SlitTreat and How to Work with (v.1.1)

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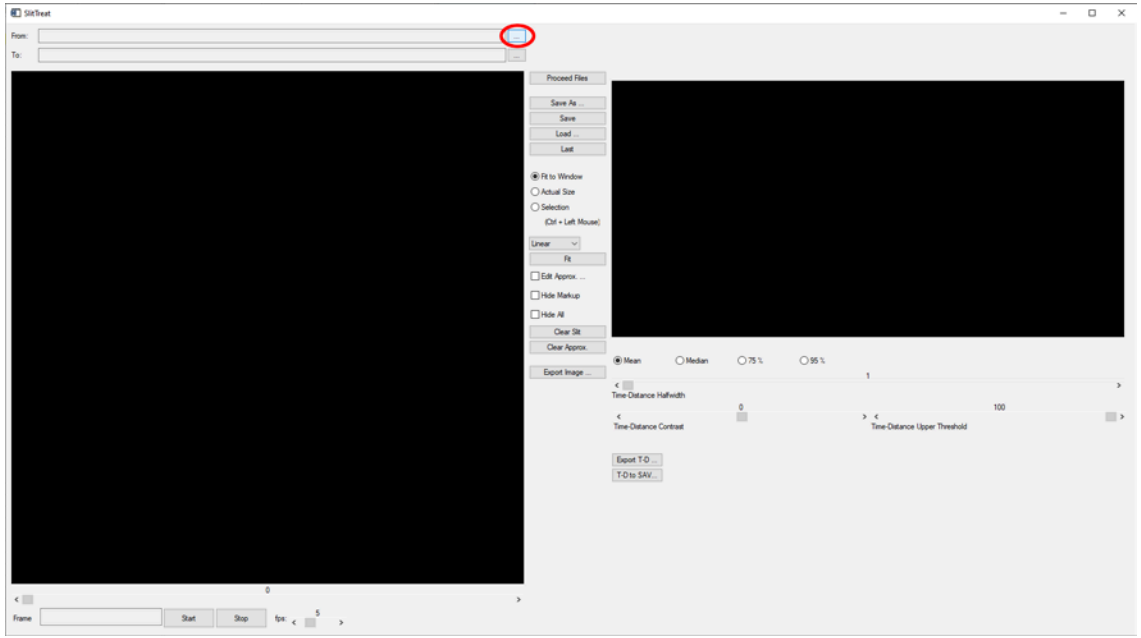
Getting Started

Requirements:

- IDL
- Set of SolarSoft packages (SSW, https://www.lmsal.com/solarsoft/ssw_packages_info.html), including ‘gen’, ‘sdo’, ‘vobs’ packages
- AS-IDL-Library package (https://github.com/Alexey-Stupishin/AS-IDL-Library)
- Coronal Jets package:
  - ✓ https://github.com/coronal-jets/pipeline_aia
  - ✓ https://github.com/coronal-jets/pipeline_common
- Set of sequential FITS to analyze. Simple sample set is placed in https://drive.google.com/file/d/1vb04siJbUSoxEveCxMq2CpZBaJfd9BwX/view?usp=sharing. All FITS should be unpackaged in the same folder.

Start SlitTreat and Select FITS file

Run ASlibrary\Utils\Slit\SlitTreat_widget.pro. You should get the following:

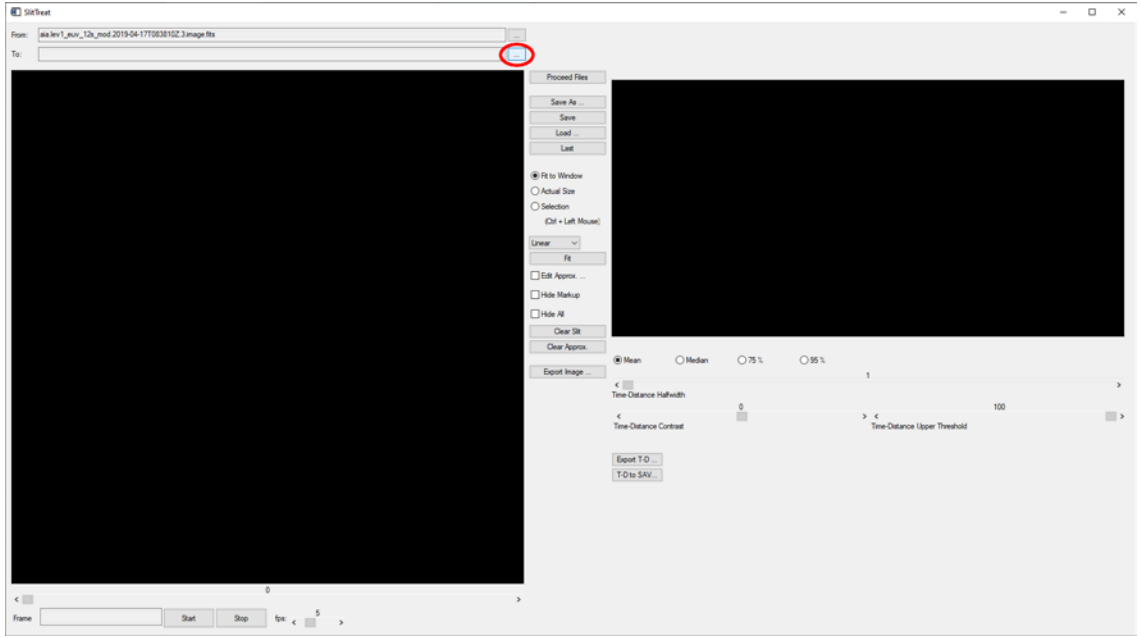


Now you can select first file in sequence, see red-marked button.

Hereinafter operations to perform are marked with colored ellipses or rectangles.

