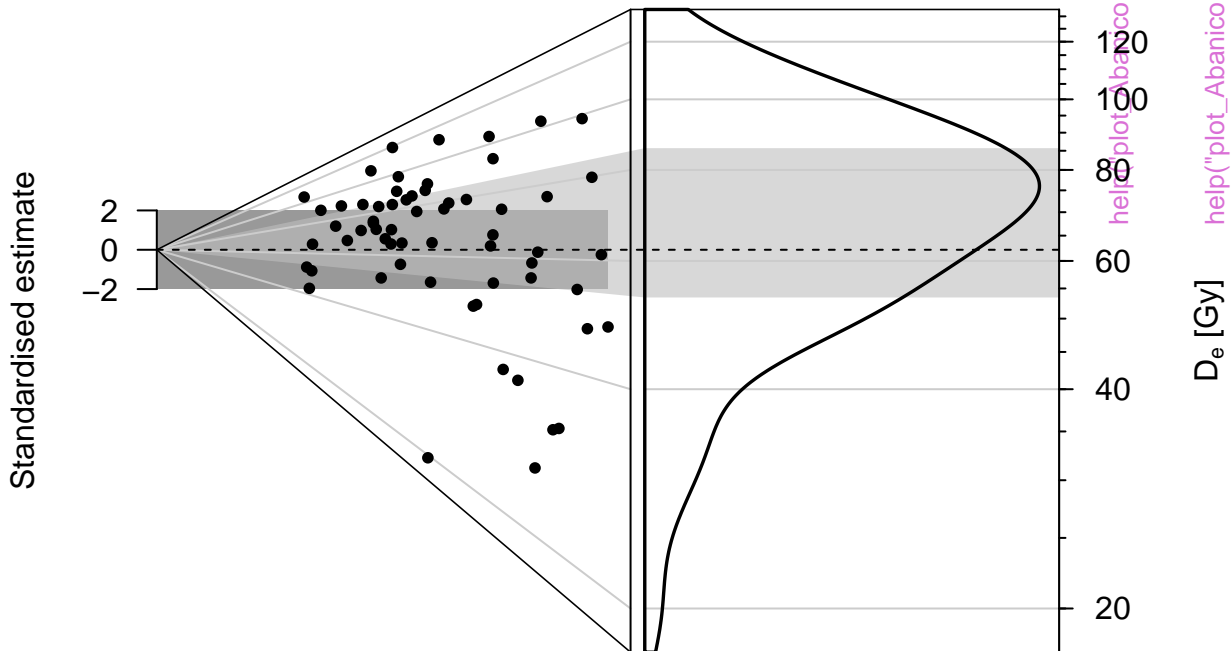
0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %



Relative standard error (%)

20

10

6.7

0

5

10

15

0

0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 53.2 %

Standardised estimate



help("plot_AbanicoPlot")

help("plot_AbanicoPlot")

Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

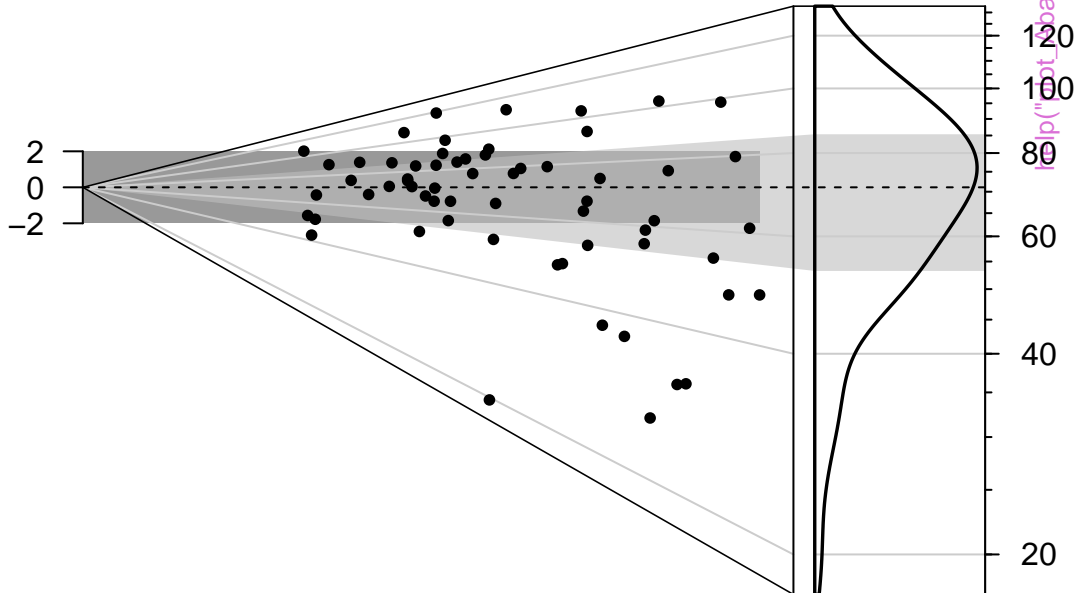
Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 54.8 %

Standardised estimate



Relative standard error (%)

20

10

6.7

0

5

10

15

0

0.016

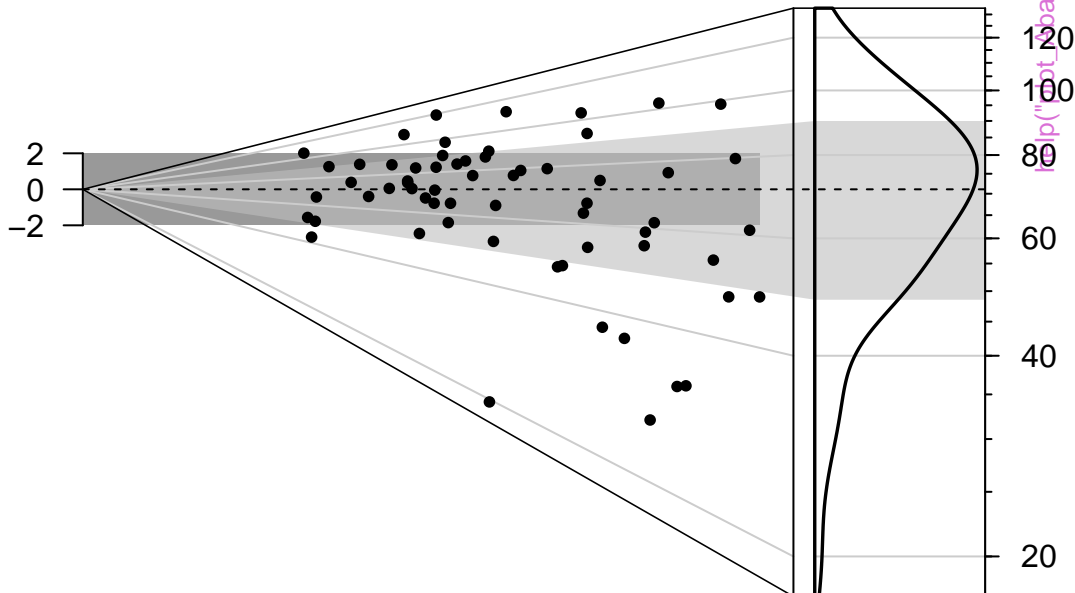
Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 54.8 %

Standardised estimate



D_e [Gy]

Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %



D_e distribution

n = 62 | in 2 sigma = 41.9 %

R Sample 1

Standardised estimate



help("plot_AbanicoPlot")

help("plot_AbanicoPlot")

D_e [Gy]

Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate

0

120

100

80

60

40

20

D_e [Gy]

Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

Precision

Density (bw 0.15)

help("plot_AbanicoPlot")

help("plot_AbanicoPlot")

D_e distribution

n = 62 | in 2 sigma = 41.9 %



Relative standard error (%)

20

10

6.7

0

5

10

15

0

0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %



D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

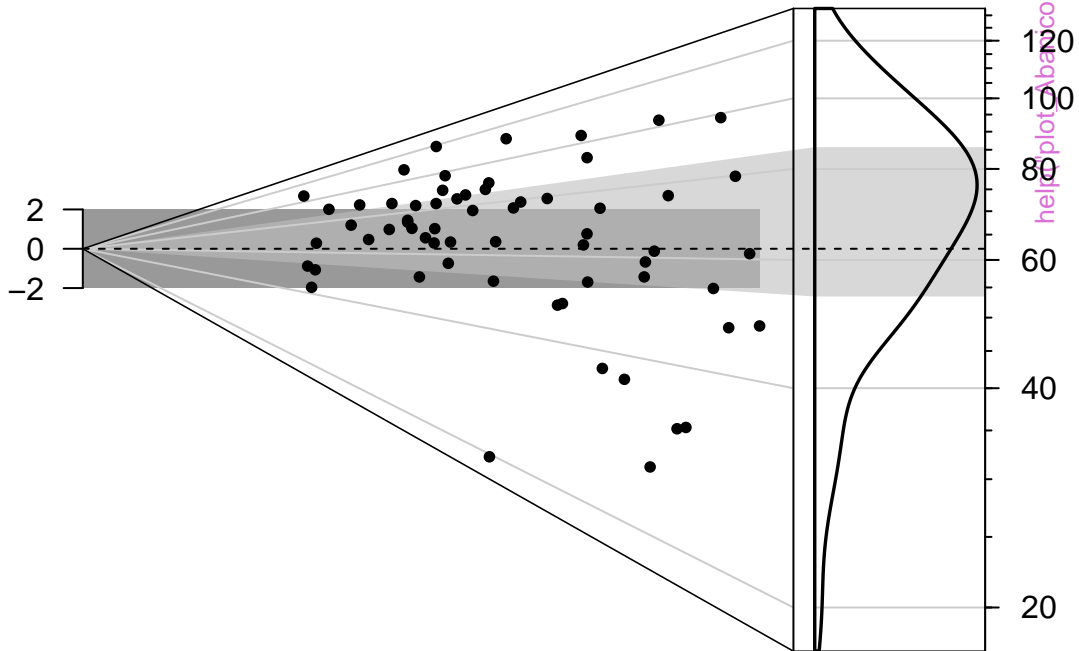
Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



D_e [Gy]

Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

Precision

Density (bw 0.15)

D_e distribution

median = 69.75

Standardised estimate



Relative standard error (%)

20

10

6.7

0

5

10

15

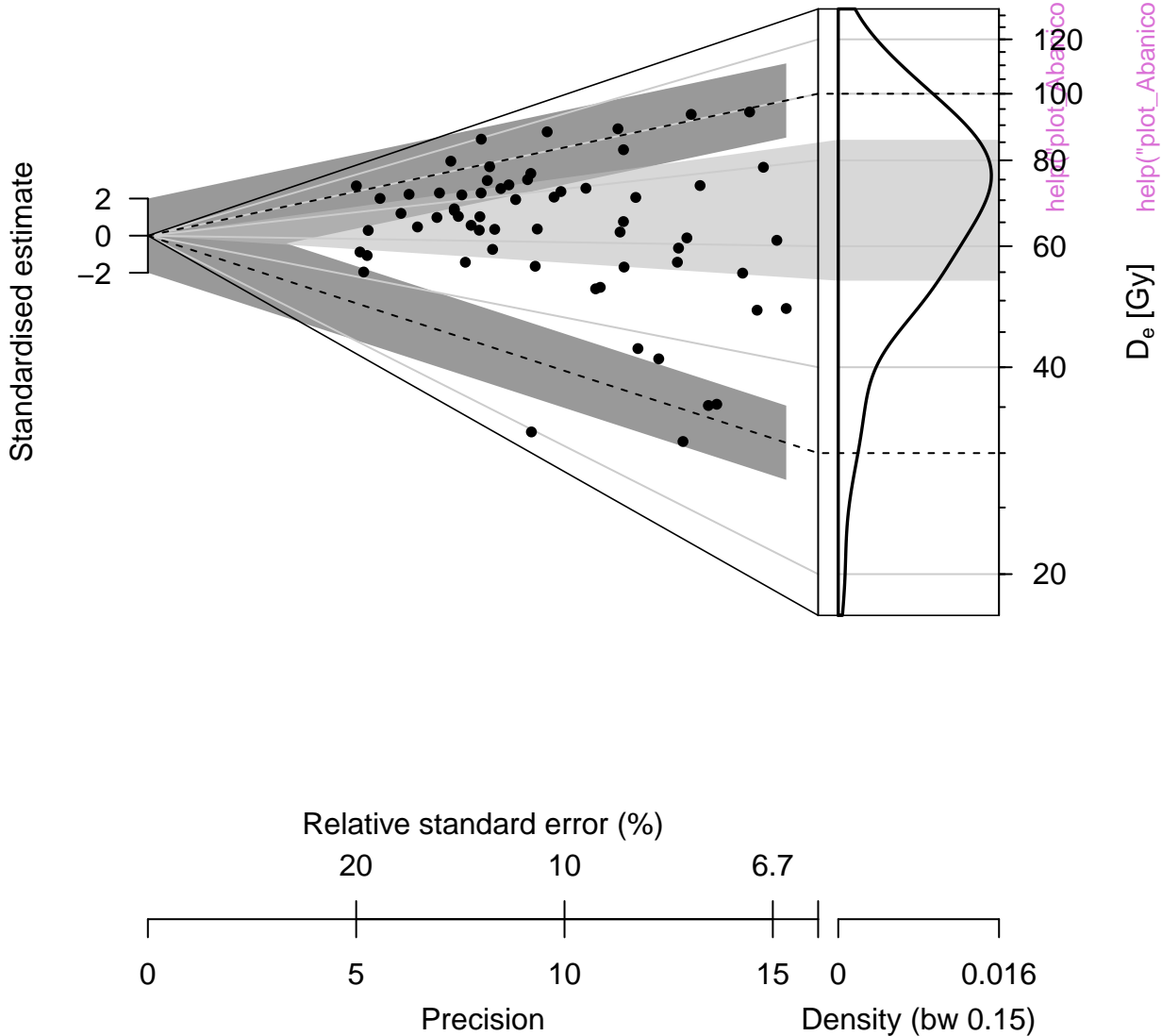
0.016

Precision

Density (bw 0.15)

D_e distribution

n = 62 | in 2 sigma = 41.9 %



D_e distribution

n = 30 | in 2 sigma = 46.7 %

n = 32 | in 2 sigma = 87.5 %

Standardised estimate



D_e [Gy]

help(plot_AbanicoPlot")

help("plot_AbanicoPlot")

Relative standard error (%)

