

SlitTreat and How to Work with (v.1.3)

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Getting Started

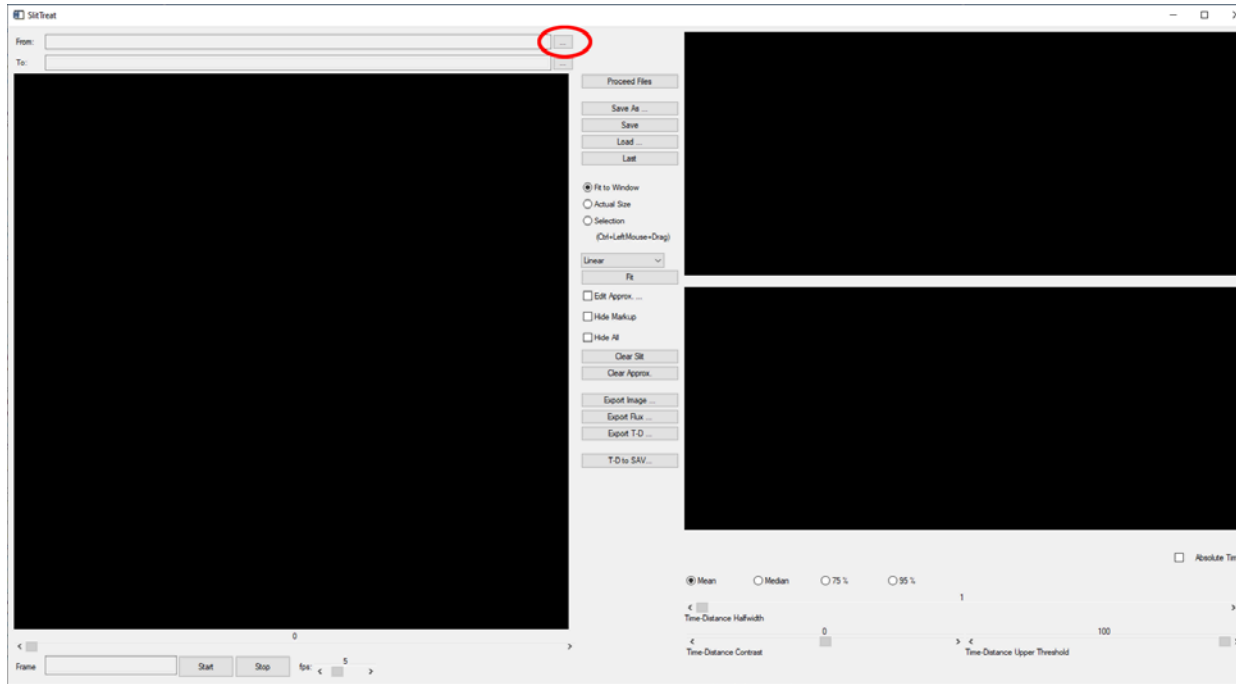
Requirements:

- IDL (project developed and tested under IDL version 8.2 (Windows) and version 8.5.1 (Linux))
- Set of SolarSoft packages (SSW, https://www.lmsal.com/solarsoft/ssw_packages_info.html), including SSW/gen, SSW/sdo, SSW/vobs (SSW/vobs/gen, SSW/vobs/ontology), SSW/packages/gx-simulator
- AS-IDL-Library package (<https://github.com/Alexey-Stupishin/AS-IDL-Library>)
- SlitTreat package (<https://github.com/Alexey-Stupishin/StilTreat>)
- Set of sequential FITS to analyze. Simple sample set is placed in SlitTreat package:
<https://github.com/Alexey-Stupishin/StilTreat/tree/main/Sample> (all FITS should be placed in the same folder)

Be sure that all packages are available in IDL Paths.