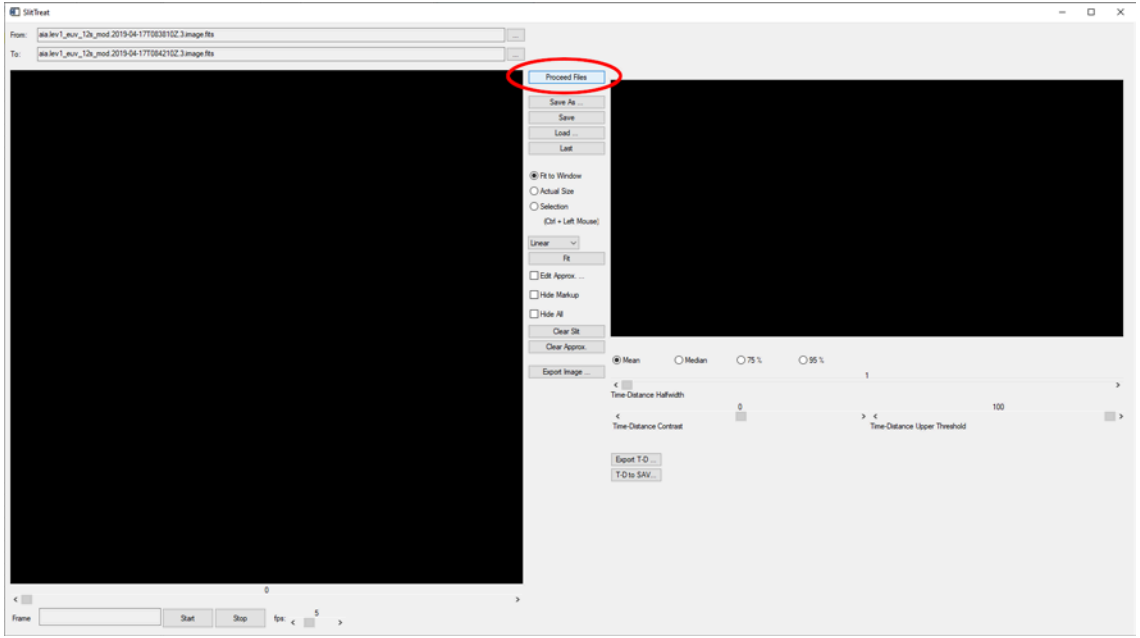
Select Second FITS file

Select second file:



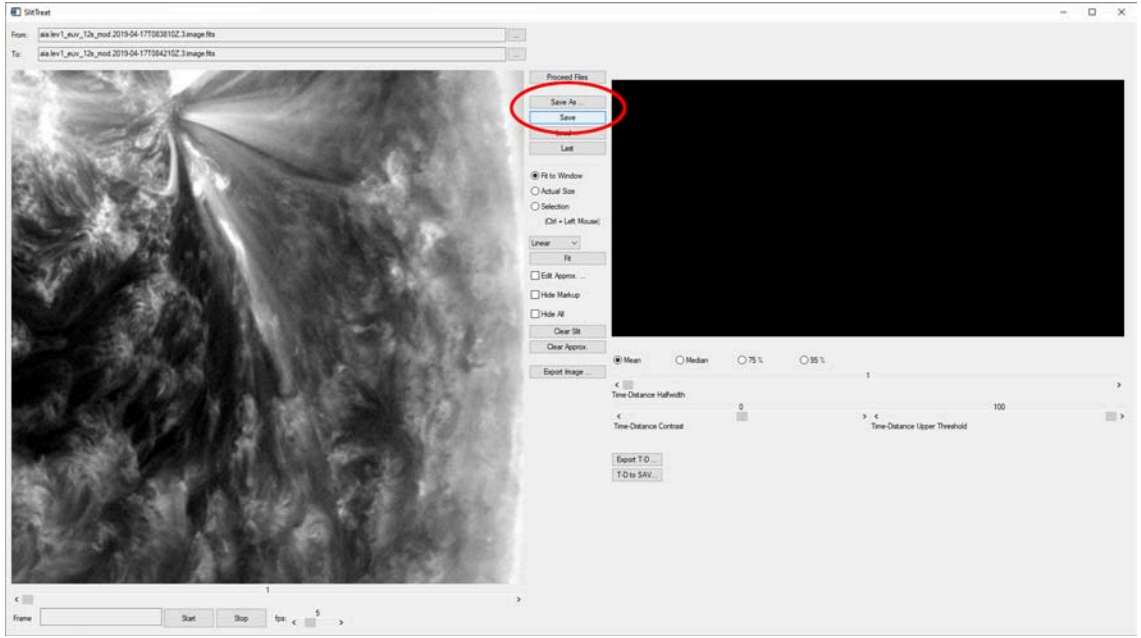
Proceed File Sequence

Proceed sequence you work with:



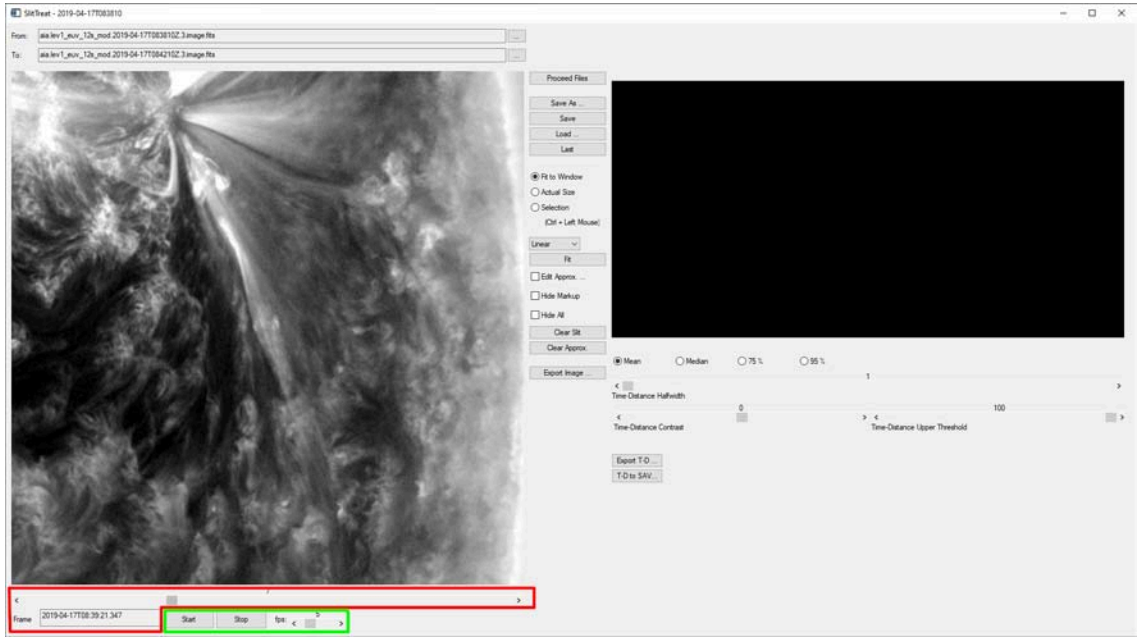
Save Project

Image is shown on the left pane (fitted to the window size). Save the project for further activity.



Since this moment you can save project at any stage of development. Do not forget it.

Select Frame and Animation



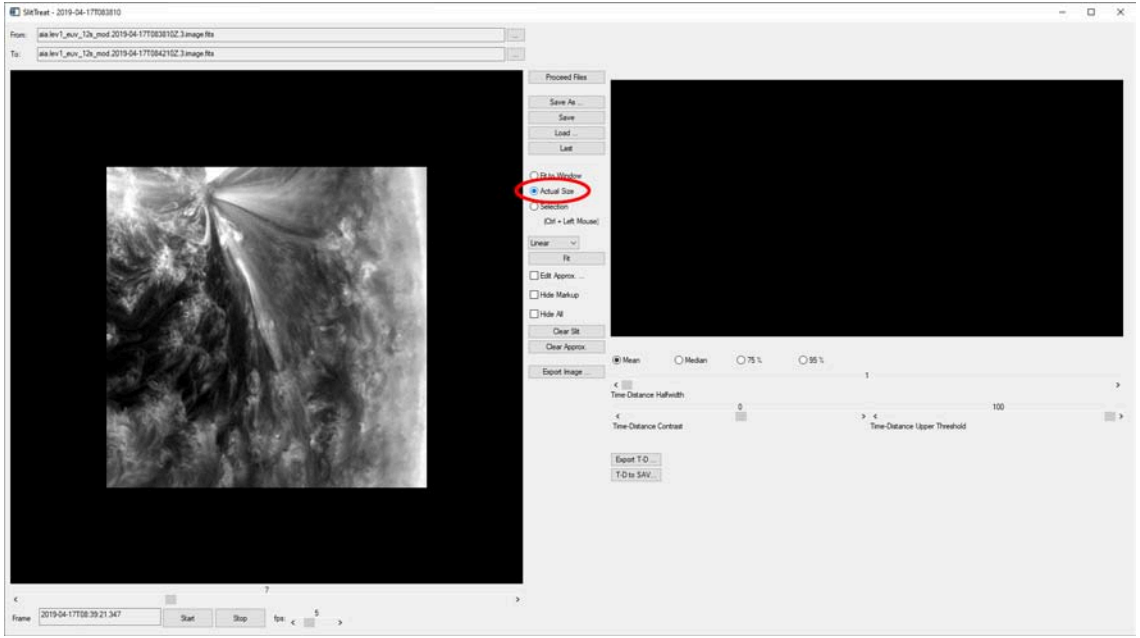
Select appropriate frame to define slit axis with slider (marked by red). Frame time is shown below. You can also animate the sequence with green-marked button ‘Start’/‘Stop’ and select frame rate.

High fps can have no effect, it depends on graphic performance of your computer.

Since now you can animate image sequence at any moment of developing.

View Actual Size

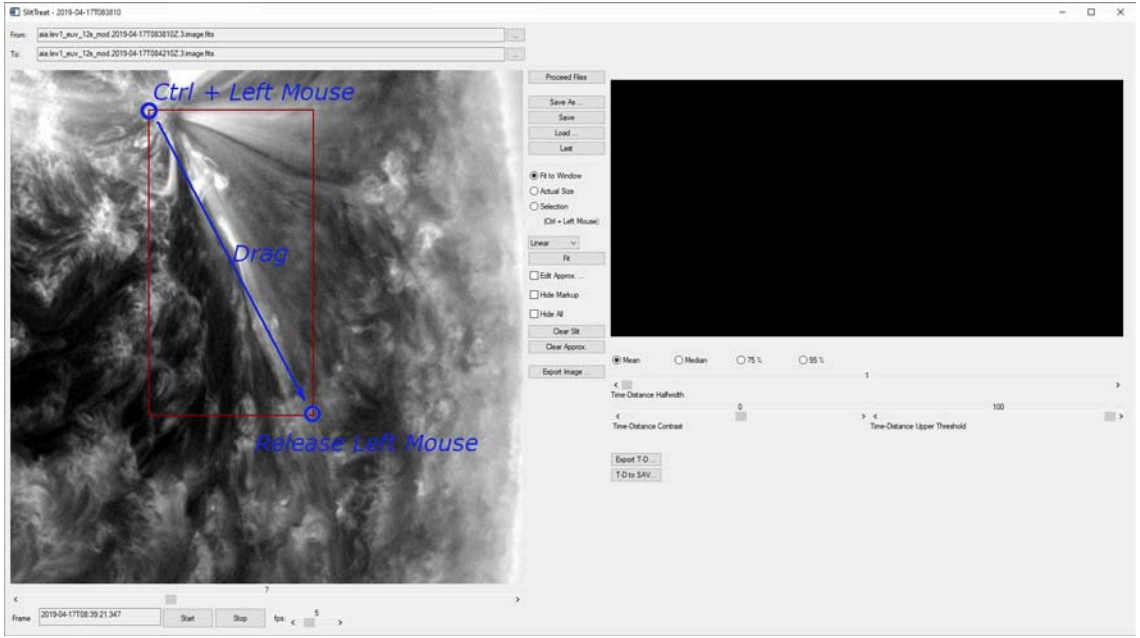
Switch to actual size (pixel-to-pixel) to see how image looks like in native resolution (without scaling).