20

10

6.7

0

5

10

15

0.032

Precision

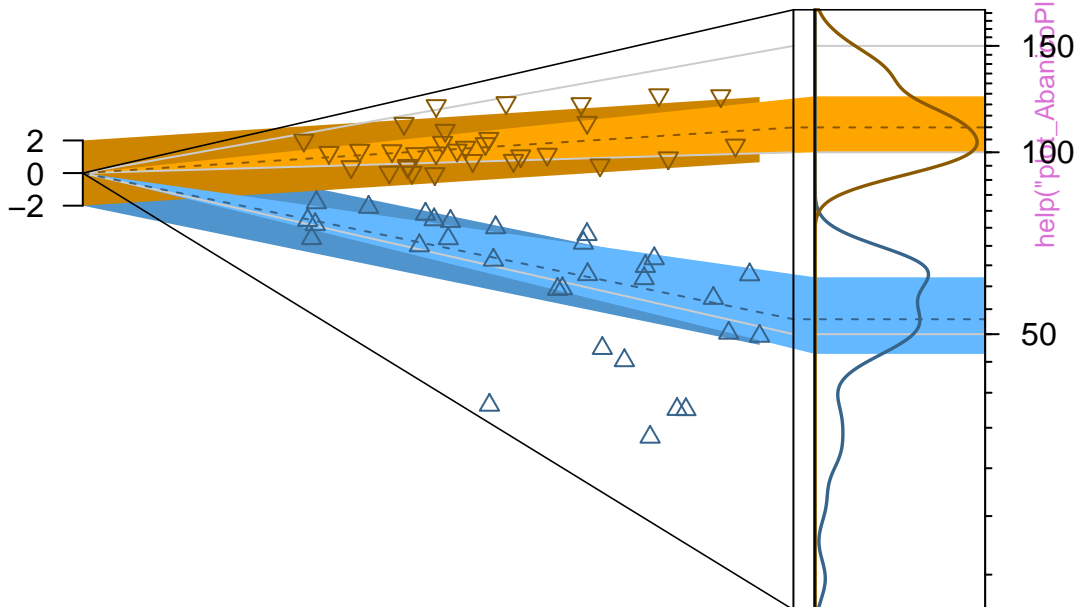
Density (bw 0.074)

D_e distribution

n = 30 | in 2 sigma = 70 % | median = 53.39

n = 32 | in 2 sigma = 84.4 % | median = 110.51

Standardised estimate



D_e [Gy]

Relative standard error (%)

20

10

6.7

0

5

10

15

0.032

Precision

Density (bw 0.074)



help("plot_AbanicoPlot")



help("plot_AbanicoPlot")

D_e distribution

n = 62 | in 2 sigma = 41.9 %

Standardised estimate



D_e [Gy]

Relative standard error (%)

20

10

6.7

0

5

10

15

0.016

Precision

Density (bw 0.15)

Dose recovery test

Example data



Dose recovery test



Dose recovery test



Dose recovery test



Dose recovery test



Dose recovery test

| n = 5 | weighted mean = 1.01 |

| n = 5 | weighted mean = 1 |



Dose recovery test

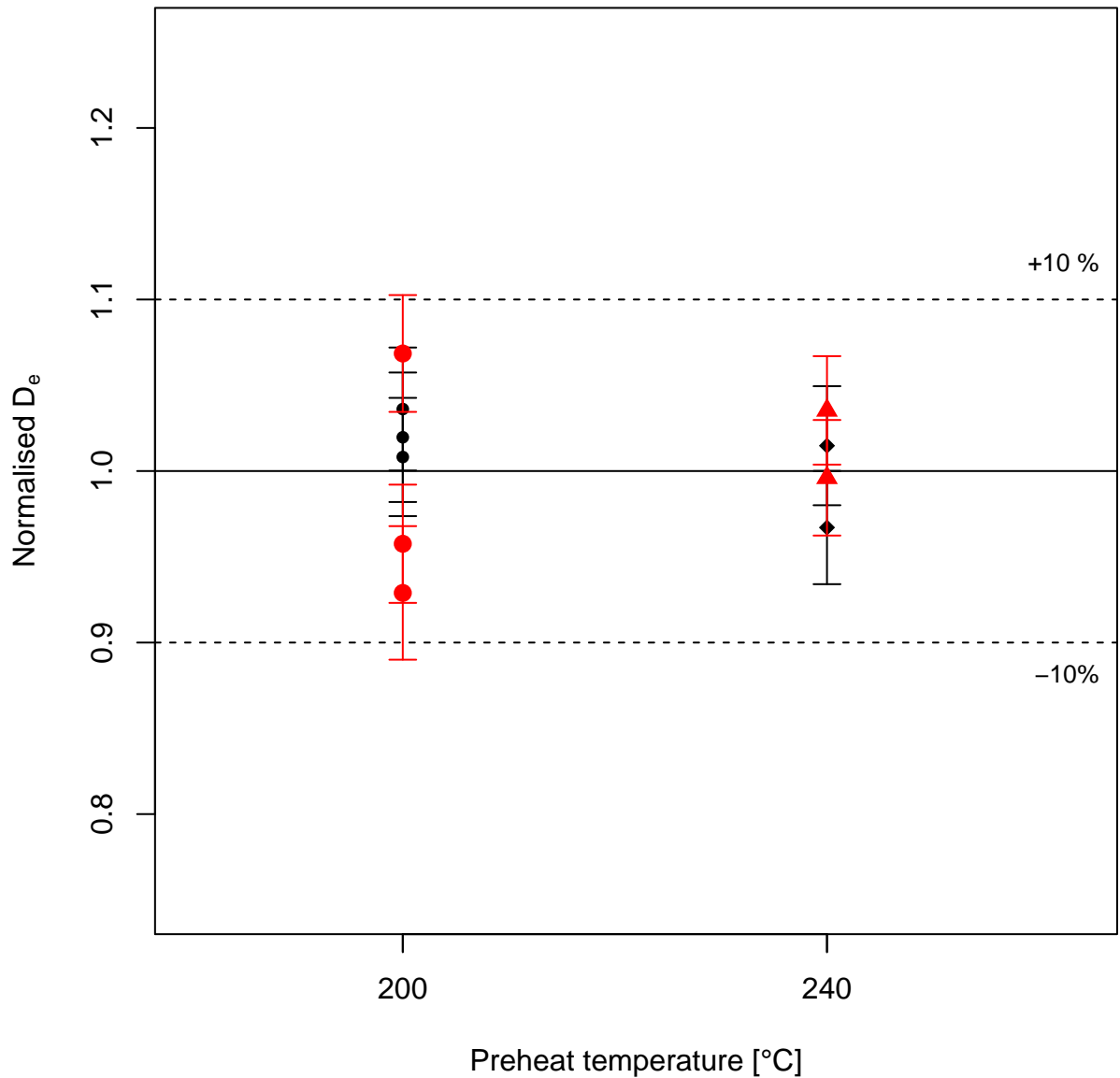


Dose recovery test

Example data



Dose recovery test



Dose recovery test



Filter Combination



Filter Combination



Growth curve

$D_e = 1737.88 \pm 57.45$ | fit: EXP



D_e from MC simulation

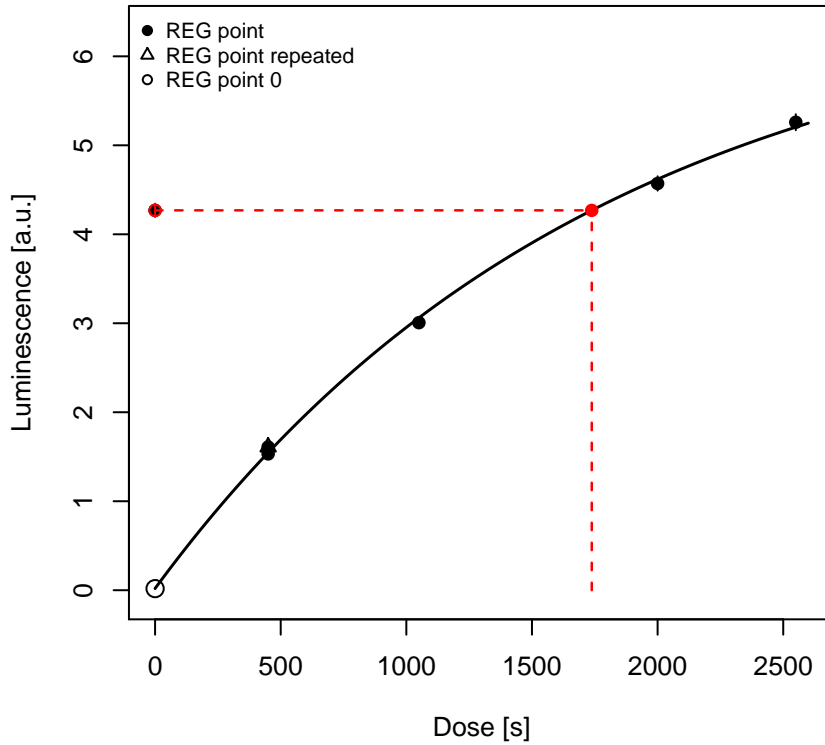


Test dose response



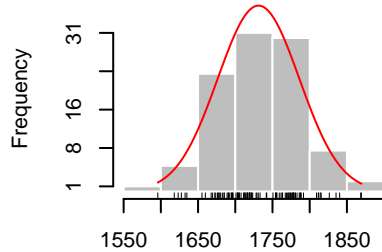
Growth curve

$D_e = 1737.88 \pm 54.9$ | fit: EXP



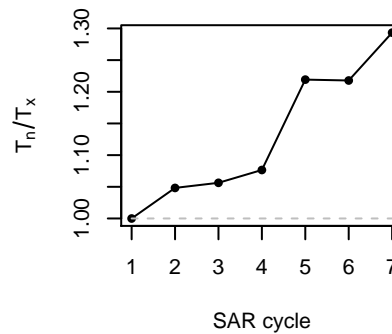
D_e from MC simulation

$D_{eMC} = 1731.23 \pm 54.9$ | quality = 99.6 %



n = 100 , valid fits = 100

Test dose response



Growth curve

$D_e = 1737.88 \pm 64.53$ | fit: EXP



D_e from MC simulation

D_{eMC} = 1745.42 ± 64.53 | quality = 99.6 %



Test dose response

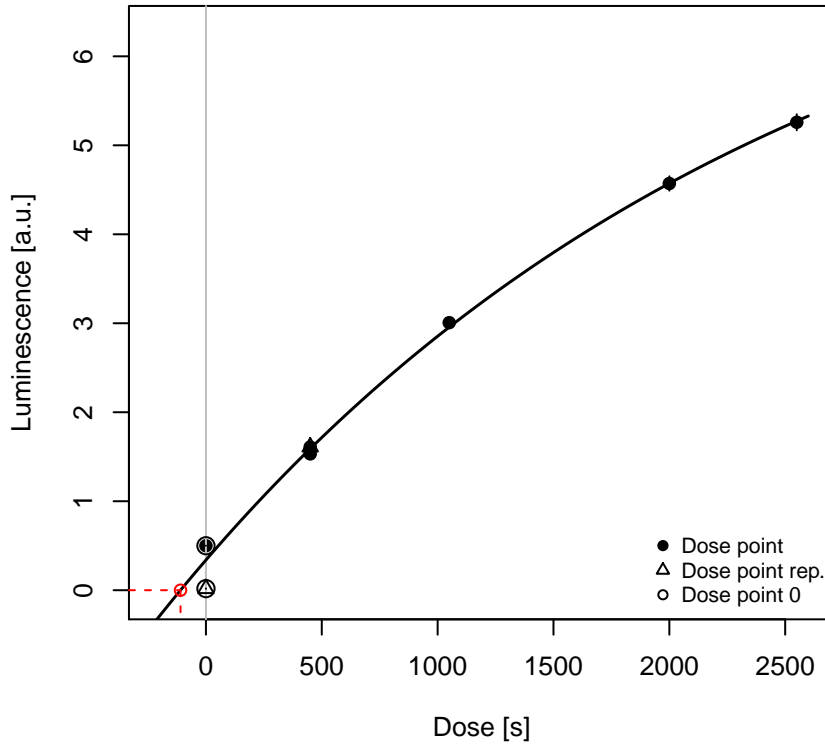




help("plot_GrowthCurve")