Start SlitTreat and Select FITS file

Run `SlitTreat_widget.pro` from SlitTreat package. You should get the following:



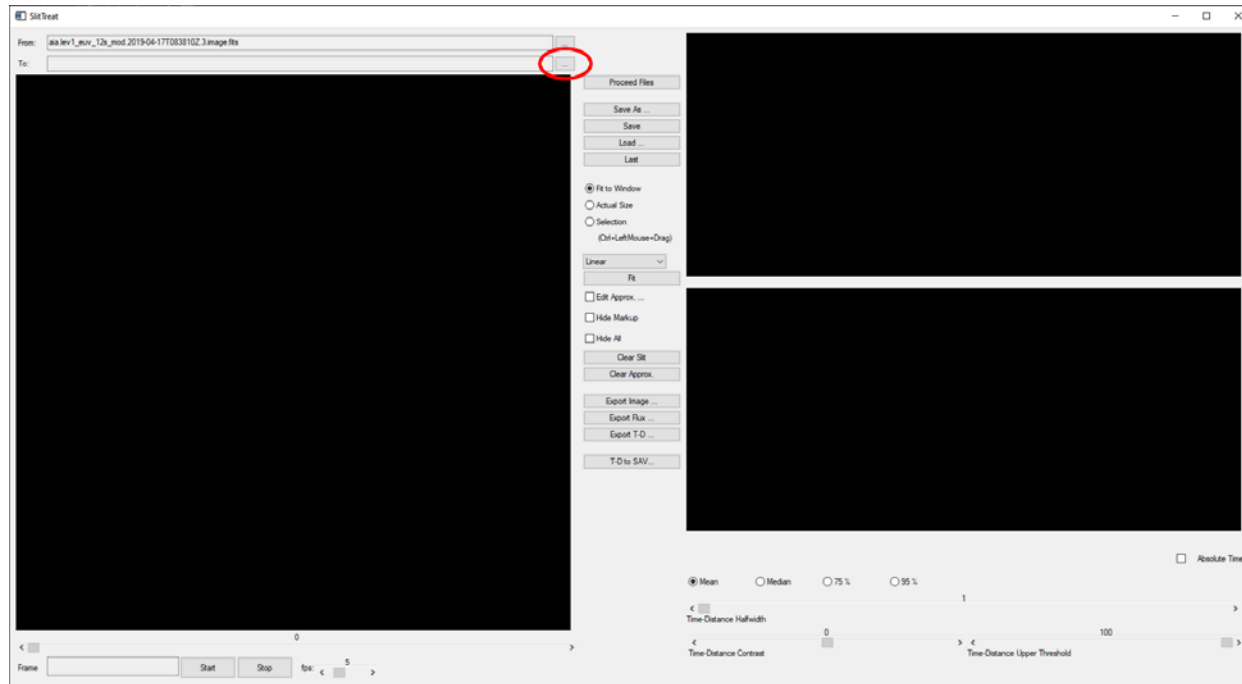
Now you can select first file in the sequence, see red-marked button.



