Package 'oreo'

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Type Package

Title Large Amplitude Oscillatory Shear (LAOS)

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Description The Sequence of Physical Processes (SPP) framework is a way of interpreting the transient data derived from oscillatory rheological tests. It is designed to allow both the linear and non-linear deformation regimes to be understood within a single unified framework. This code provides a convenient way to determine the SPP framework metrics for a given sample of oscillatory data. It will produce a text file containing the SPP metrics, which the user can then plot using their software of choice. It can also produce a second text file with additional derived data (components of tangent, normal, and binormal vectors), as well as pre-plotted figures if so desired. It is the R version of the Package SPP by Simon Rogers Group for Soft Matter (Simon A. Rogers, Brian M. Erwin, Dimitris Vlassopoulos, Michel Cloitre (2011) <doi:10.1122/1.3544591>).

Imports gridExtra,ggplot2,openxlsx,tools,spectral,pracma,fftwtools,scales

Depends R (>= 3.5.0)

License GPL-2

Encoding UTF-8

RoxygenNote 7.1.1

NeedsCompilation no

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Repository CRAN

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R topics documented:

`mydata` *Data from the Giesikus model*

Description

The data is arranged into four columns: Time (s), Strain (-), Rate (1/s) and Stress (Pa). reflecting the applied strain- control

Usage

```
data(mydata)
```

Format

A data frame with 1024 rows and 4 columns

V1 Time

V2 Strain

V3 Rate

V4 Stress

References

ppp

plotColeCole *Cole-Cole plot*

Description

create Cole-Cole plot

create Cole-Cole plot

Usage

```
plotColeCole(Gp_t, Gpp_t, ...)
```

```
plotColeCole(Gp_t, Gpp_t, ...)
```

Arguments

Gp_t	from the output matrix from fft analysis or numerical differentiation analysis
Gpp_t	from the output matrix from fft analysis or numerical differentiation analysis
...	parameters of plot()

Value

No return value

No return value

Author(s)

Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

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References

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
Gp_t= out$spp_data_out$Gp_t
Gpp_t= out$spp_data_out$Gpp_t
plotColeCole(Gp_t,Gpp_t)
```

---

plotDeltaStrain *Strain Delta Plot*

Description

create Strain Delta Plot

create Strain Delta Plot

Usage

```
plotDeltaStrain(strain, delta_t, ...)

plotDeltaStrain(strain, delta_t, ...)
```

Arguments

strain	from the output matrix from fft analysis or numerical differentiation analysis
delta_t	from the output matrix from fft analysis or numerical differentiation analysis
...	parameters of plot()

Value

No return value

No return value

Author(s)

Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

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Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
strain= out$spp_data_out$strain
delta_t= out$spp_data_out$delta_t
plotDeltaStrain(strain,delta_t)
```

---

plotDisp *Strain Displacement Stress*

Description

Strain Displacement Stress

Strain Displacement Stress

Usage

```
plotDisp(strain, disp_stress, ...)

plotDisp(strain, disp_stress, ...)
```

Arguments

strain	from the output matrix from fft analysis or numerical differentiation analysis
disp_stress	from the output matrix from fft analysis or numerical differentiation analysis
...	parameters of plot()

Value

No return value

No return value

References

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
strain= out$spp_data_out$strain
disp_stress= out$spp_data_out$disp_stress
plotDisp(strain,disp_stress)
```

`plotFft` *Fourier Harmonic Magnitudes plot*

Description

create Fourier Harmonic Magnitudes plot

create Fourier Harmonic Magnitudes plot

Usage

```
plotFft(ft_amp, fft_resp, spp_params, ...)
```



```
plotFft(ft_amp, fft_resp, spp_params, ...)
```


Arguments

`ft_amp`	from the output matrix from fft analysis or numerical differentiation analysis
`fft_resp`	from the output matrix from fft analysis or numerical differentiation analysis
`spp_params`	input parameters used for the fft analysis or numerical differentiation analysis
`...`	parameters of plot()

Value

No return value

No return value

Author(s)

Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- rpp_fft(time_wave,resp_wave,L=1024,omega=3.16 , M=15,p=1)
ft_amp= out$ft_out$ft_amp
fft_resp= out$ft_out$fft_resp
spp_params= out$spp_params
plotFft(ft_amp,fft_resp,spp_params)
```