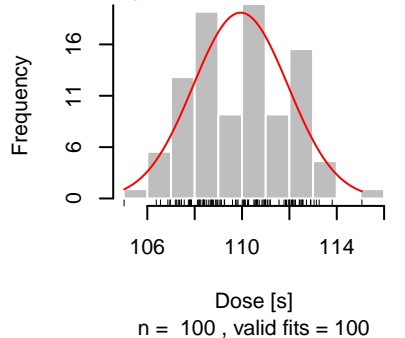
Growth curve

$D_e = 109.74 \pm 2$ | fit: EXP

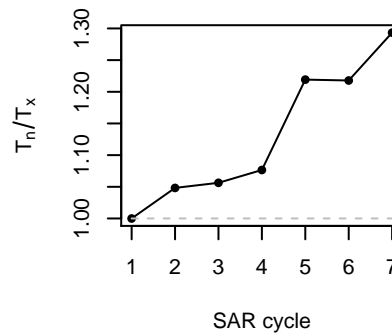


D_e from MC simulation

$D_{eMC} = 109.94 \pm 2$ | quality = 99.8 %



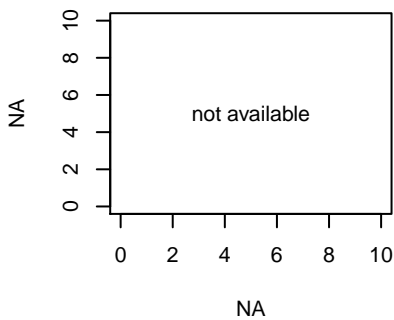
Test dose response



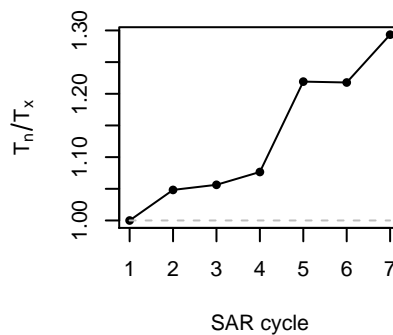
Growth curve



D_e from Monte Carlo simulation



Test dose response



Histogram



Histogram of De-values

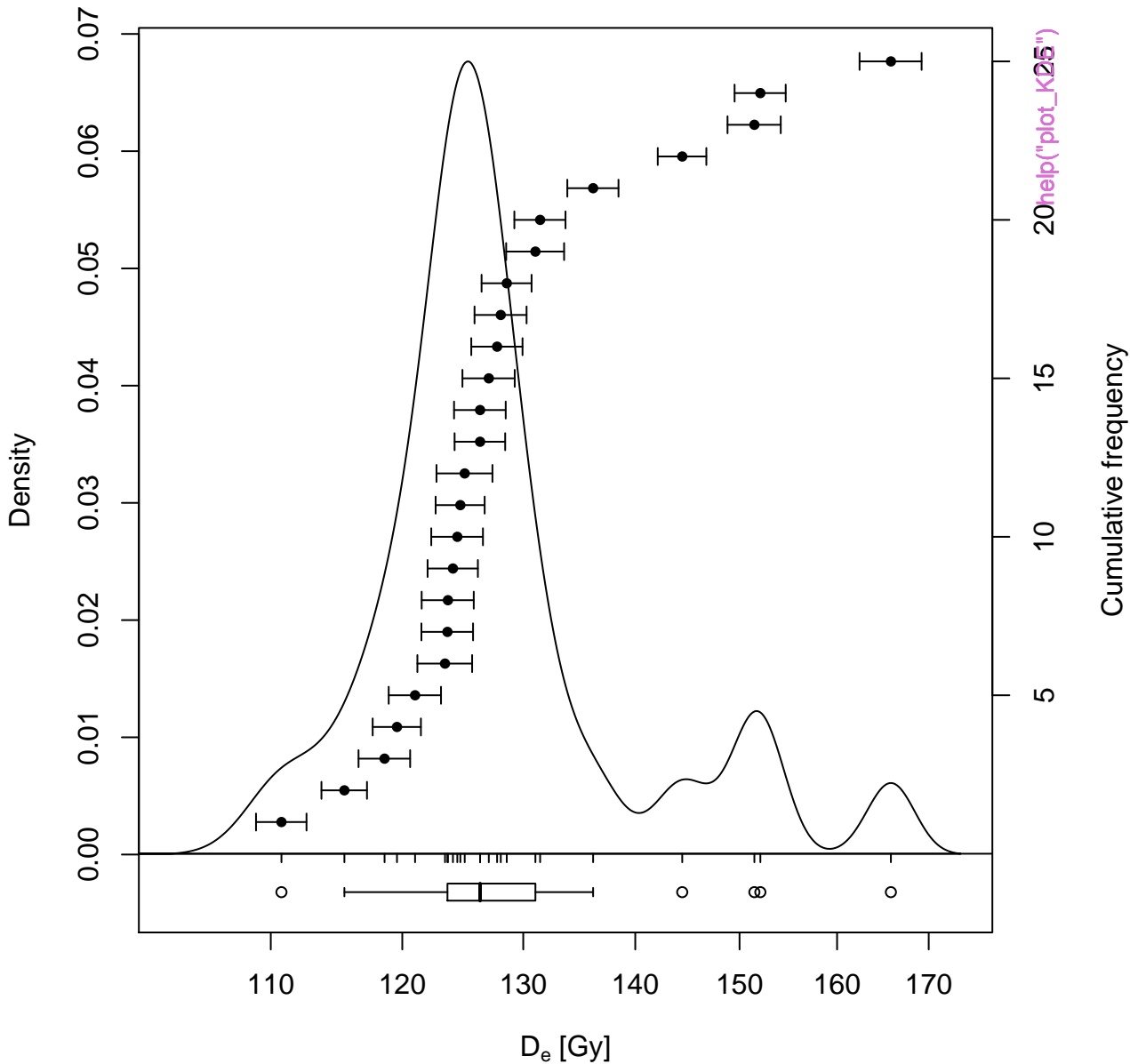
Example data set



D_e distribution



D_e distribution



Dose distribution



D_e distribution



D_e distribution

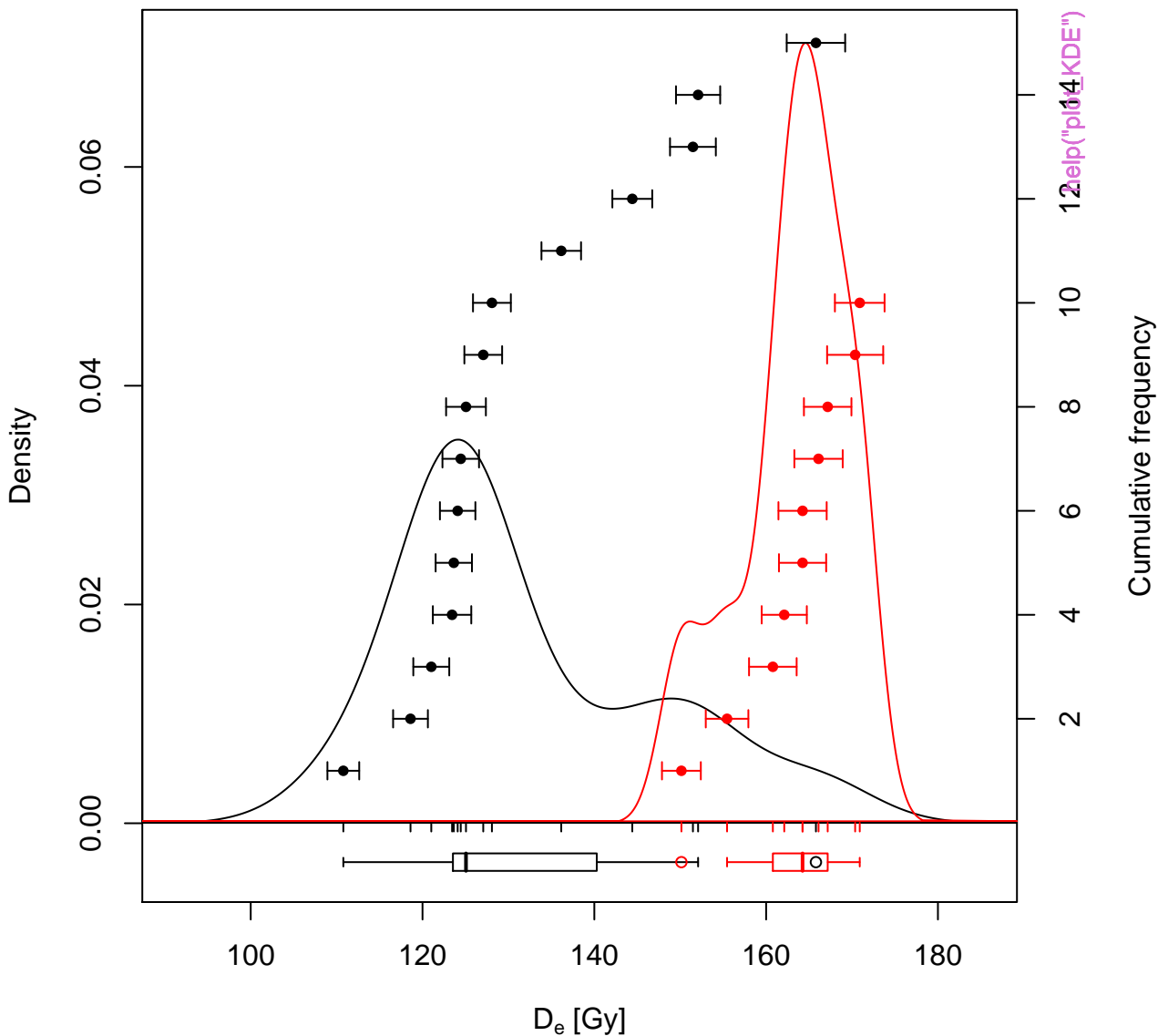
n = 25 | median = 126.36 | skewness = 1262.54 | in 2 sigma = 96 %



D_e distribution



D_e distribution



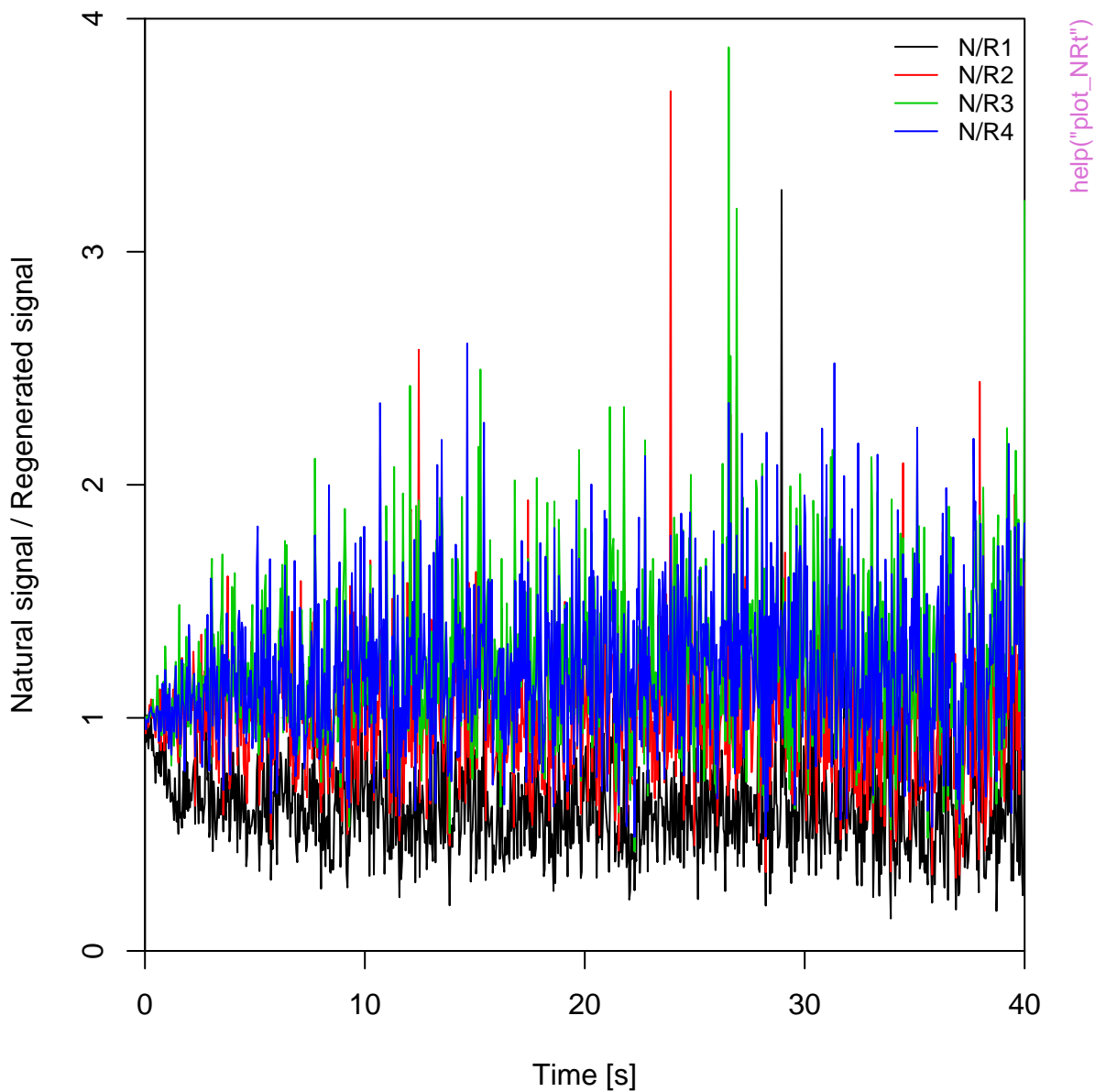
D_e distribution



D_e distribution



NR(t) Plot

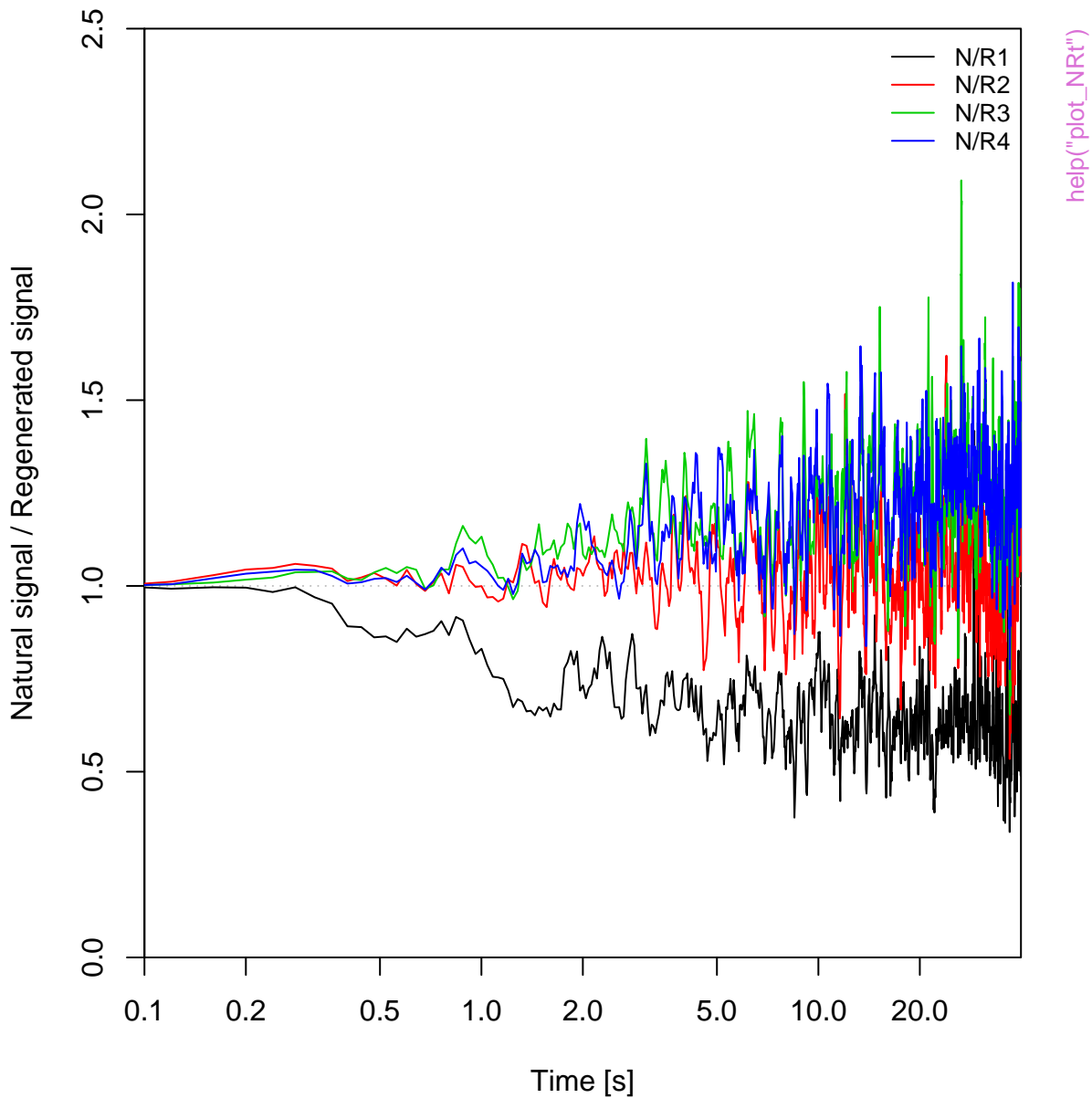


NR(t) Plot



help("plot_NRt")