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

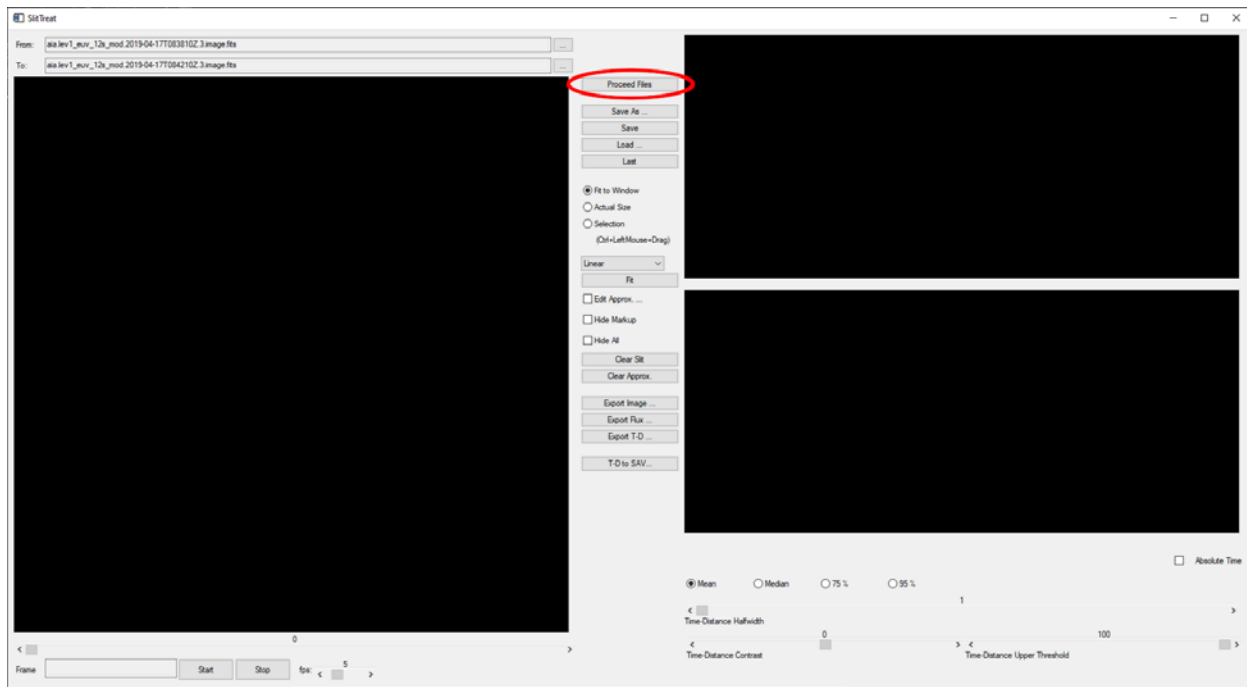
Select Second FITS file

Select last file in the sequence:



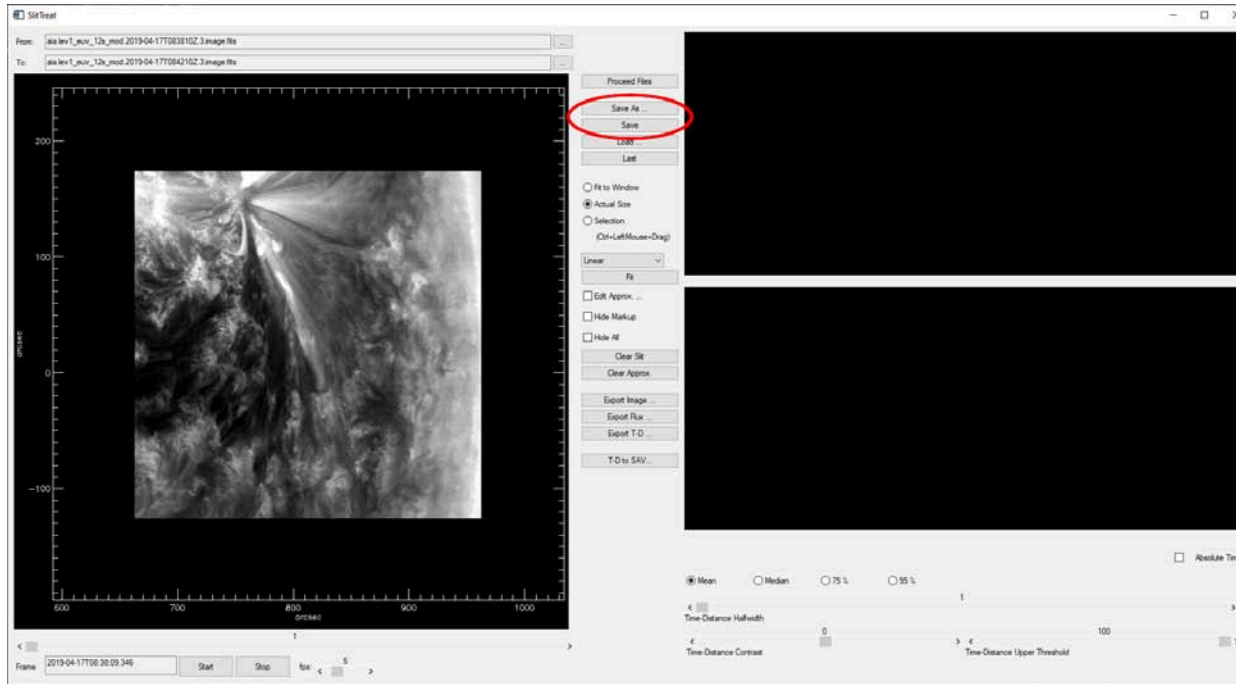
Proceed File Sequence

Proceed sequence you work with:



Save Project

Image is shown on the left pane (actual size, in native resolution without scaling).