You can switch between resolutions at any moment of developing.

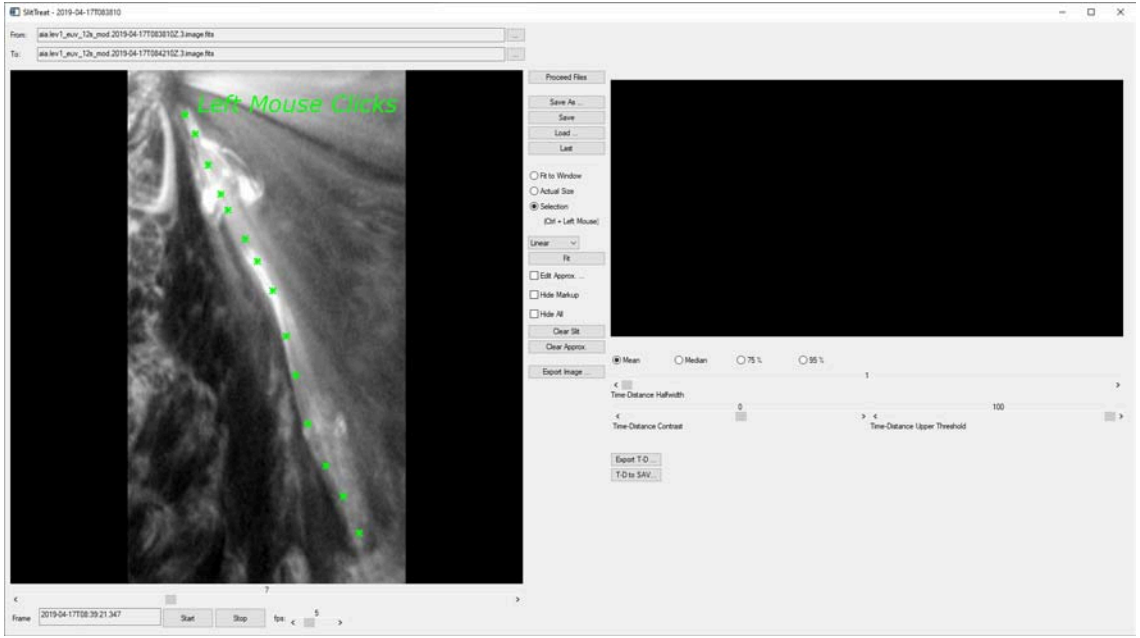
Select Region

Select region which effective covered investigated jet. Use the traditional technique (see operations on the sketch, in blue):



Markup

The result of selection is shown below (note that scale selection button were switched to ‘selection’).



Now you can markup slit by click the points alone the slit axis. Green asterisks are result of clicking.

You can switch between resolutions at any moment of developing.

For undo the last selected markup point use *right mouse click*.

Linear Fit

Choose ‘linear’ (default choice) and press ‘Fit’ button.

Approximation of the slit axis is shown on the left pane. On the right pane time-distance image appears. Coordinates of the axis (from-to) are shown above the image, times (from-to) are below. Blue vertical line points out to the time moment selected on the left pane (and will be repositioned if frame will be changed or during animation).

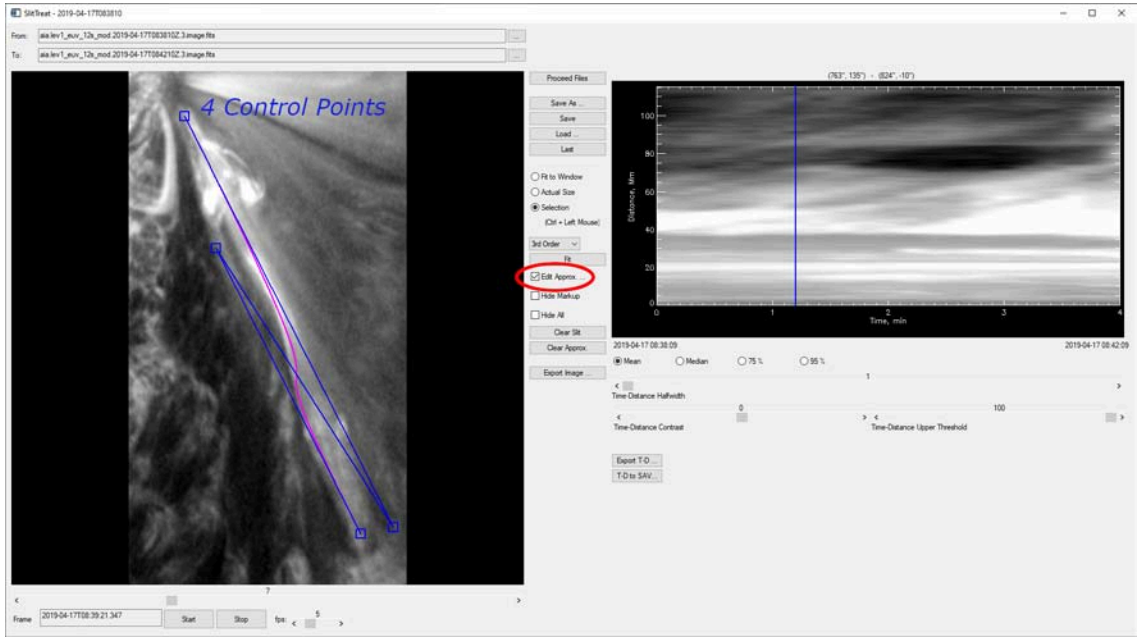
3rd-Order Fit

You can also try to approximate slit axis by curve (3rd order) line.