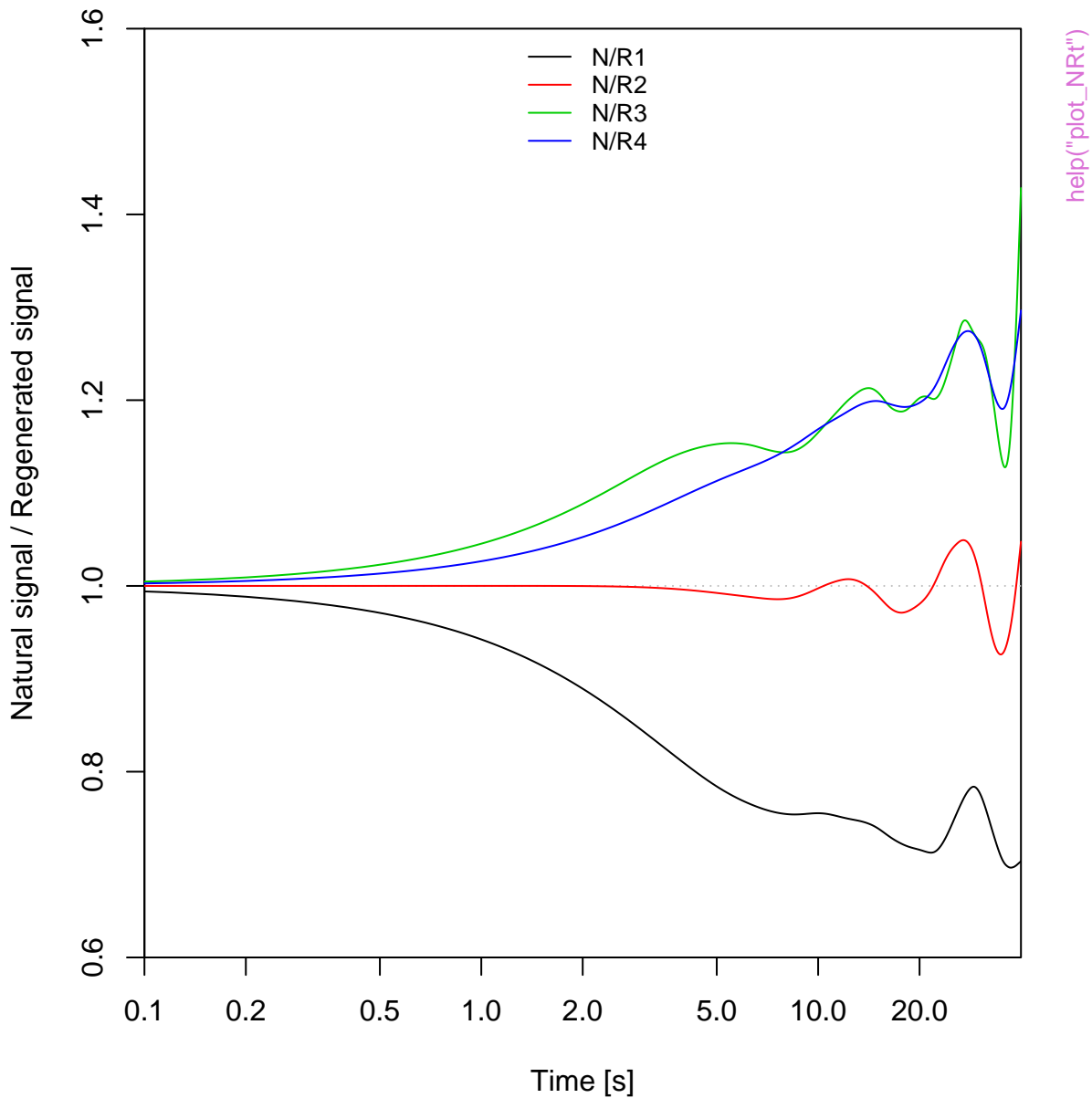
NR(t) Plot



NR(t) Plot

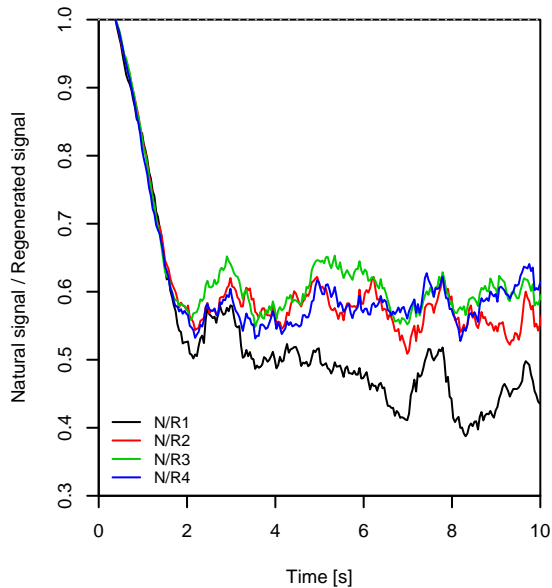
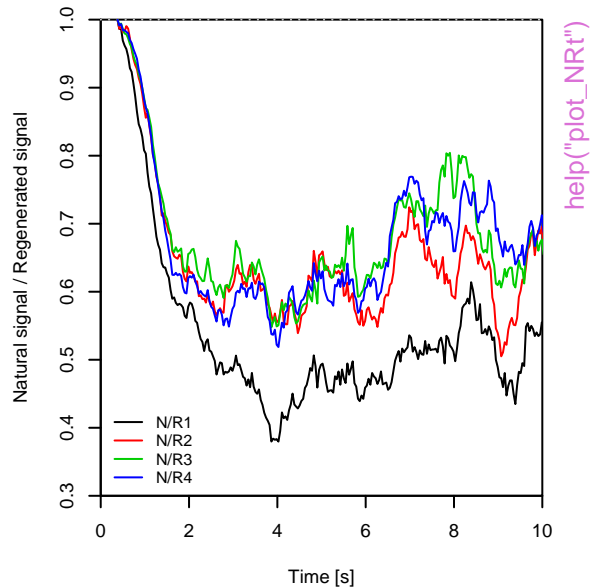


NR(t) Plot

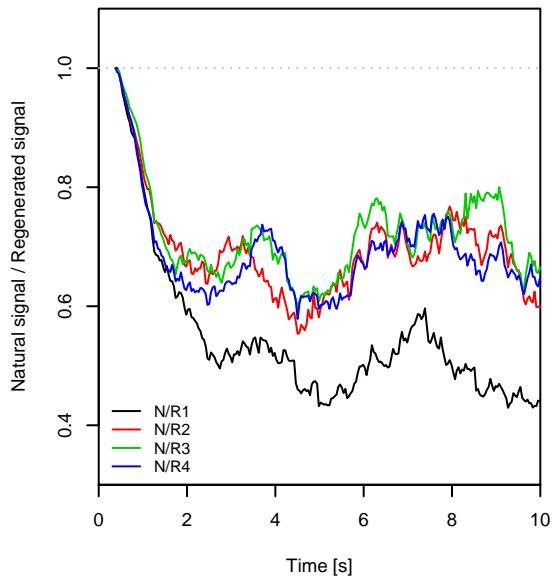
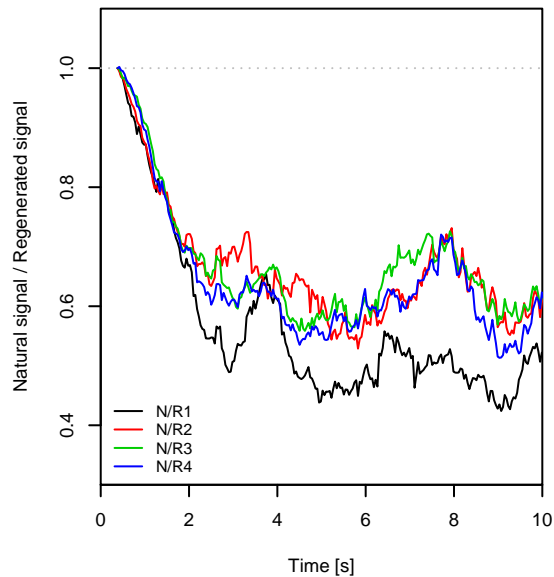


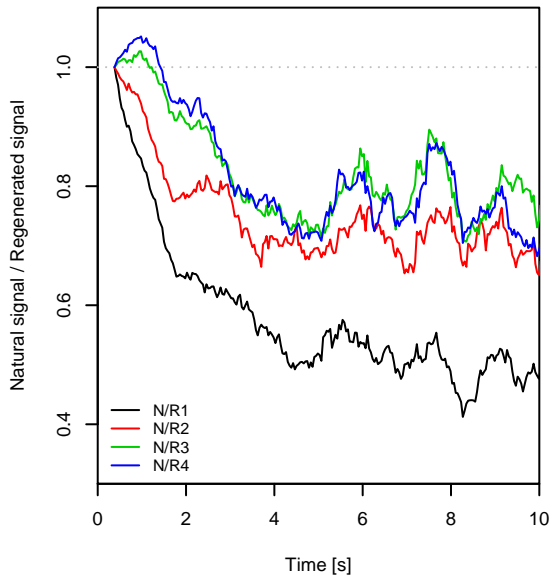
TnTx(t) Plot

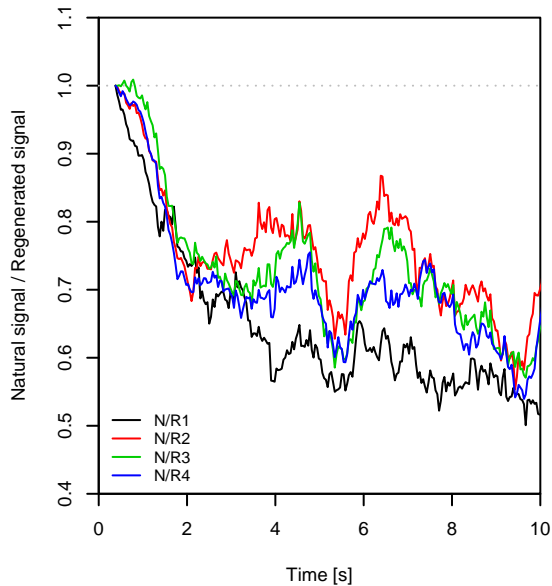
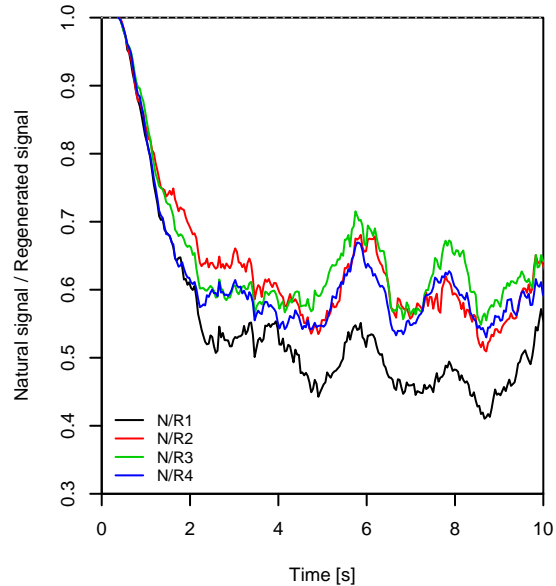


Aliquot #1**Aliquot #2**

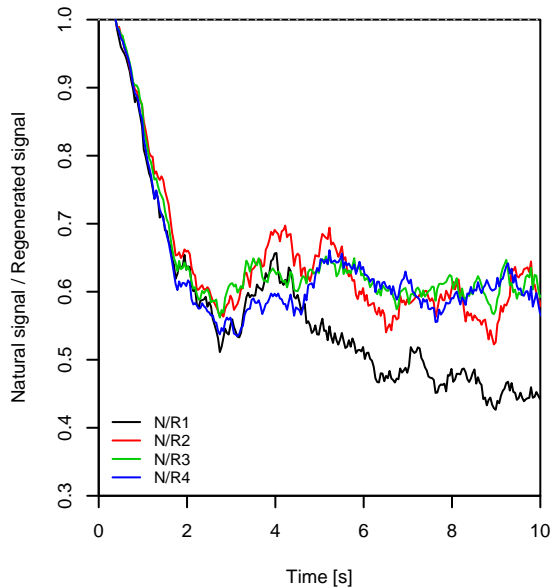
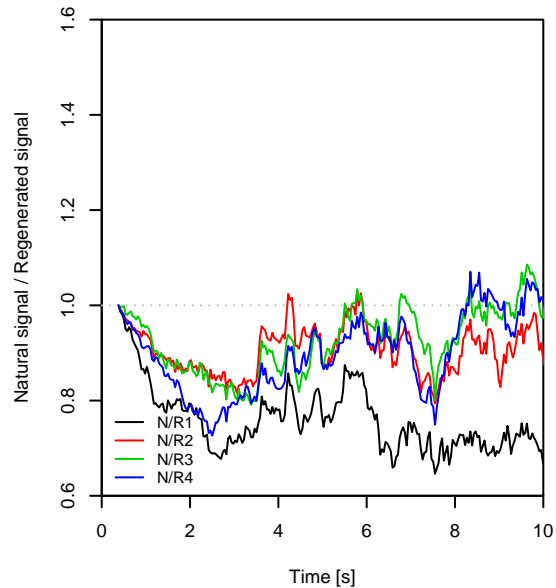
help("plot_NRt")

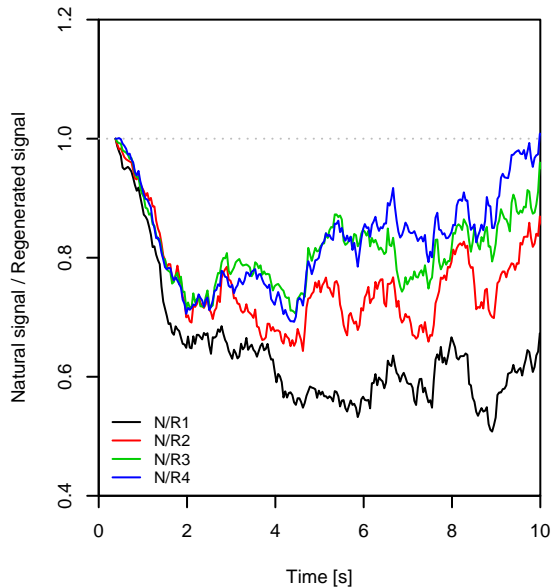
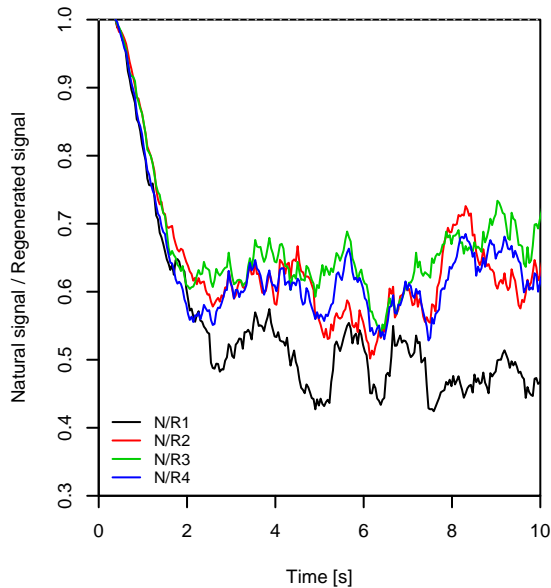
Aliquot #3**Aliquot #4**

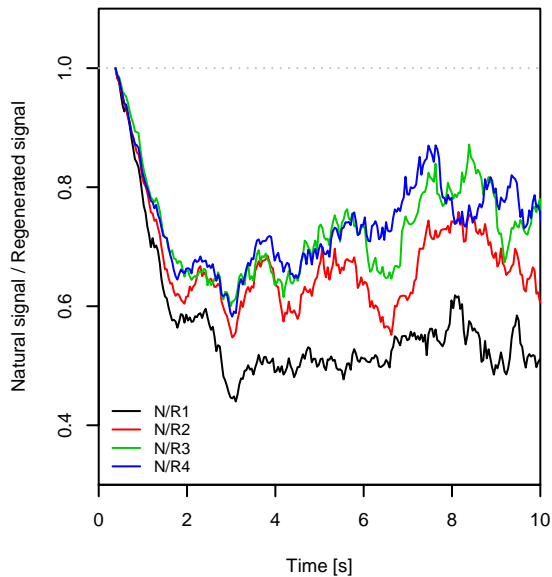
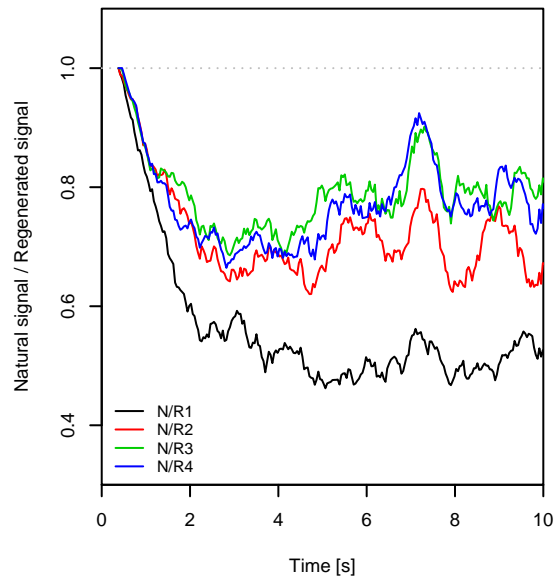
Aliquot #5**Aliquot #6****Aliquot #7****Aliquot #8**