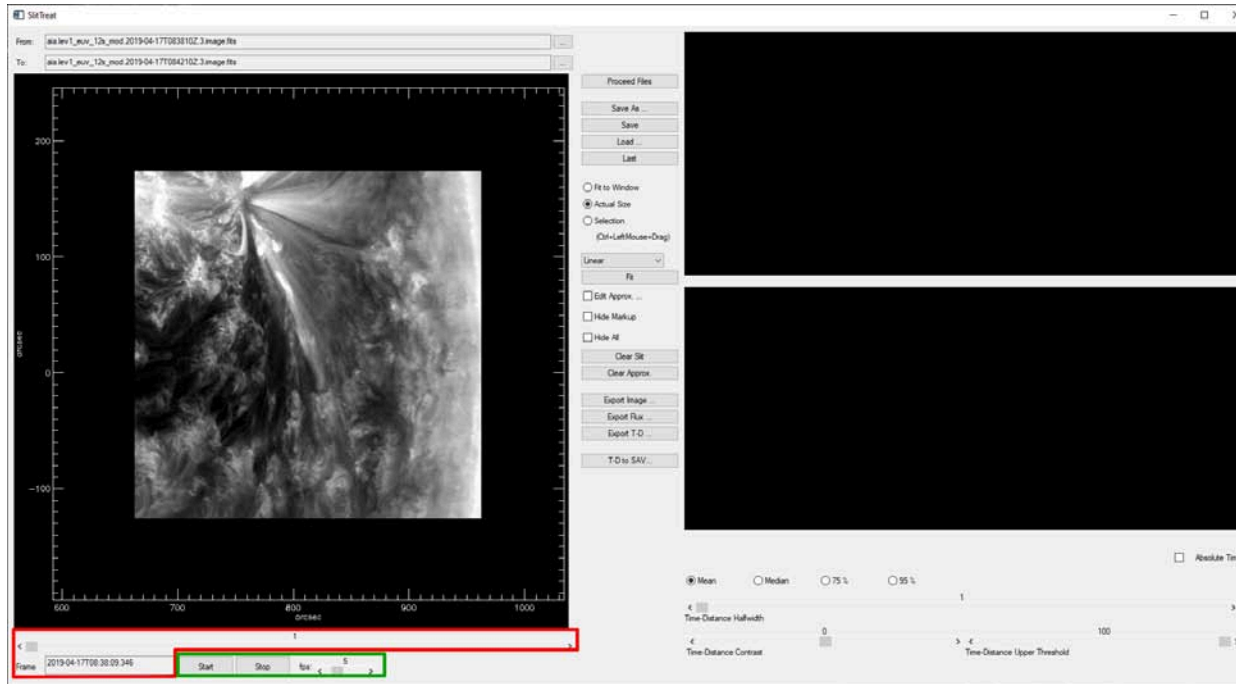
Save the project for further activity.



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.



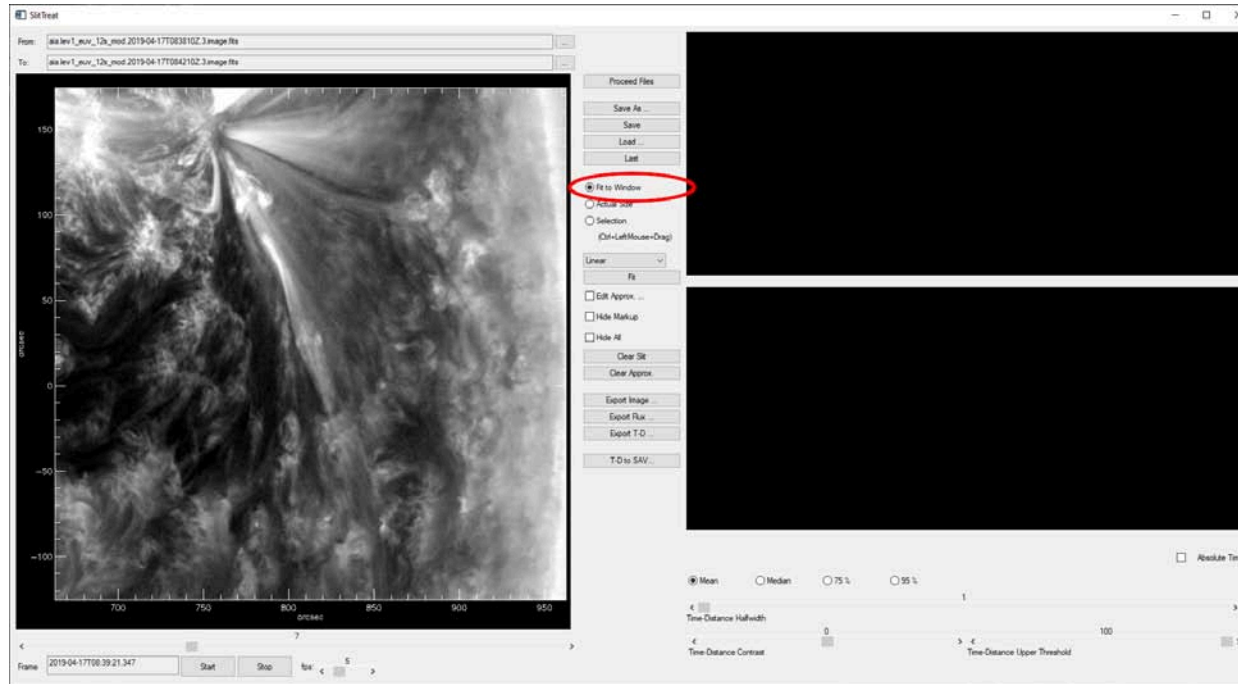
You can also animate the sequence with green-marked buttons 'Start'/'Stop' and select frame rate.

