# Long Term Statistics toolbox for ArcGIS – User Guide

https://enielsen93.github.io/enielsen93/LTS-Toolbox.html

### Introduction

Long Term Statistics toolbox is a tool to develop DHI MIKE Urban LTS-files (Long Term Statistics) through ArcGIS.

The tool is compatible with all versions of ArcGIS and can use both .dfs0-files from MIKE Urban or .km2-files from the rain gauge system of Spildevandskomitéen. It can write LTS-files for use in long term simulations through Mike Urban.

## Contents

# 1 Field descriptions

The user interface of the tool 'Create LTS–file' is seen on figure 1. The different fields are described in the following.



Figure 1: The user interface

## 1.1 Input DFS0 or KM2 file (Rain series)

Select the DFS0 or KM2 file that you wish to generate an LTS file for. DFS0 files can be generated through Mike Urban, and KM2 files are available from `http://svk.dmi.dk` (requires SVK license to access).

## 1.2 Output MOUSE Job list (MJL) file

Select the path and filename for the MOUSE job list (LTS–file) that you wish to generate. *Overwriting existing MJL files is not permitted.*

## 1.3 Duration of time series

The duration of the time series is calculated for an input DFS0 or KM2 file immediately after selecting one in field 'Input DFS0 or KM2 file (Rain series)'. If the calculated time period is incorrect, replace the calculated number with your own. *Calculation of duration of time series does not account for gaps in the time series, e.g. from rain gauge failure. If the actual duration of time series is known, replace the calculated value with this in [years]*

The duration of the time series is used for calculating the return period for each rain event, which is used in field 'Include all rain events with return period above' and 'Return period above'.

## 1.4 Select only rain events between these two dates

Insert the two dates that you wish to include rain events from. Example: If you wish to include only rain events in the years 2008 and 2009, write '2008 – 2010' or '01/01/2008 – 01/01/2010'.

*Default value is the start and end date of the input time series.*

## 1.5 Include all rain events with total rain depth above

Includes all rain events with total rain depth above a certain rain depth. Example: If input value is 2, all rain events with a total rain depth above 2 mm will be included in the LTS-file. If the field is left empty, no rain events will be included from this method.

*Can not be used simultaneously with field 'Include all rain events with return period above'.*

## 1.6 Include all rain events with return period above

Includes all rain events with with a return period above a certain extent. E.g. if input value is 5, all rain events with a return period above 5 years are included in the LTS-file. Return period is calculated from the total rain depth of an event.

The ranking of each rain event is according to the total rain depth of the event. Thus the event with the greatest rain depth is assigned a return period of the duration of the time series, seen in field 'Duration of time series'. The event with the 2nd greatest rain depth is assigned a return period corresponding to half the duration of the time series etc.

The return period of a rain event is calculated from the following formula:

$$RP = \frac{dur_{\text{time series}}}{rank} \tag{1}$$

Where:

| | |
|---:|:---|
| $RP$ | Return period of an event |
| $dur_{\text{time series}}$ | Duration of time series |
| $rank$ | Rank of rain event according to rain depth (greatest is 1) |

*Can not be used simultaneously with field 'Include all rain events with total rain depth above'.*

## 1.7   Soft start time

Soft start time of LTS simulation. If input value is 60, the LTS simulation will include 60 minutes prior to the beginning of a rain event, including whatever rain may fall in that period.

*This period is not included in the evaluation of the total rain depth or the return period for an event.*

## 1.8   Soft stop time

Soft stop time of LTS simulation. If input value is 60, the LTS simulation will include 60 minutes after the end of a rain event, including whatever rain may fall in that period.

*This period is not included in the evaluation of the total rain depth or the return period for an event.*

## 1.9   Merge rain events over dry periods

Check this field if you wish to merge rain events that are separated by a dry period. Maximum allowed duration of the dry period if they're to be merged is selected in field 'Merge rain events over dry periods'.

## 1.10   Merge rain events over dry periods

Merge rain events if they're separated by a dry period below the input value. Example: If two rain events are separated by a dry period of 120 minutes, and the input value is 160, these two rain events will be merged – this means that the total rain depth of the event and the time aggregates will be calculated across both rain events.