Aliquot #9**Aliquot #10**

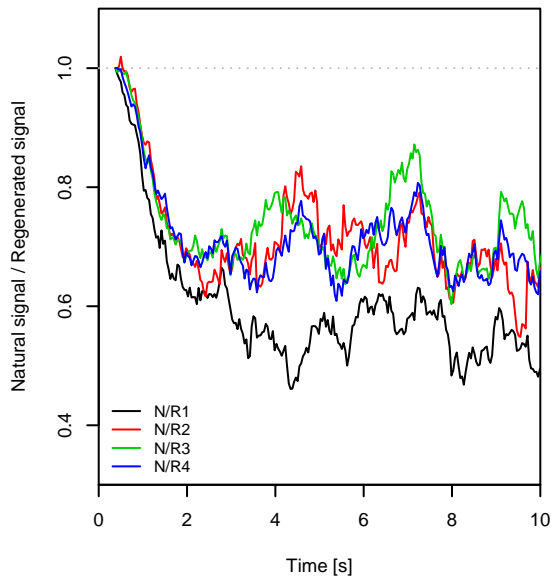
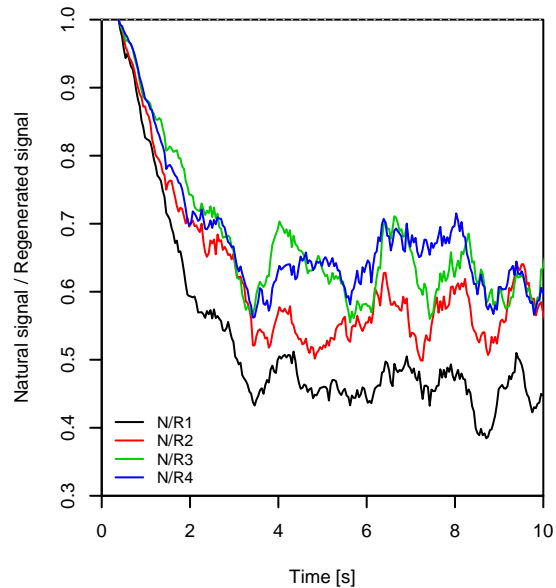
help("plot_NRt")

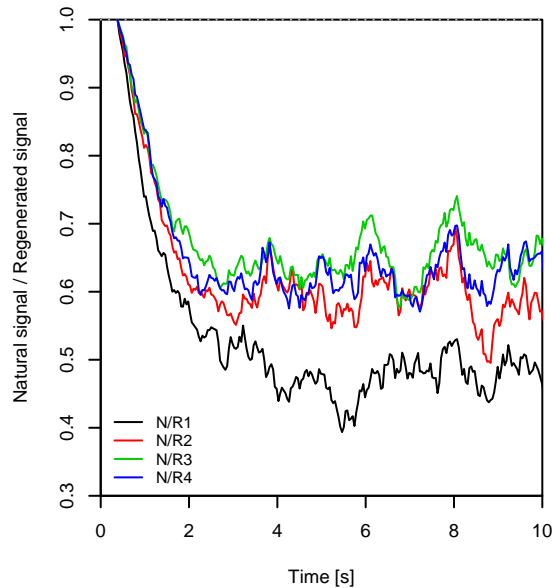
Aliquot #11**Aliquot #12**

Aliquot #13**Aliquot #14****Aliquot #15****Aliquot #16**

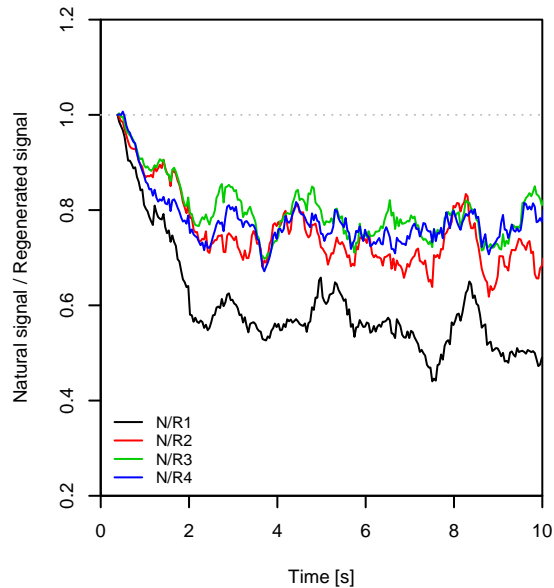
Aliquot #17**Aliquot #18**

help("plot_NRt")

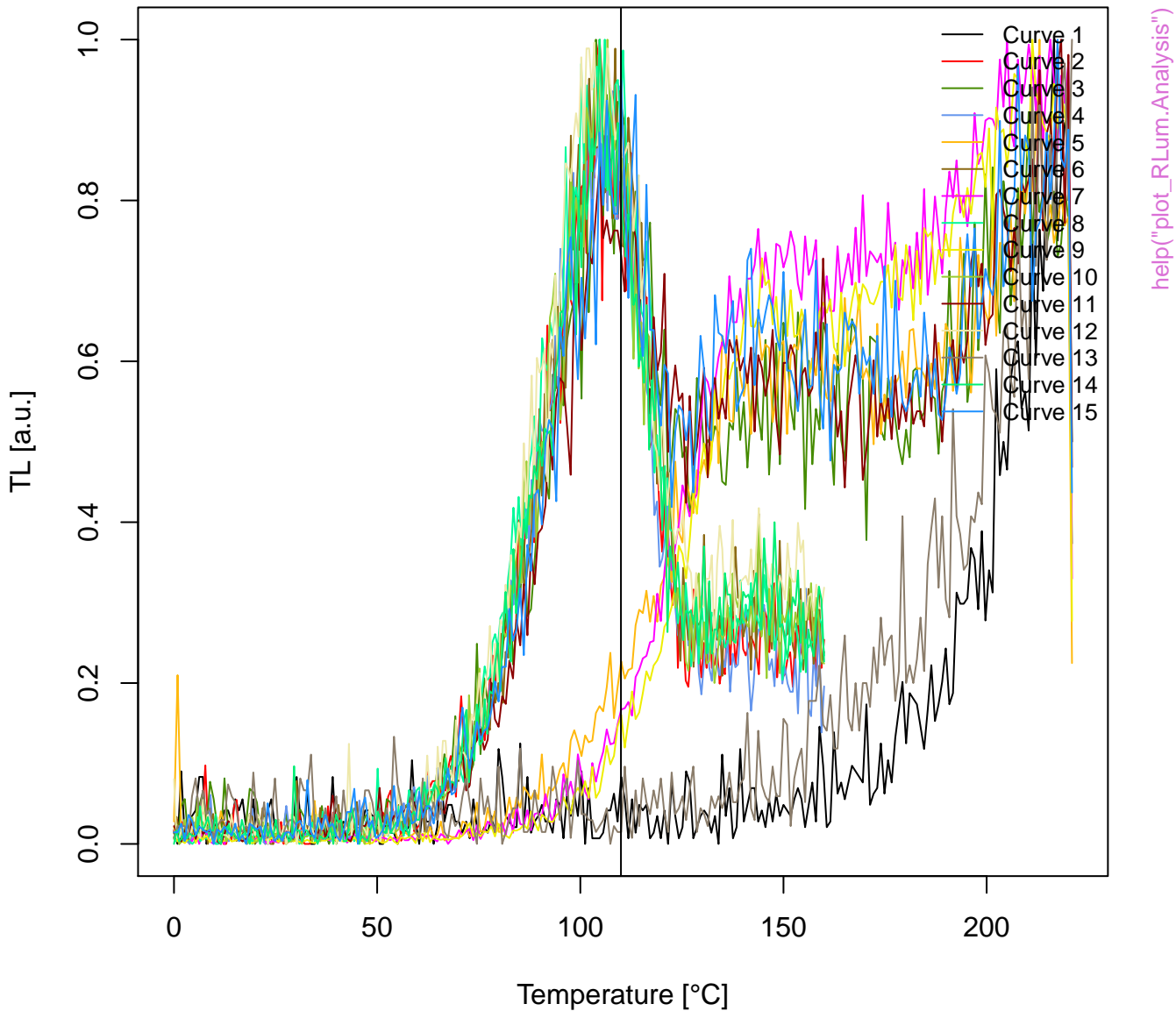
Aliquot #19**Aliquot #20**

Aliquot #21**Aliquot #22**

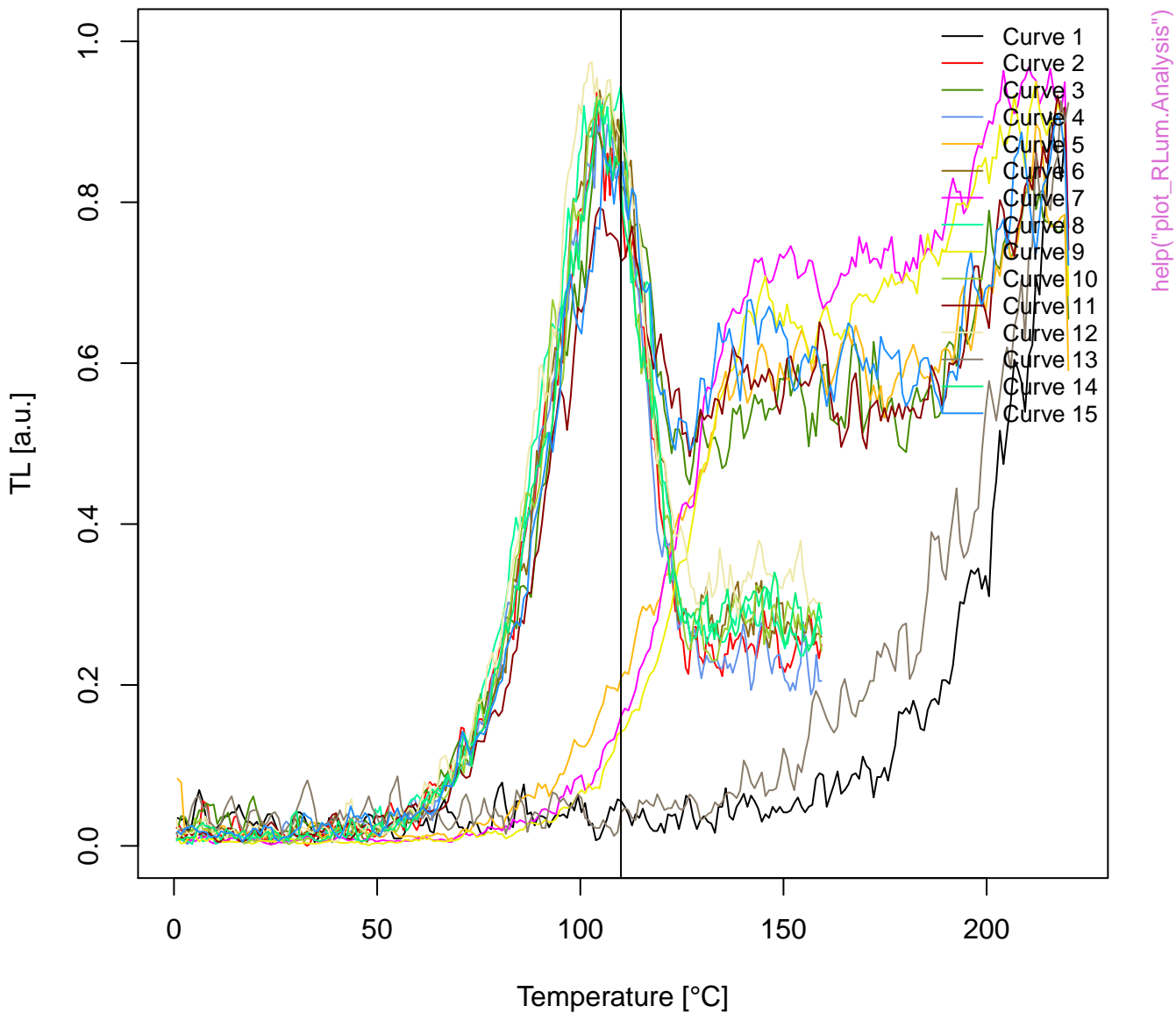
help("plot_NRt")

Aliquot #23**Aliquot #24**

TL combined



TL combined



unkown curve type



RLum.Data.Image

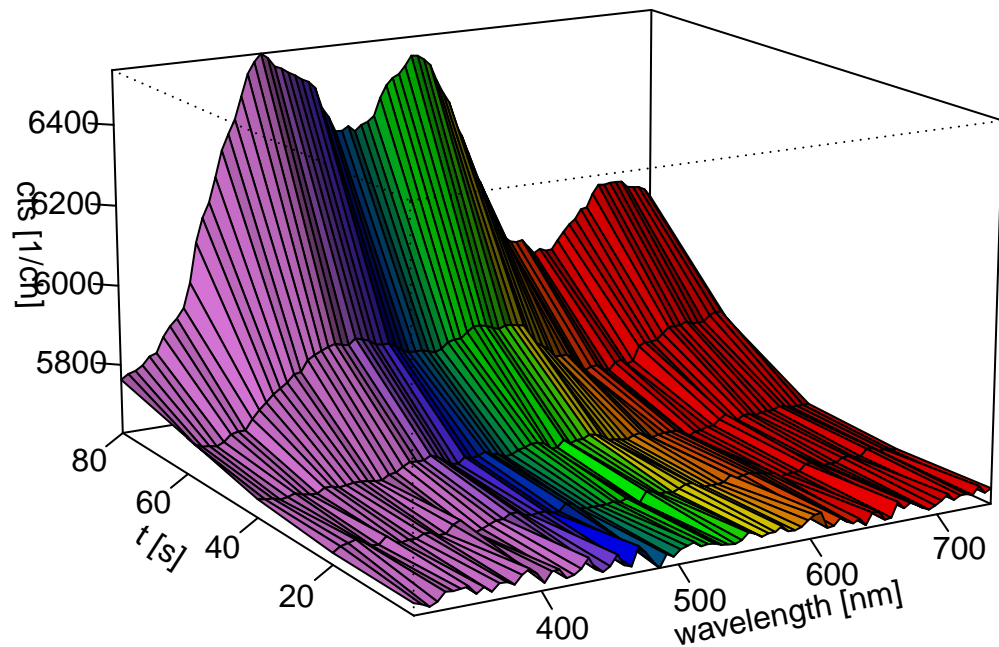


RLum.Data.Spectrum



[help\("plot_RLum.Data.Spectrum"\)](#)