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.

Fit to Window

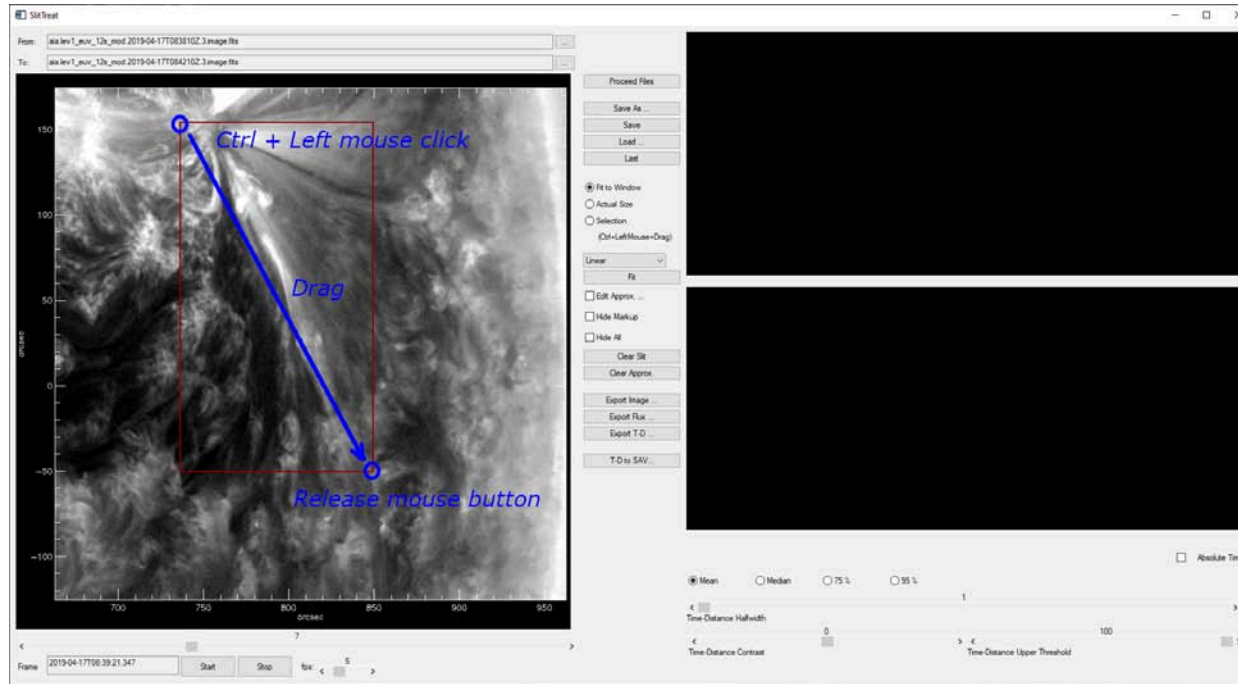
Scale image to fit window.



You can switch between resolutions at any moment of developing.