In the case of complex or suspicious markup 3rd order approximation can be erroneous or even not finished after 10000 iterations. But you always can use linear approximation as initial approach and edit slit axis as described below.

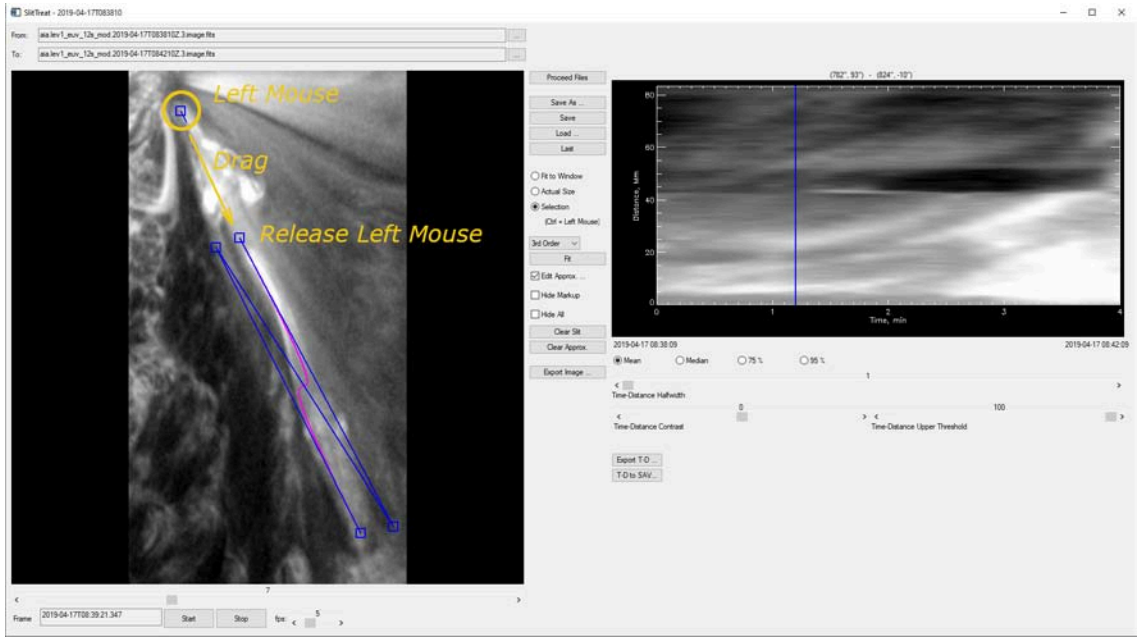
Edit Slit Axis

Switch to Edit mode. You will see 4 control points, which can be moved to adjust the shape of the curve.



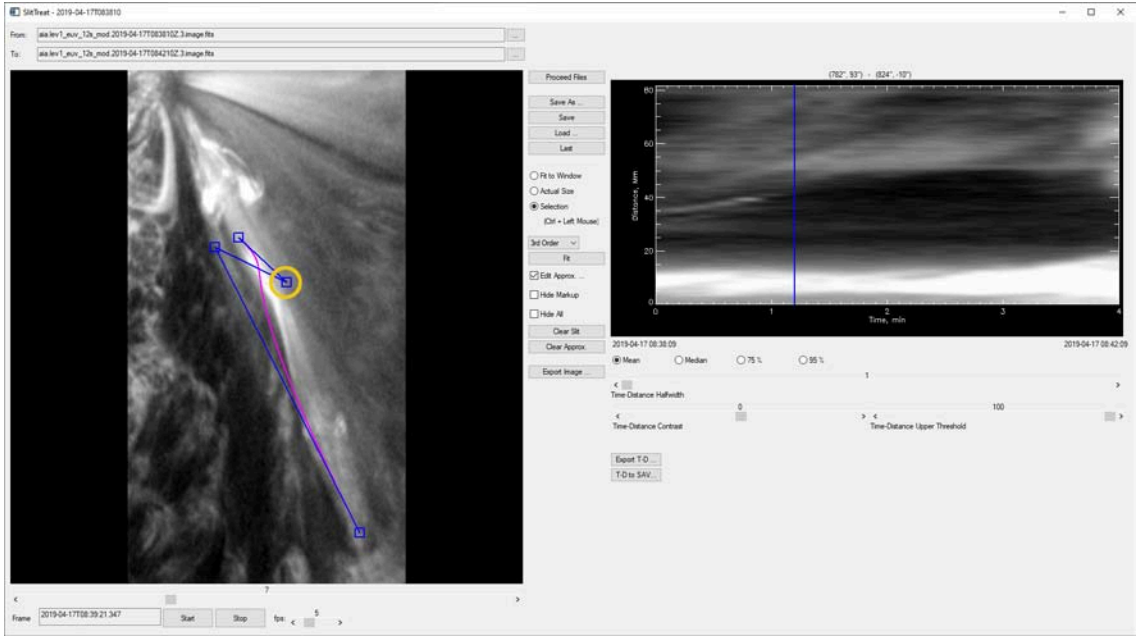
Edit Slit Axis (2)