`plotGpdot` *Gp_t_dot vs Gpp_t_dot*

Description

create Gp_t_dot vs Gpp_t_dot

create Gp_t_dot vs Gpp_t_dot

Usage

```
plotGpdot(Gp_t_dot, Gpp_t_dot, ...)
```

`plotGpdot(Gp_t_dot, Gpp_t_dot, ...)`

Arguments

`Gp_t_dot`	from the output matrix from fft analysis or numerical differentiation analysis
`Gpp_t_dot`	from the output matrix from fft analysis or numerical differentiation analysis
`...`	parameters of plot()

Value

No return value

No return value

Author(s)

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Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
Gp_t_dot= out$spp_data_out$Gp_t_dot
Gpp_t_dot= out$spp_data_out$Gpp_t_dot
plotGpdot(Gp_t_dot,Gpp_t_dot)
```

---

plotPAV *Strain Delta Plot*

Description

create Strain Delta Plot

create Strain Delta Plot

Usage

```
plotPAV(strain, delta_t_dot, ...)

plotPAV(strain, delta_t_dot, ...)
```

Arguments

strain	from the output matrix from fft analysis or numerical differentiation analysis
delta_t_dot	from the output matrix from fft analysis or numerical differentiation analysis
...	parameters of plot()

Value

No return value

No return value

References

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
strain= out$spp_data_out$strain
delta_t_dot= out$spp_data_out$delta_t_dot
plotPAV(strain,delta_t_dot)
```

---

plotSpeedGp *Speed-G'_t plot*

Description

create Speed-G'_t plot

create Speed-G'_t plot

Usage

```
plotSpeedGp(Gp_t, G_speed, ...)
```

```
plotSpeedGp(Gp_t, G_speed, ...)
```

Arguments

Gp_t	from the output matrix from fft analysis or numerical differentiation analysis
G_speed	from the output matrix from fft analysis or numerical differentiation analysis
...	parameters of plot()

Value

No return value

No return value

Author(s)

Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

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Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
Gp_t= out$spp_data_out$Gp_t
G_speed= out$spp_data_out$G_speed
plotSpeedGp(Gp_t,G_speed)
```

`plotSpeedGpp` *Speed-G"_t plot*

Description

create Speed-G"_t plot

create Speed-G"_t plot

Usage

```
plotSpeedGpp(G_speed, Gpp_t, ...)
```

```
plotSpeedGpp(G_speed, Gpp_t, ...)
```

Arguments

G_speed	from the output matrix from fft analysis or numerical differentiation analysis
Gpp_t	from the output matrix from fft analysis or numerical differentiation analysis
...	parameters of plot()

Value

No return value

No return value

Author(s)

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References

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Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
G_speed= out$spp_data_out$G_speed
Gpp_t= out$spp_data_out$Gpp_t
plotSpeedGpp(G_speed,Gpp_t)
```

---

plotStrain *Strain Gp_t,eq_strain_est*

Description

Strain Gp_t,eq_strain_est

Strain Gp_t,eq_strain_est

Usage

```
plotStrain(Gp_t, eq_strain_est, ...)

plotStrain(Gp_t, eq_strain_est, ...)
```

Arguments

Gp_t	from the output matrix from fft analysis or numerical differentiation analysis
eq_strain_est	from the output matrix from fft analysis or numerical differentiation analysis
...	parameters of plot()

Value

No return value

No return value

References

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
Gp_t= out$spp_data_out$Gp_t
eq_strain_est= out$spp_data_out$eq_strain_est
plotStrain(Gp_t,eq_strain_est)
```

---

plotStressRate *Stress-Rate plot*

Description

create Stress Rate Plot

create Stress Rate Plot

Usage