Select Region

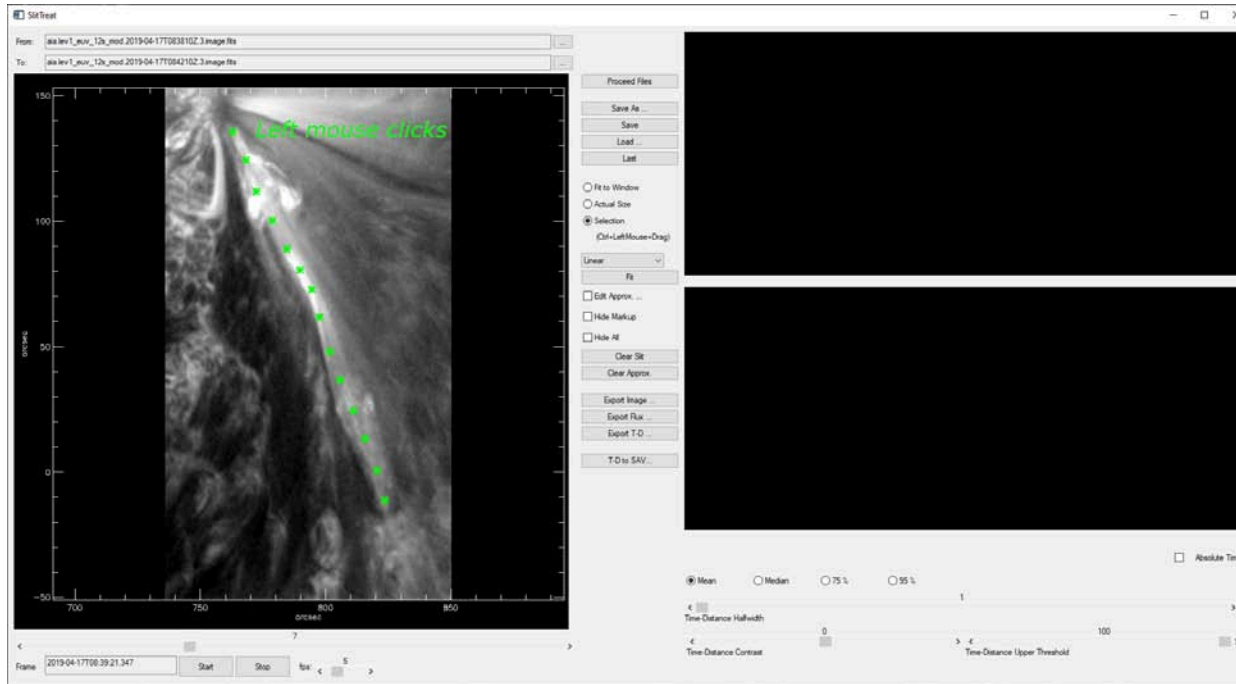
Select region which effectively covered investigated jet.



Ctrl+ left click and drag mouse cursor (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 along the slit axis. Green asterisks are result of clicking.



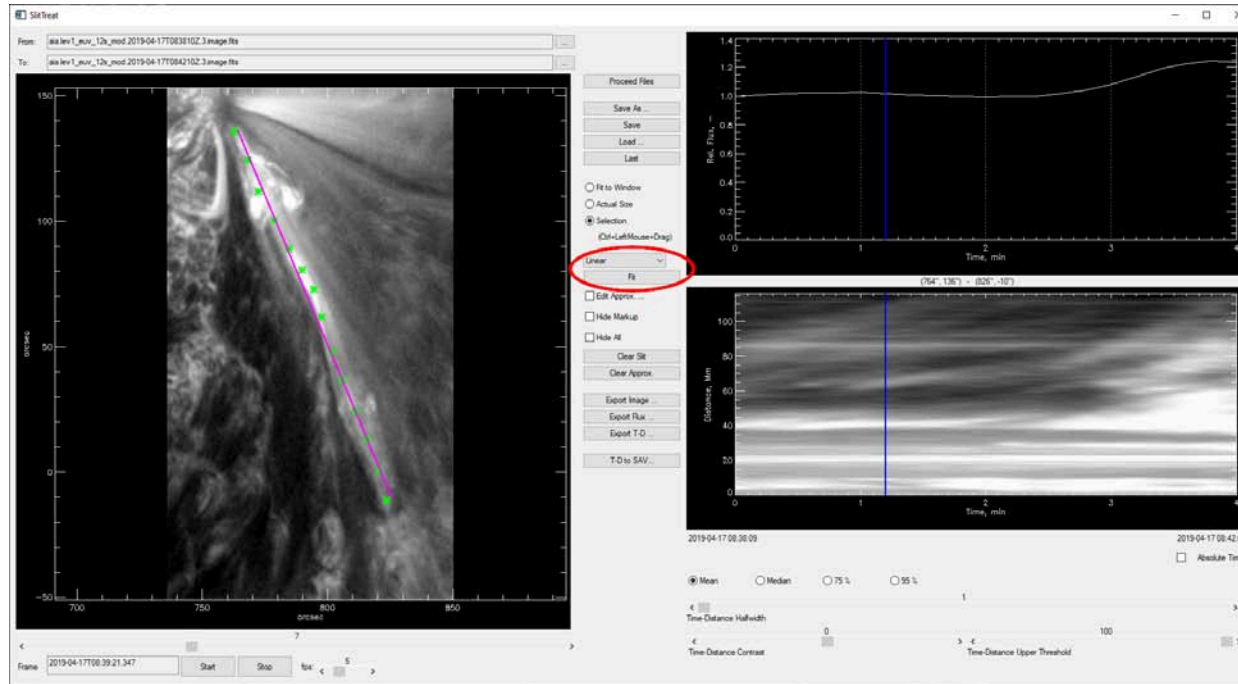
You can switch between resolutions at any moment of developing.