Drag any of 4 control points in the usual way by left mouse button:



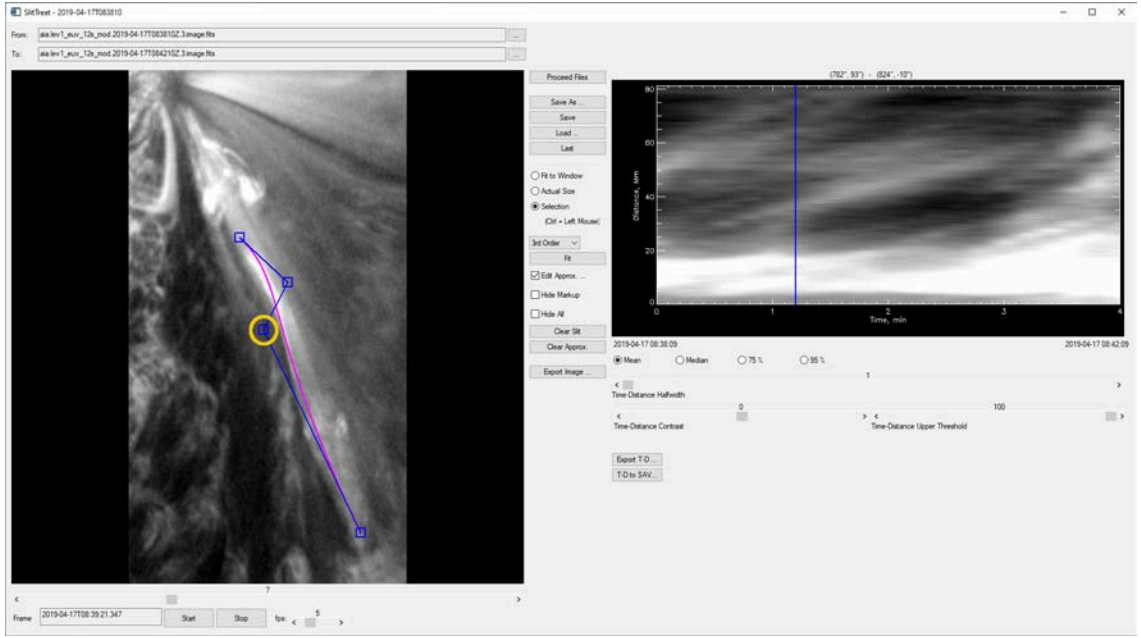
Edit Slit Axis (3)

Drag 2nd point …



Edit Slit Axis (4)

… drag 3rd point …

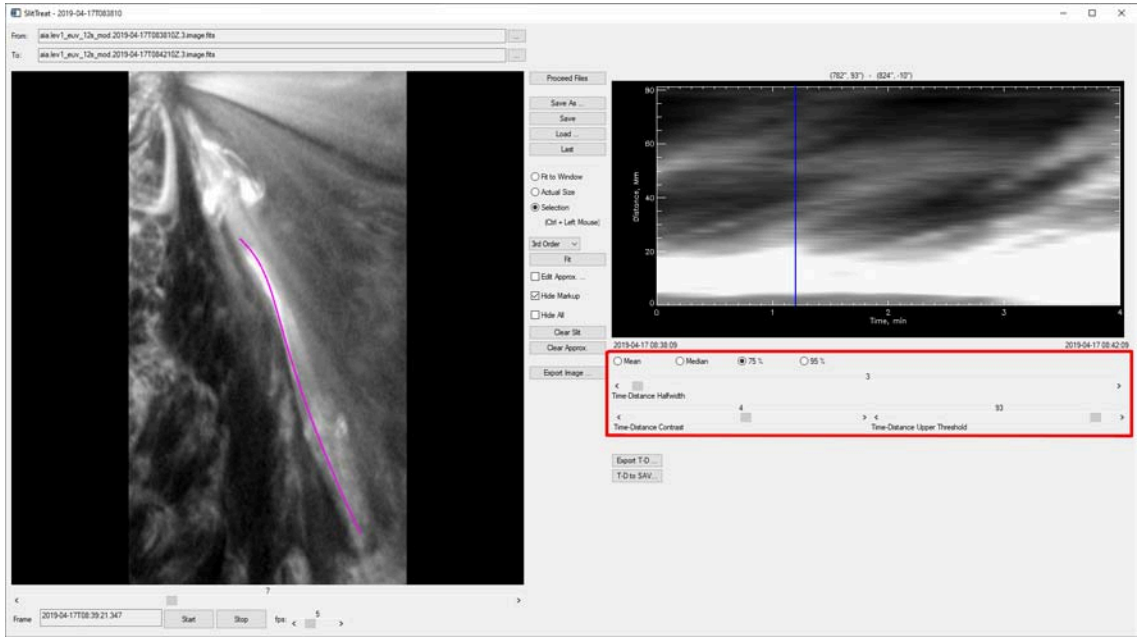


Stop Edit, Hide Markup

Switch to the normal mode and hide markup points.