```
plotStressRate(stress, rate, ...)

plotStressRate(stress, rate, ...)
```

Arguments

stress	data the output matrix from fft analysis or numerical differentiation analysis
rate	data the output matrix from fft analysis or numerical differentiation analysis
...	parameters of plot()

Value

No return value

No return value

Author(s)

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References

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Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
rate= out$spp_data_out$rate
stress= out$spp_data_out$stress
plotStressRate(stress, rate)
```

`plotStressStrain` *Stress-Strain plot*

Description

create Stress Strain Plot

create Stress Strain Plot

Usage

```
plotStressStrain(stress, strain, strain_in, stress_in, ...)

plotStressStrain(stress, strain, strain_in, stress_in, ...)
```

Arguments

`stress`	data the output matrix from fft analysis or numerical differentiation analysis
`strain`	data the output matrix from fft analysis or numerical differentiation analysis
`strain_in`	data the input matrix from fft analysis or numerical differentiation analysis
`stress_in`	data the input matrix from fft analysis or numerical differentiation analysis
`...`	parameters of plot()

Value

No return value

No return value

Author(s)

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Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
strain= out$spp_data_out$strain
stress= out$spp_data_out$stress
strain_in= out$spp_data_in$strain
stress_in= out$spp_data_in$stress
plotStressStrain(stress, strain,strain_in,stress_in)
```

`plotStressTime` *Stress-Time plot*

Description

create Stress-Time plot

create Stress-Time plot

Usage

```
plotStressTime(time_wave_in, stress_in, time_wave, stress)

plotStressTime(time_wave_in, stress_in, time_wave, stress)
```

Arguments

`time_wave_in`	raw time from input data
`stress_in`	stress from input data
`time_wave`	from the output matrix from fft analysis or numerical differentiation analysis
`stress`	from the output matrix from fft analysis or numerical differentiation analysis

Value

No return value

No return value

Author(s)

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Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
time_wave_in= out$spp_data_in$time_wave
stress_in= out$spp_data_in$stress
time_wave= out$spp_data_out$time_wave
stress= out$spp_data_out$stress
plotStressTime(time_wave_in,stress_in,time_wave,stress)
```

`plotTimeRate` *Rate, time_wave plot*

Description

create Rate, time_wave plot

create Rate, time_wave plot

Usage

```
plotTimeRate(time_wave, rate, time_wave_in, strain_rate, ...)

plotTimeRate(time_wave, rate, time_wave_in, strain_rate, ...)
```

Arguments

`time_wave`	from the output matrix from fft analysis or numerical differentiation analysis
`rate`	from the output matrix from fft analysis or numerical differentiation analysis
`time_wave_in`	raw time from input data
`strain_rate`	strain rate from input data
`...`	parameters of plot()

Value

No return value

No return value

Author(s)

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Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
time_wave= out$spp_data_out$time_wave
rate= out$spp_data_out$rate
time_wave_in= out$spp_data_in$time_wave
strain_rate= out$spp_data_in$strain_rate
plotTimeRate(time_wave,rate,time_wave_in,strain_rate)
```

`plotTimeStrain` *Strain time_wave,strain*

Description

Strain time_wave, strain

Strain time_wave, strain

Usage

```
plotTimeStrain(time_wave, strain, time_wave_in, strain_in, ...)

plotTimeStrain(time_wave, strain, time_wave_in, strain_in, ...)
```

Arguments

`time_wave`	time from output data
`strain`	from the output matrix from fft analysis or numerical differentiation analysis
`time_wave_in`	time from input data
`strain_in`	from the input matrix from fft analysis or numerical differentiation analysis
`...`	parameters of plot()

Value

No return value

No return value

References

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
time_wave= out$spp_data_out$time_wave
strain= out$spp_data_out$strain
time_wave_in= out$spp_data_in$time_wave
strain_in= out$spp_data_in$strain
plotTimeStrain(time_wave,strain,time_wave_in,strain_in)
```