RLum.Data.Spectrum



`help("plot_RLum.Data.Spectrum")`

RLum.Data.Spectrum



unkown curve type



Likelihood profile: gamma



Likelihood profile: sigma



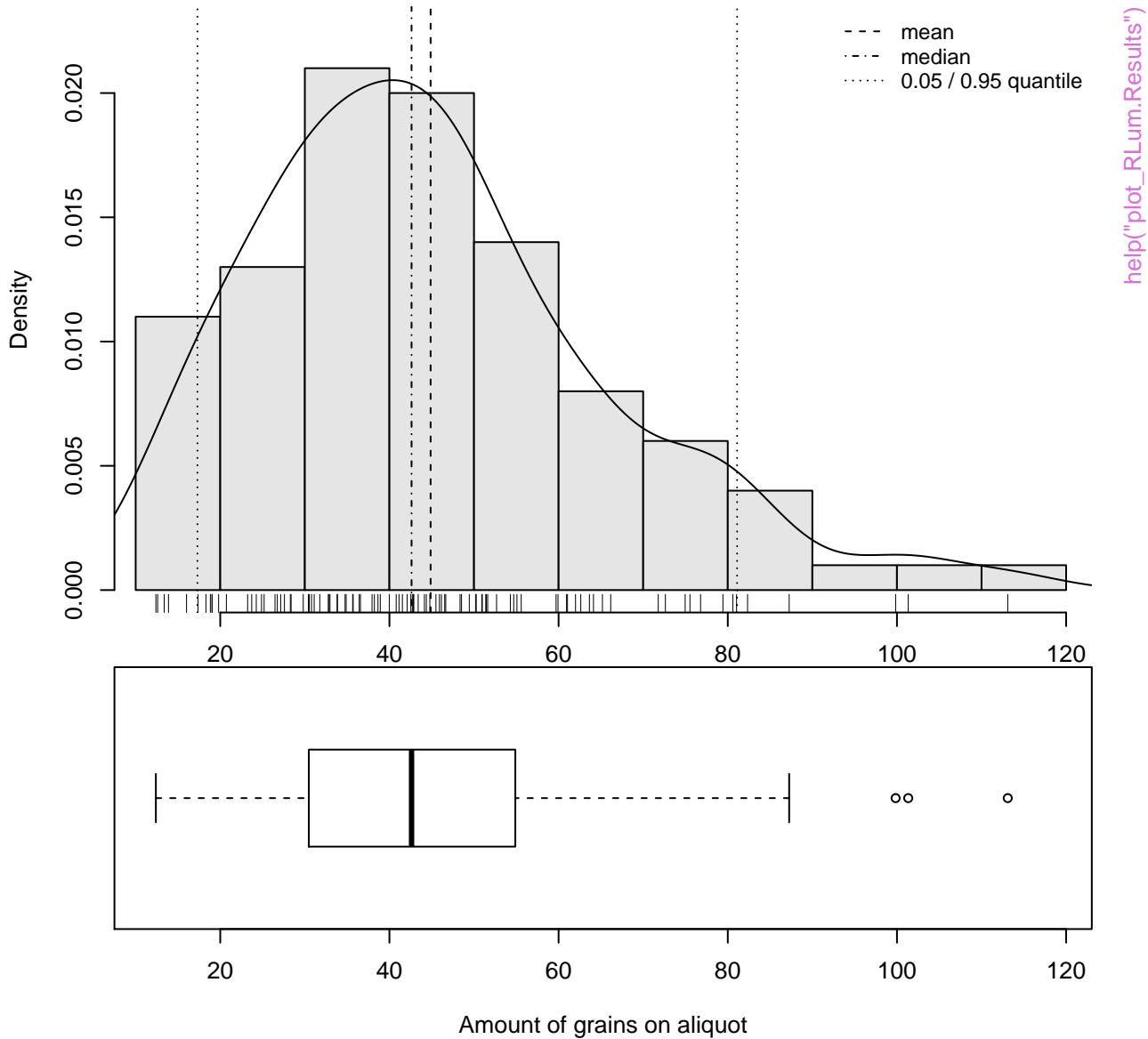
Likelihood profile: p0



help("plot_RLum.Results")

Monte Carlo Simulation

$$n = \mid \hat{\mu} = 45 \mid \hat{\sigma} = 21 \mid \frac{\hat{\sigma}}{\sqrt{n}} = 2 \mid v = 0.84$$



D_e distribution

n = 25 | in 2 sigma = 68 %



D_e distribution

n = 25 | in 2 sigma = 68 %



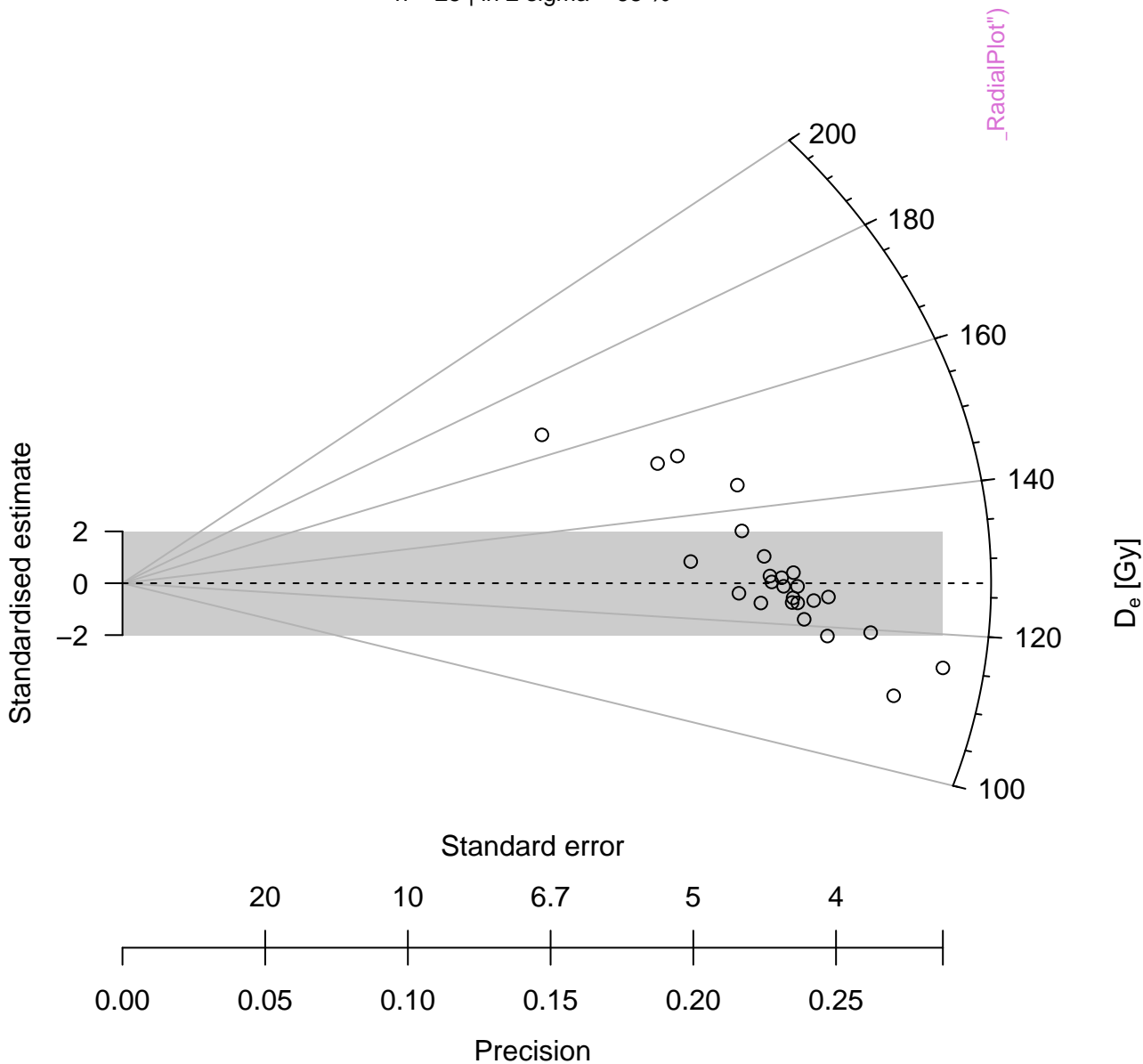
D_e distribution

n = 25 | in 2 sigma = 68 %



D_e distribution

n = 25 | in 2 sigma = 68 %



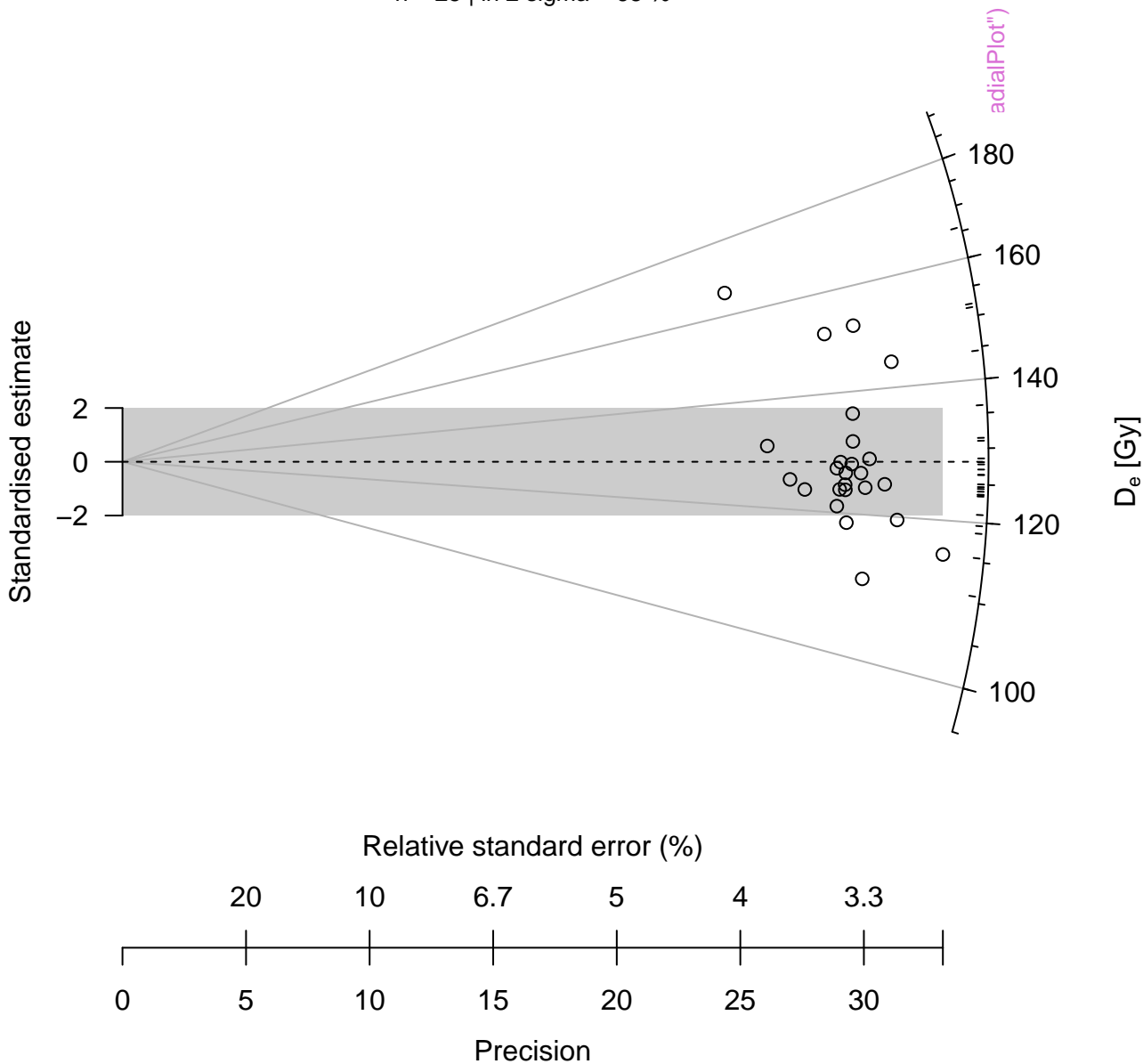
D_e distribution

n = 25 | in 2 sigma = 68 %



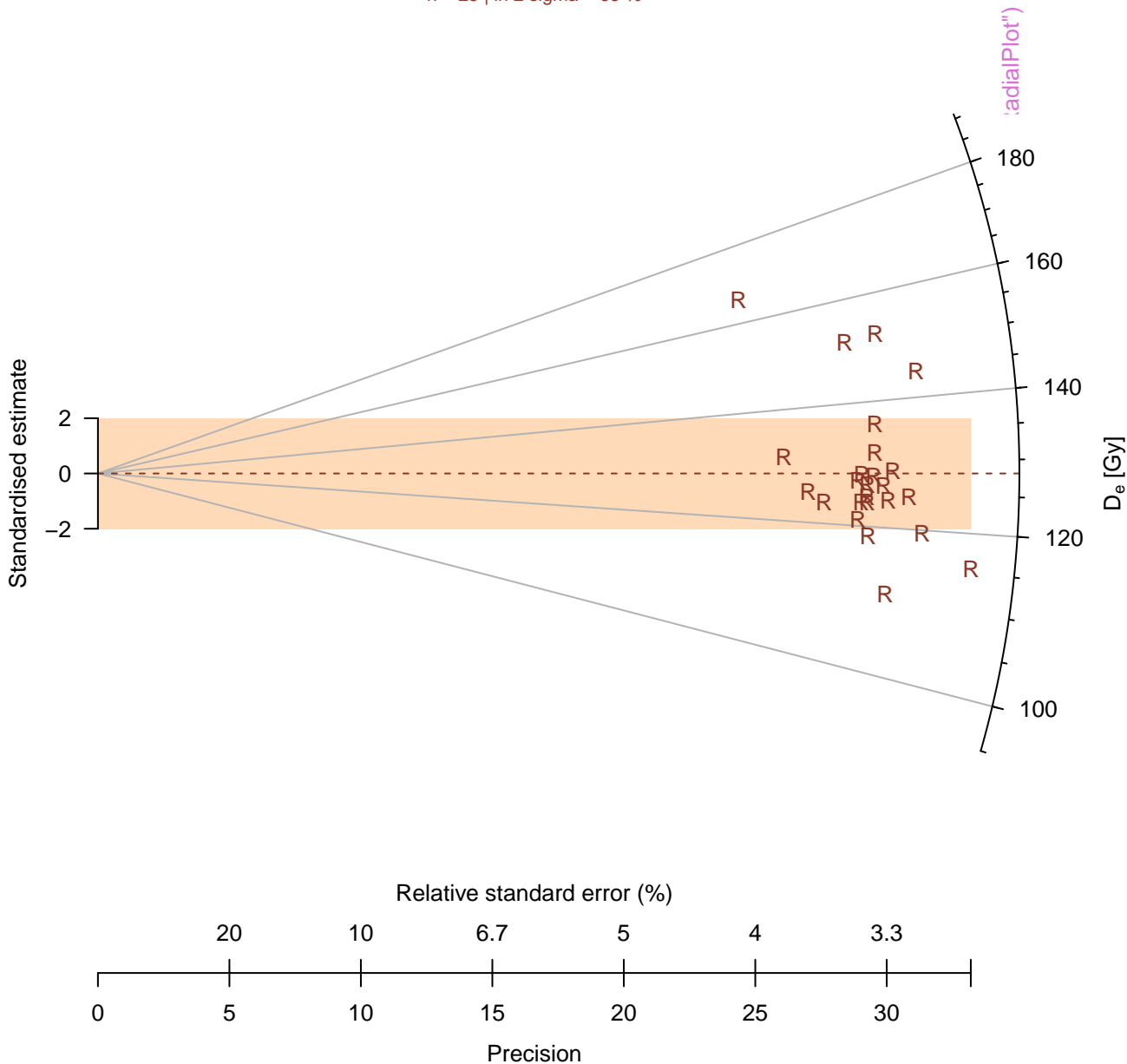
D_e distribution

n = 25 | in 2 sigma = 68 %



D_e distribution

n = 25 | in 2 sigma = 68 %



D_e distribution

n = 25 | in 2 sigma = 68 %

Standardised estimate

0

0

20

5

10

10

6.7

15

5

20

4

25

3.3

30

Precision

Relative standard error (%)

adialPlot")