An illustration of this feature is shown in 2. The rain depth, return period, and time aggregates are calculated across both rain events if the input value is above 120 min. If not, then the two rain events are considered separate.
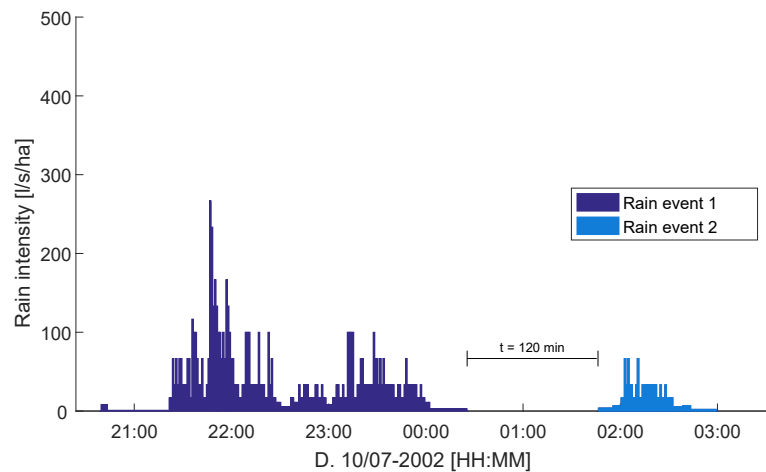
Figure 2: Illustration of the effect of merging rain events.

**Save DFS0 file**

*Feature no longer supported. Do not change anything here.*

## 1.11 Use time aggregates

Check this field if you wish to select and include rain events according to the accumulated rain depth over a defined period.

## 1.12 Return period above

Includes all rain events whose return period according to rain depth over each input time aggregate period is above input value. See field Include all rain events with return period above, except total rain depth is replaced with rain depth over time aggregate period.

For a time series with a total duration of 10 years, with 6 selected time aggregate periods, if the input return time is 5 years, then the total amount of included rain events is $2 \cdot 6 = 12$. Because some rain events will most likely contain multiple time aggregates with a high return period, the actual amount of included events will be significantly less than 12.

## 1.13 Number of included events for each aggregate

Includes a specific amount of events that rank highest in rain depth over time aggregate period.

If input value is 12, with 6 selected time aggregate periods, then the total amount of included events is $12 \cdot 6 = 72$. Because some rain events will most likely contain multiple time aggregates with a high return period, the actual amount of included events will be significantly less than 72.

## 1.14 Time aggregates

List of time aggregates for which events will be included for. Write a value into the field box and click the plus icon to add it. Select a value from the list and click the cross to delete this period.

An illustration of the time aggregate period is shown in figure 3. Two rain events are shown, and for this illustration the input values for time aggregates are 30 min, 60 min, 1480 min, 360 min, and 1440 min. Two events are separated by a period of 2 hours, but because the duration of the dry period is less than the greatest value for time aggregate period, the two events are merged.
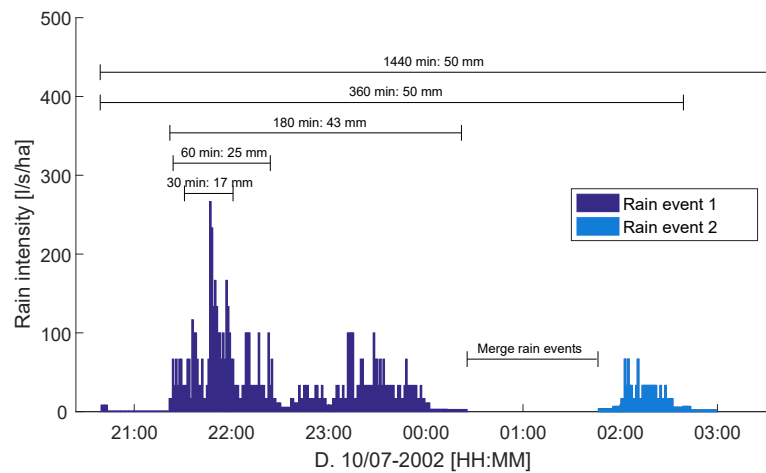
Figure 3: Illustration of the effect of merging rain events.