---

plotTimeStress *Stress-Time plot*

Description

create Stress-Time plot

create Stress-Time plot

Usage

```
plotTimeStress(time_wave, stress, time_wave_in, strain_rate, ...)

plotTimeStress(time_wave, stress, time_wave_in, strain_rate, ...)
```

Arguments

time_wave	from the output matrix from fft analysis or numerical differentiation analysis
stress	from the output matrix from fft analysis or numerical differentiation analysis
time_wave_in	raw time from input data
strain_rate	strain rate from input data
...	parameters of plot()

Value

No return value

No return value

Author(s)

Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
time_wave= out$spp_data_out$time_wave
stress= out$spp_data_out$stress
time_wave_in= out$spp_data_in$time_wave
strain_rate= out$spp_data_in$strain_rate
plotTimeStress(time_wave,stress,time_wave_in,strain_rate)
```

---

plotVGP *VGP plot*

Description

create VGP plot

create VGP plot

Usage

```
plotVGP(G_star_t, delta_t, ...)

plotVGP(G_star_t, delta_t, ...)
```

Arguments

G_star_t	from the output matrix from fft analysis or numerical differentiation analysis
delta_t	from the output matrix from fft analysis or numerical differentiation analysis
...	parameters of plot()

Value

No return value

No return value

Author(s)

Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

Giorgio Luciano and Serena Beretta, based on the Plotting functions created by Simon Rogers Group for Soft Matter

References

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Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
G_star_t= out$spp_data_out$G_star_t
delta_t= out$spp_data_out$delta_t
plotVGP(G_star_t,delta_t)
```

---

rpp_fft *SPP Analysis via fourier*

Description

applies the SPP Analysis by means of a fourier series.

Usage

```
rpp_fft(time_wave, resp_wave, L, omega, M, p)
```

Arguments

time_wave	Lx1 vector of time at each measurement point
resp_wave	Lx3 matrix of the strain, rate and stress data,with each row representing a measuring point
L	number of measurement points in the extracted data
omega	frequency of oscilation (rad/s)
M	number of harmonics for stress
p	number of cycles

Value

a list with the following data frame spp_data_in= the data frame with the data spp_params=spp_params, spp_data_out= Length,frequency,harmonics,cycles,max_harmonics,step_size fsf_data_out= Tx,Ty,Tz,Nx,Ny,Nz,Bx,By,Bz coordinates of the trajectory (T=tangent,N=principal Normal,B=Binormal Vectors) ft_out=data frame with that includes time_wave,strain,rate,stress,Gp_t,Gpp_t,G_star_t,tan_delta_t,delta_t,disp_stress,eq_strain_est,Gp_t_dot,G

Author(s)

Simon Rogers Group for Soft Matter (matlab version), Giorgio Luciano and Serena Berretta (R version)

References

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- rpp_fft(time_wave,resp_wave,L=1024,omega=3.16 , M=15,p=1)
```

Rpp_num *SPP Analysis via numerical differentiation*

Description

applies the SPP Analysis by means of a numerical differentiation.

Usage

```
Rpp_num(time_wave, resp_wave, L, k, num_mode)
```

Arguments

time_wave	Lx1 vector of time at each measurement point
resp_wave	Lx3 matrix of the strain, rate and stress data,with each row representing a measuring point
L	number of measurement points in the extracted data
k	step size for numerical differentiation
num_mode	numerical method

Value

a list with the following data frame spp_data_in= the data frame with the data spp_params=spp_params, spp_data_out= Length,frequency,harmonics,cycles,max_harmonics,step_size fsf_data_out= Tx,Ty,Tz,Nx,Ny,Nz,Bx,By,Bz coordinates of the trajectory (T=tangent,N=principal Normal,B=Binormal Vectors) ft_out=data frame with that includes time_wave,strain,rate,stress,Gp_t,Gpp_t,G_star_t,tan_delta_t,delta_t,disp_stress,eq_strain_est,Gp_t_dot,G

Author(s)

Simon Rogers Group for Soft Matter (matlab version), Giorgio Luciano and Serena Berretta (R version)

References

Simon A. Rogersa, M. Paul Letting, A sequence of physical processes determined and quantified in large-amplitude oscillatory shear (LAOS): Application to theoretical nonlinear models Journal of Rheology 56:1, 1-25

Examples