180

160

140

120

100

D_e [Gy]

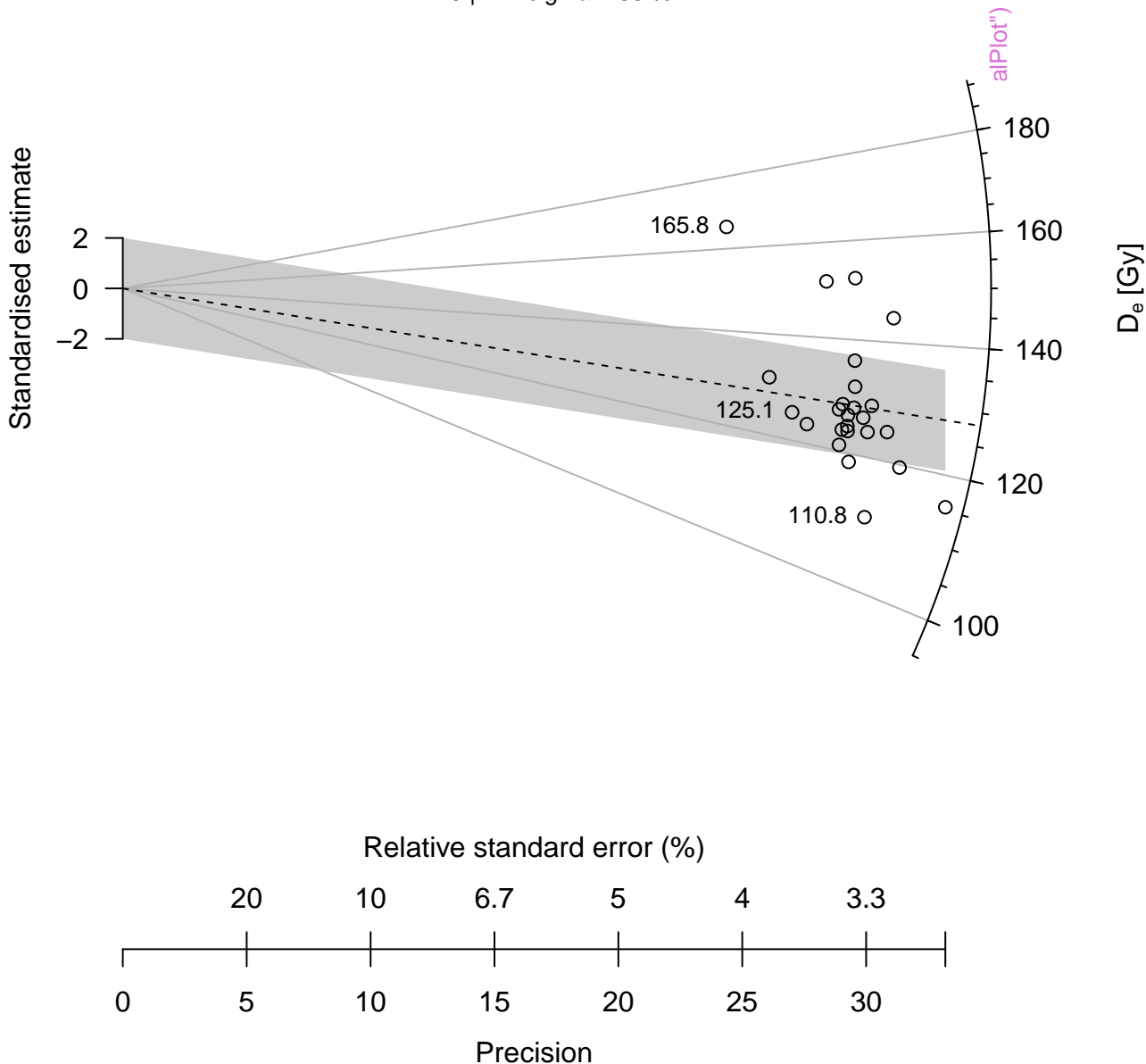
D_e distribution

n = 25 | in 2 sigma = 68 %



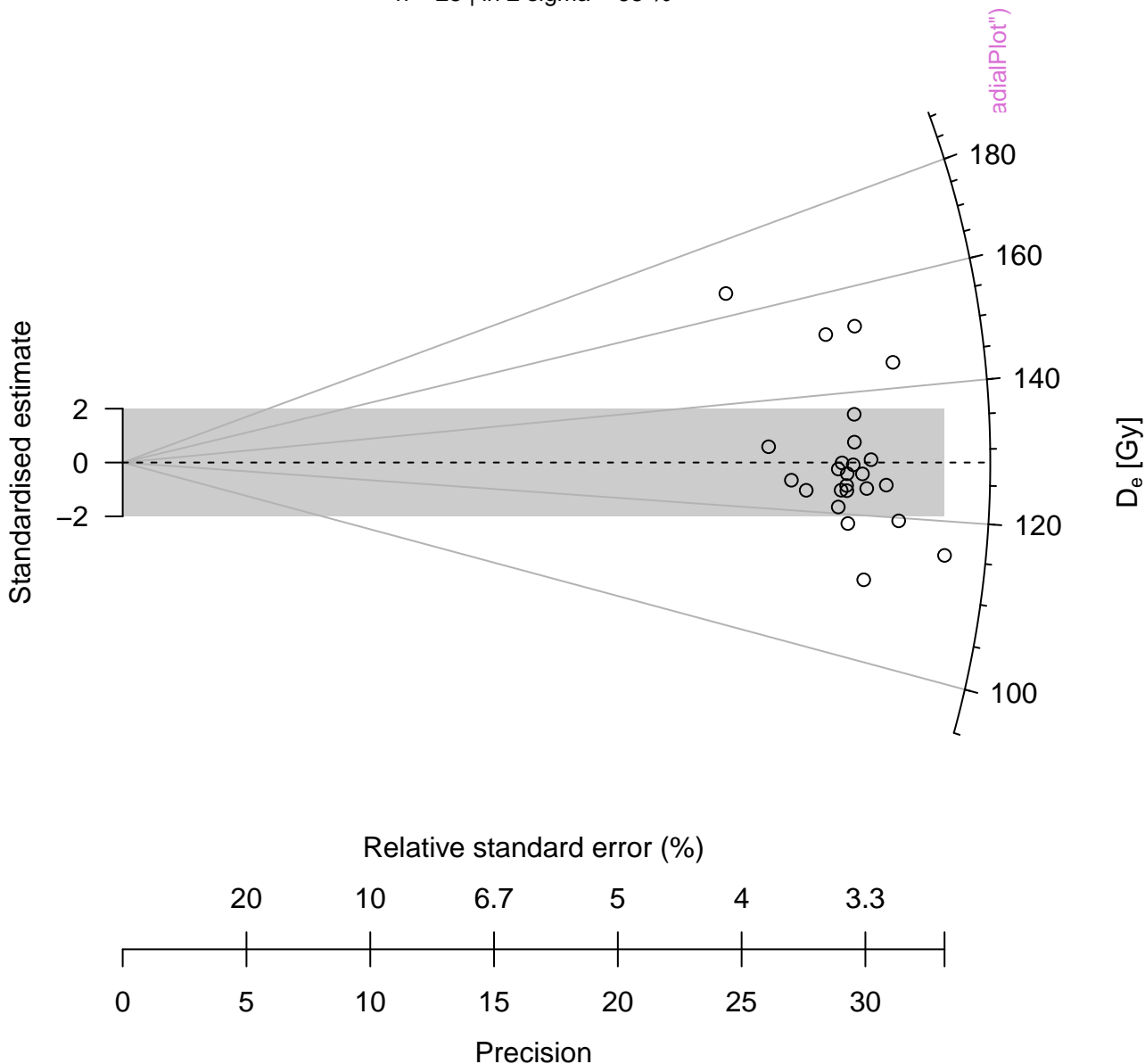
D_e distribution

n = 25 | in 2 sigma = 68 %



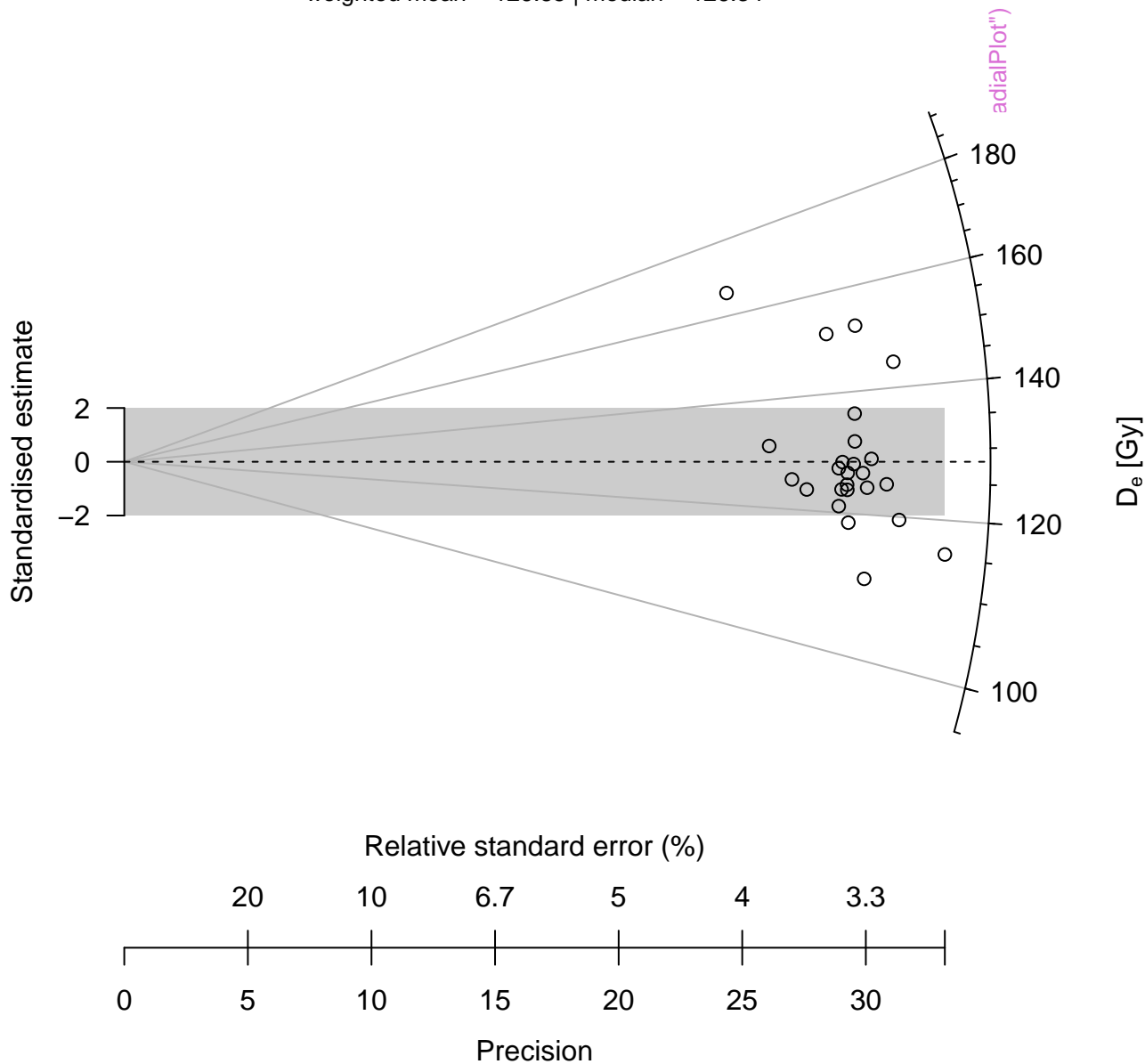
D_e distribution

n = 25 | in 2 sigma = 68 %



D_e distribution

weighted mean = 126.85 | median = 126.34



D_e distribution

n = 15 | in 2 sigma = 53.3 %

n = 10 | in 2 sigma = 90 %



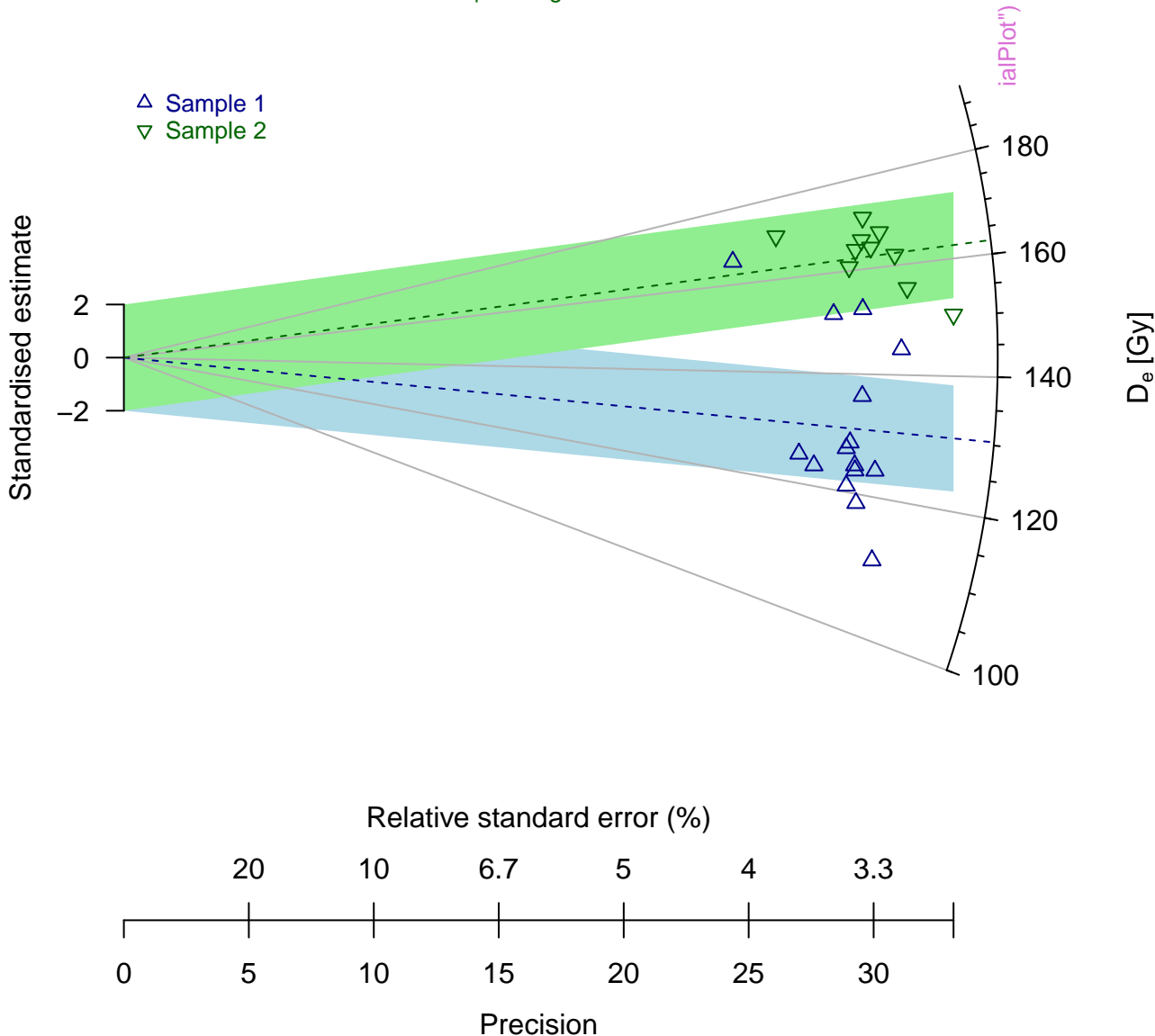
