This file documents the use of methods_shower_model.m

For an explanation of what this MatLab routine does and an illustration of some of the results, the reader is referred to the publication: J. De Keyser, S. Calders, H. Lamy, F. Verbelen, K. Kolenberg, Deriving meteor stream properties from meteor count rate time series in a multi-observer network, Planetary and Space Science, 2026.

The routine can be called with a number of arguments. All of these are optional. For those arguments that are not specified, the routine will prompt the user to provide the corresponding inputs – unless for some arguments that specify the default configuration of the computations.

Here follows a brief description of the arguments:

process_id
  string, id of the process; default is empty string

process_name
  string, name of the process; default is empty string

do_plot_initial_data
  string, indicating whether to plot the initial data
    false
      do not plot initial data
    true
      do plot initial data

do_plot
  string, indicating whether to plot the results
    false
      do not plot
    true
      do plot

do_plot_simple
  string, indicating whether to plot the results in a simpler version
    false
      do not plot
    true
      do plot

do_plot_raw_distributions
  string, indicating whether to plot distributions before outlier elimination
    false
      do not plot
    true
      do plot

do_plot_lmin_on_distributions

string, indicating whether to plot curves corresponding to the local minima encountered during the optimization process in the distribution plots

false

do not plot

true

do plot

do_plot_correlations

string, indicating whether to plot correlation results

false

do not plot

true

do plot

do_close_plots_when_done

string, indicating whether to close all the plots after the calculations

false

do not close

true

do close

do_print

string, indicating whether to print the results to file

false

do not print

true

do print

do_print_intermediary_results

string, indicating whether to print detailed results for each random sample

false

do not print detailed results

true

do print detailed results

do_plot_during_optimization

string, indicating whether to plot results during the optimization process

false

do not plot during optimization

true

do plot during optimization

do_debug

string, indicating whether to print debugging results

false

do not print debugging results

true

do print debugging results

data_folder
string, path to the folder where the data files are located; the path can be absolute or relative to the current working directory; default is 'Data' in the current working directory

output_folder
string, path to the folder where the output files are located; the path can be absolute or relative to the current working directory; default is 'Output' in the current working directory

data_set_names
list of strings, names of data sets, relative to the data_folder

number_of_bins_per_day
string, number of data bins per day used in the computation
‘24’
data binned per hour
‘48’
data binned per half hour
‘96’
data binned per quarter hour

precision
double, precision with which to optimize the parameters

horizontal_axis
string, indicating the type of horizontal axis in results plots
‘time’
plot results as a function of time
‘solar_longitude’
plot results as a function of solar longitude

vertical_axis_scale
string, indicating the scale of the vertical axis in results plots
‘linear’
linear scale
‘log’
logarithmic scale

data_uncertainty_representation
string, indicating the manner in which to represent uncertainty on the data
‘bars’
use error bars
‘range’
use shaded range

smoothing_technique
string, indicating the data smoothing technique to apply
‘no_smoothing’
no smoothing
‘smoothing3’
3-point smoothing

‘smoothing5’
5-point smoothing

method
string, indicating the method to apply
‘OF_per_data_source_no_SP’
Observability function per data source, no sporadic background
‘OF_and_SP_per_data_source’
Observability function and sporadic background per data source
‘OF_and_SP_per_station’
Observability function and sporadic background per station
‘OF_and_SmoothSP_per_station’
Observability function and smooth sporadic background per station
‘OF_per_station_with_ModelSP’
Observability function per station with sporadic background model
‘OF_per_data_source_no_SP_shared_stream’
Observability function per data source, no sporadic background, shared stream parameters
‘OF_and_SP_per_data_source_shared_stream’
Observability function and sporadic background per data source, shared stream parameters
‘OF_and_SP_per_station_shared_stream’
Observability function and sporadic background per station, shared stream parameters
‘OF_and_SmoothSP_per_station_shared_stream’
Observability function and smooth sporadic background per station, shared stream parameters
‘OF_per_station_with_ModelSP_shared_stream’
Observability function per station with sporadic background model, shared stream parameters

constraint
string, indicating the type of constraint on the observability function
‘none’
no constraint
‘constraint_radiant_below_horizon’
observability zero when the radiant is below the horizon

forcing_nonnegative
boolean, indicating whether to force the observability function and the sporadic profile to be nonnegative
false
do not force to be nonnegative
true
force to be nonnegative

weighting
string, indicating the type of weighting of the data
‘equal’
no weighting, all data points receive identical weight
‘poisson’

weight the data according to their estimated Poisson error

streams
list of strings, names of streams

stream_models
list of strings, names of stream models
'single_exponential_fixed'
Single-exponential model, fixed location
'double_exponential_fixed'
Double-exponential model, fixed location
'single_exponential'
Single-exponential model
'double_exponential'
Double-exponential model
'2_coincident_single_exponential_fixed'
2 coincident single-exponential model, fixed location
'2_coincident_double_exponential_fixed'
2 coincident double-exponential model, fixed location
'2_coincident_single_exponential'
2 coincident single-exponential model
'2_coincident_double_exponential'
2 coincident double-exponential model

uncertainty_computation
string, indicating the type of uncertainty computation
'none'
no uncertainty computation (estimate based on local minima)
'poisson'
random sampling following Poisson statistics

number_of_runs
integer, number of random samples considered in the computation

One can also specify

```
methods_shower_model('help')
```

to obtain an overview of the possible arguments.