```
 data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
time_wave <- df$raw_time
resp_wave <- data.frame(df$strain,df$strain_rate,df$stress)
out <- Rpp_num(time_wave, resp_wave , L=1024, k=8, num_mode=1)
```

---

rpp_out_csv *Export results of the performed SPP analysis in csv format*

Description

This function export the output the SPP analysis (performed via FFT or Numeric Analysis) and export it to csv files

Usage

```
rpp_out_csv(out, myfilename = "my_models.xlsx")
```

Arguments

out	output of the SPP analysis (performed via FFT or Numeric Analysis)
myfilename	name of the file where to save results (csv)

Value

No return value

Author(s)

Simon Rogers Group for Soft Matter (matlab version), Giorgio Luciano and Serena Berretta (R version)

---

rpp_out_excel *Export results of the performed SPP analysis in xls format*

Description

This function export the output the SPP analysis (performed via FFT or Numeric Analysis) and export it to xls files

Usage

```
rpp_out_excel(out, myfilename = "my_models.xlsx")
```

Arguments

out	output of the SPP analysis (performed via FFT or Numeric Analysis)
myfilename	name of the file where to save results in xls format

Value

No return value

Author(s)

Simon Rogers Group for Soft Matter (matlab version), Giorgio Luciano and Serena Berretta (R version)

rpp_read *Read function*

Description

This function reads data from the selected file, and assign it to a dataframe

Usage

```
rpp_read(filename, header = TRUE, selected = c(2, 3, 4, 0, 0, 1, 0, 0), ...)
```

Arguments

filename	the name of the file to read
header	TRUE if colnames are present FALSE if colnames are not present
selected	the user should input the number of the columns that represent strain-smoothed (gamma), strain rate-smoothed (gamma dot), stress smoothed (tau recon), Elast-Stress (FTtau_e), Visco-Stress (FTtau_v), raw time (time), raw stress (tau), raw strain (gamma) i.e. selected=c(2, 3, 4, 0, 0, 1, 0, 0) means that the second column of your data is the strain rate smoothed, the third column is the stress smoothed, the stress smoothed is the fourth column in the original data, and finally that we do not have data for the raw stress and raw strain
...	parameters of read.csv

Value

a dataframe with all the columns assigned

Author(s)

Giorgio Luciano and Serena Berretta, Simon Rogers Group for Soft Matter (matlab version)

rpp_read2 *Read function*

Description

This function reads data from a dataframe

Usage

```
rpp_read2(dat, selected = c(2, 3, 4, 0, 0, 1, 0, 0), ...)
```

Arguments

dat	dataframe of input
selected	the user should input the number of the columns that represent strain-smoothed (gamma), strain rate-smoothed (gamma dot), stress smoothed (tau recon), Elast-Stress (FTtau_e), Visco-Stress (FTtau_v), raw time (time), raw stress (tau), raw strain (gamma) i.e. selected=c(2, 3, 4, 0, 0, 1, 0, 0) means that the second column of your data is the strain rate smoothed, the third column is the stress smoothed, the stress smoothed is the fourth column in the original data, and finally that we do not have data for the raw stress and raw strain
...	parameters of read.csv

Value

a dataframe with all the columns assigned

Author(s)

Giorgio Luciano and Serena Berretta, Simon Rogers Group for Soft Matter (matlab version)

Examples

```
data(mydata)
df <- rpp_read2(mydata , selected=c(2, 3, 4, 0, 0, 1, 0, 0))
```

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