D_e distribution

n = 15 | in 2 sigma = 53.3 %

n = 10 | in 2 sigma = 90 %

△ Sample 1

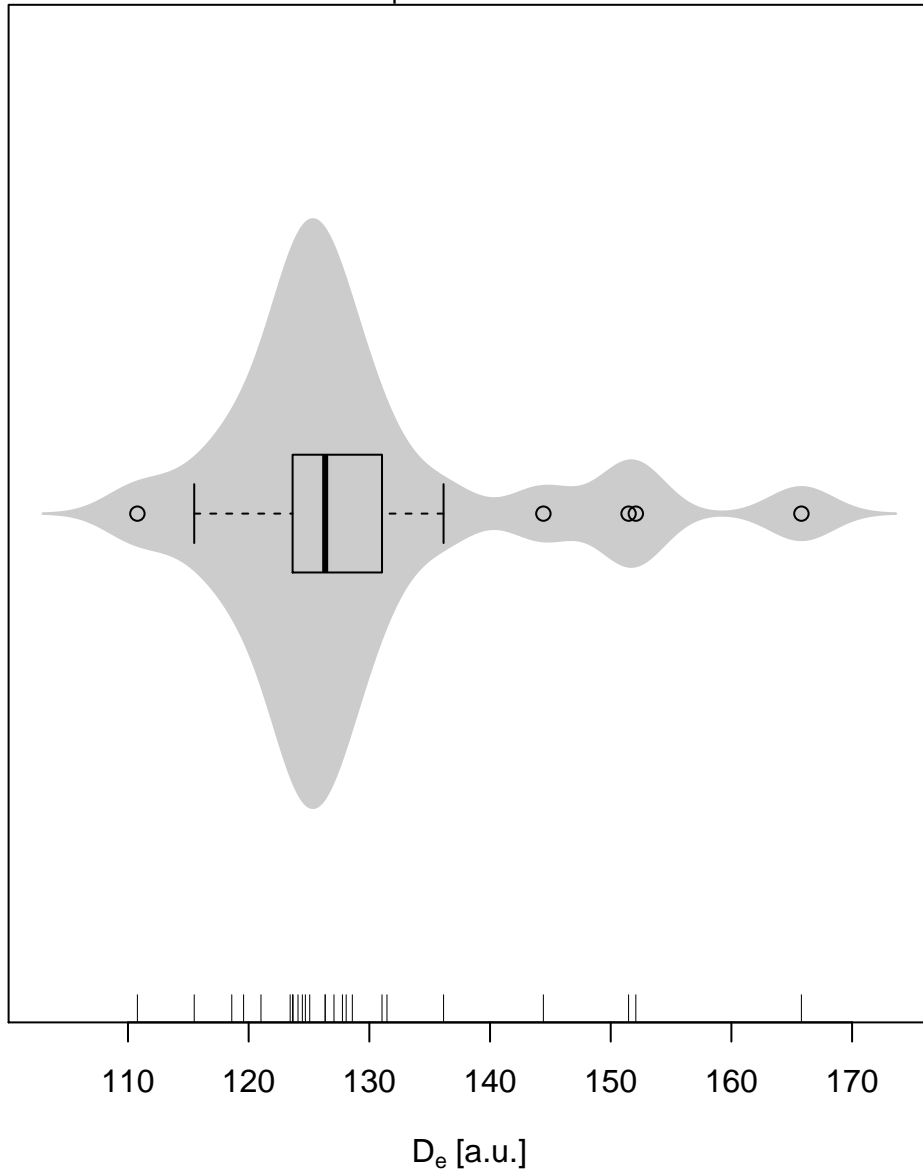
▽ Sample 2



Violin Plot

n = 25 | median = 126.34

Density

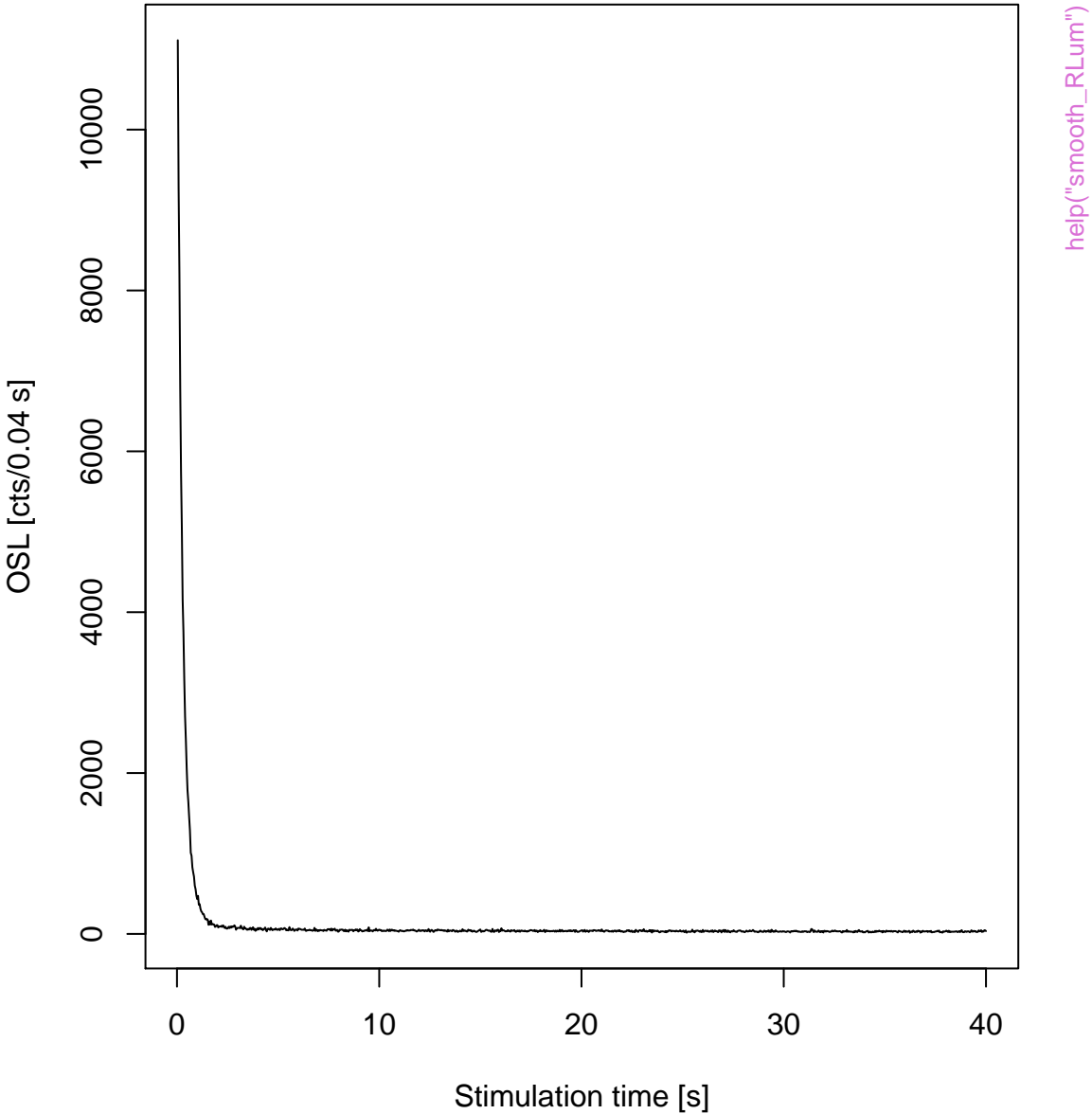


[help\("plot_ViolinPlot"\)](#)

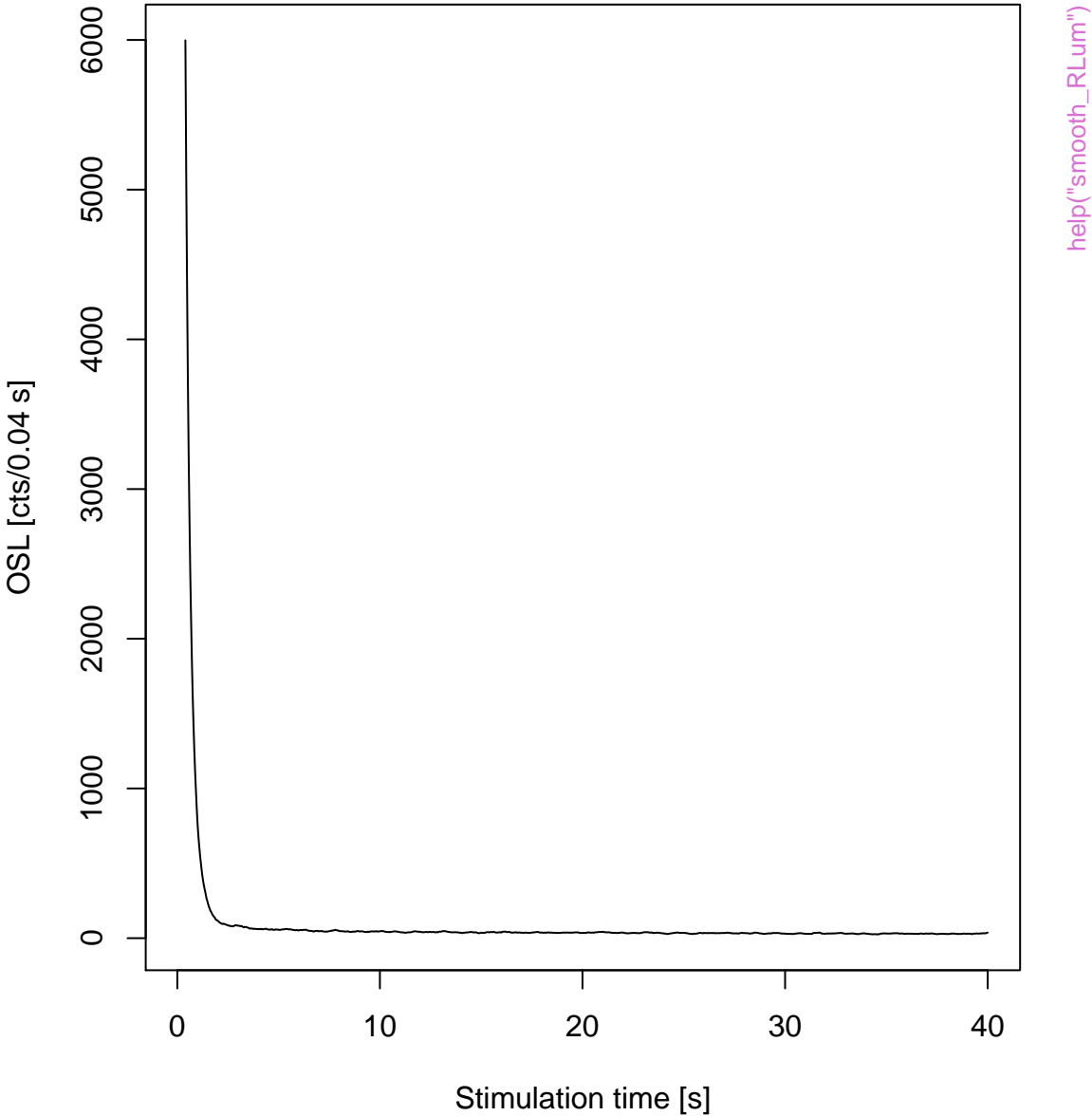
OSL



OSL

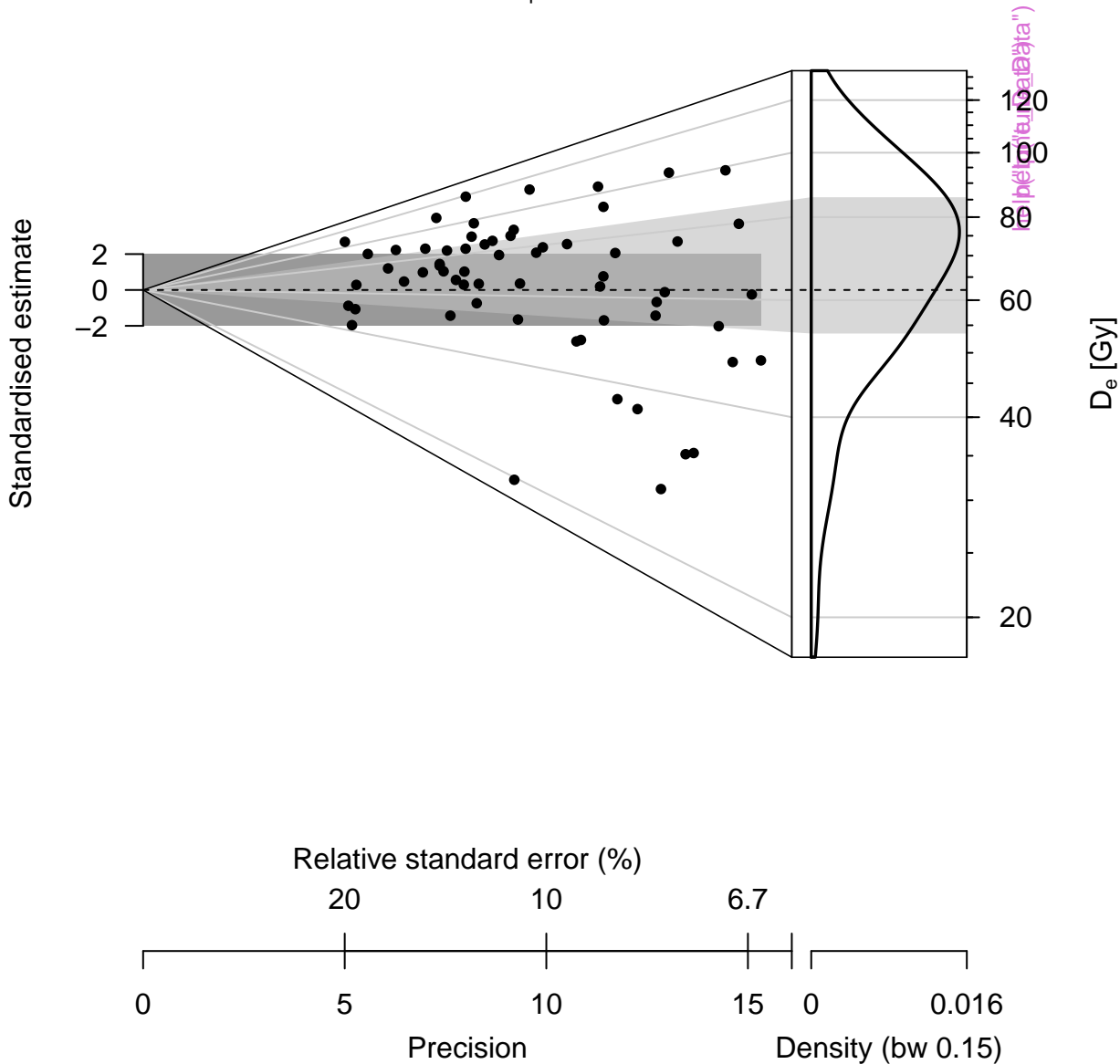


OSL



D_e distribution

n = 62 | mean = 66



D_e distribution

n = 62 | mean = 66