Set Slit Appearance

You can try to clarify visualization of the jet on the time-distance image by tuning some parameters:

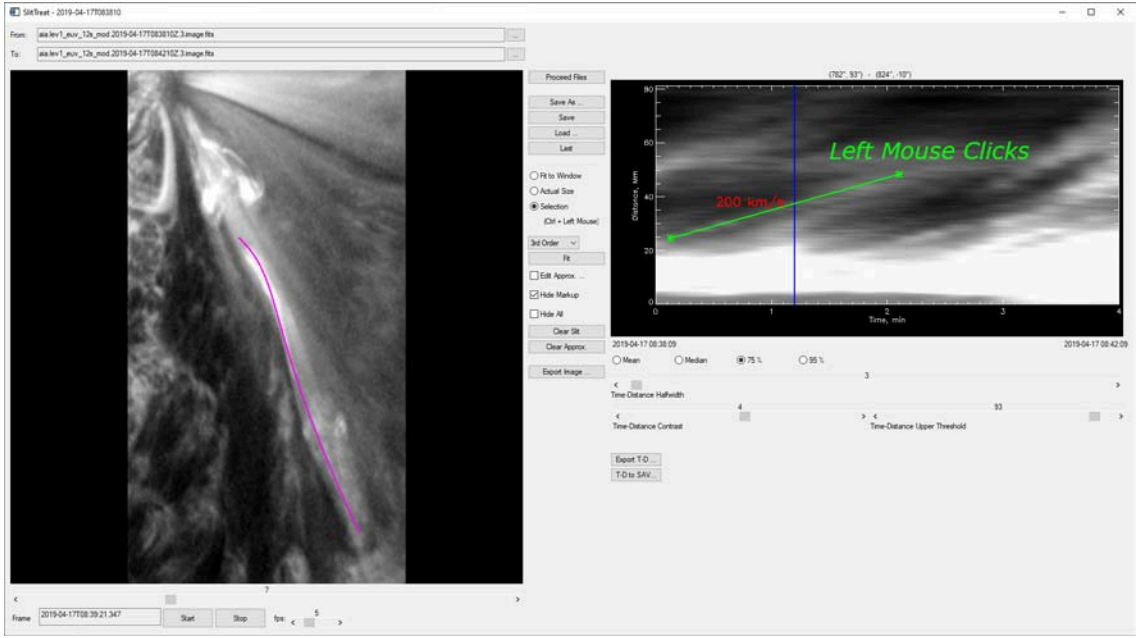


Halfwidth – halfwidth of the slit along normal to the slit axis. In the case HW > 1 central characteristics of the sample (Mean, Median, 75%, 95%) can be chosen.

Try Contrast and Upper Threshold to visual emphasize of the jet.

Measure Jet Speed

You can measure the speed of some jet by click two points on the time-distance image:

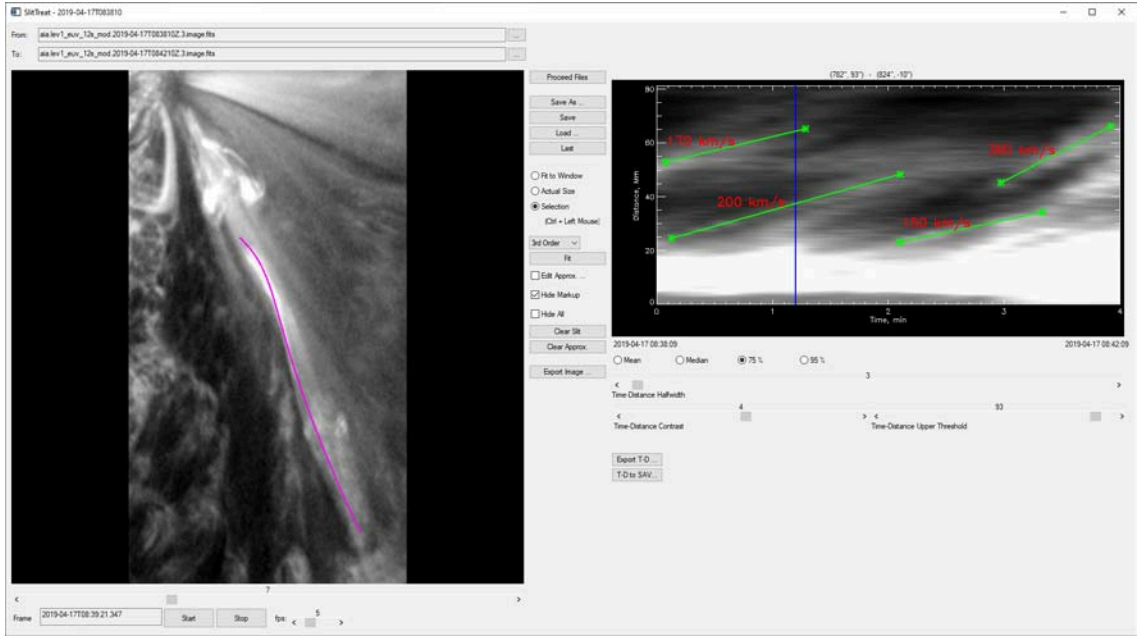


Value of the speed appears automatically after selecting of the 2nd point.

For undo the last selected point use *right mouse click*.

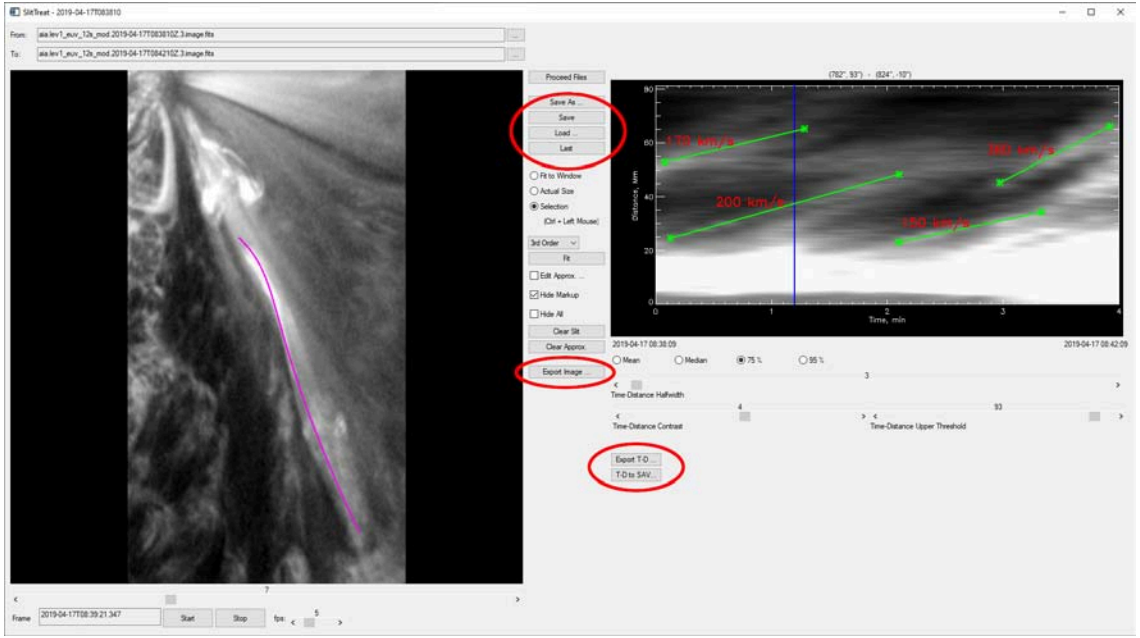
Measure Several Speeds

You can measure speeds of several jets on the same time-distance image.



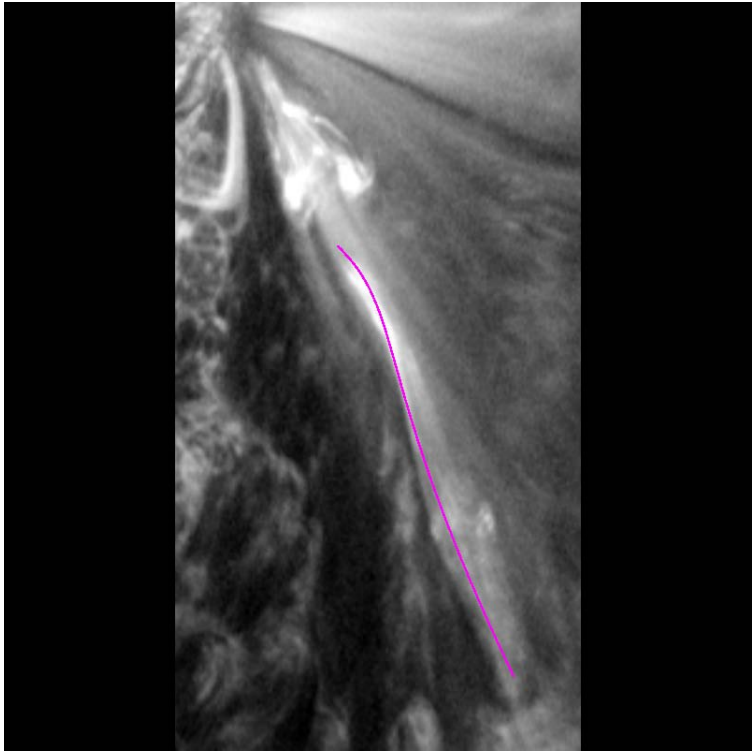
Export, Save, Load

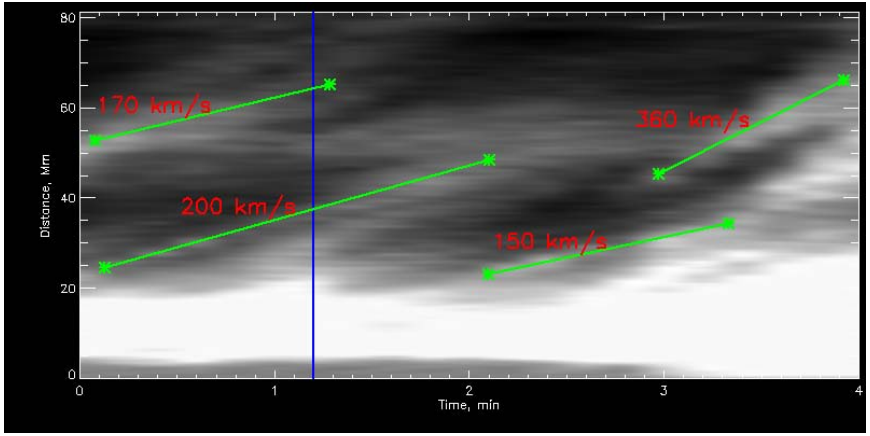
You can export both images as PNG-files.
You can also export time-distance as the SAV-file. Structure of the file listed at the end of the document.



Do not forget to save project for the further references. You can always restore it by ‘Load…’ button (or last project by ‘Last’ button).

Exported Images





SAV-file structure

TIMEDIST *Time-distance intensity array* [N_{dist} x N_{times}]
SLIT_CRD_FROM *Coordinates of the slit beginning (end), arcsec*
SLIT_CRD_TO *Coordinates of the slit end (beginning), arcsec*
SLIT_TIME_FROM *Start time (UTC)*
SLIT_TIME_TO *End time (UTC)*
DIST_STEP *Step by distance, km*
TIME_STEP *Step by time, s*
HALF_WIDTH *Slit halfwidth*
MODE *Name of the sample central characteristics*
JETS *Structure array for selected jets (if any, otherwise* **!NULL***):*

- **SPEED** *Speed, km/s*
- **SPEED_DIST_FROM** *Start position, km (from the beginning of slit axis)*
- **SPEED_DIST_TO** *End position, km (from the beginning of slit axis)*
- **SPEED_TIME_FROM** *Start time, s (from the 1st frame in sequence)*
- **SPEED_TIME_TO** *End time, s (from the 1st frame in sequence)*