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

Linear Fit

Choose 'linear' (default choice) and press 'Fit' button.

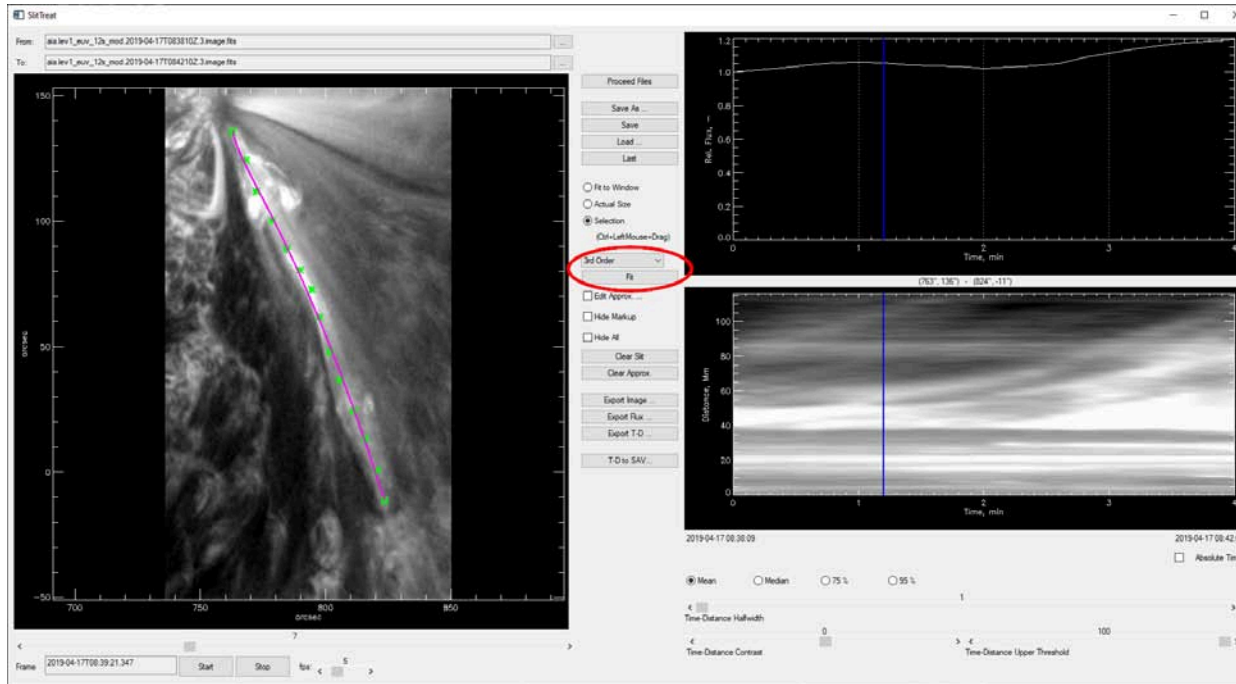


Approximation of the slit axis is shown on the left pane. On the right-bottom pane time-distance image appears. Coordinates of the axis (from-to) are shown above the image, times (from-to) are below. Blue vertical line points out to the time moment selected on the left pane (and will be repositioned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

Right-top pane shows the dynamics of the total flux inside the slit, relative to the flux of the first frame.

3rd-Order Fit

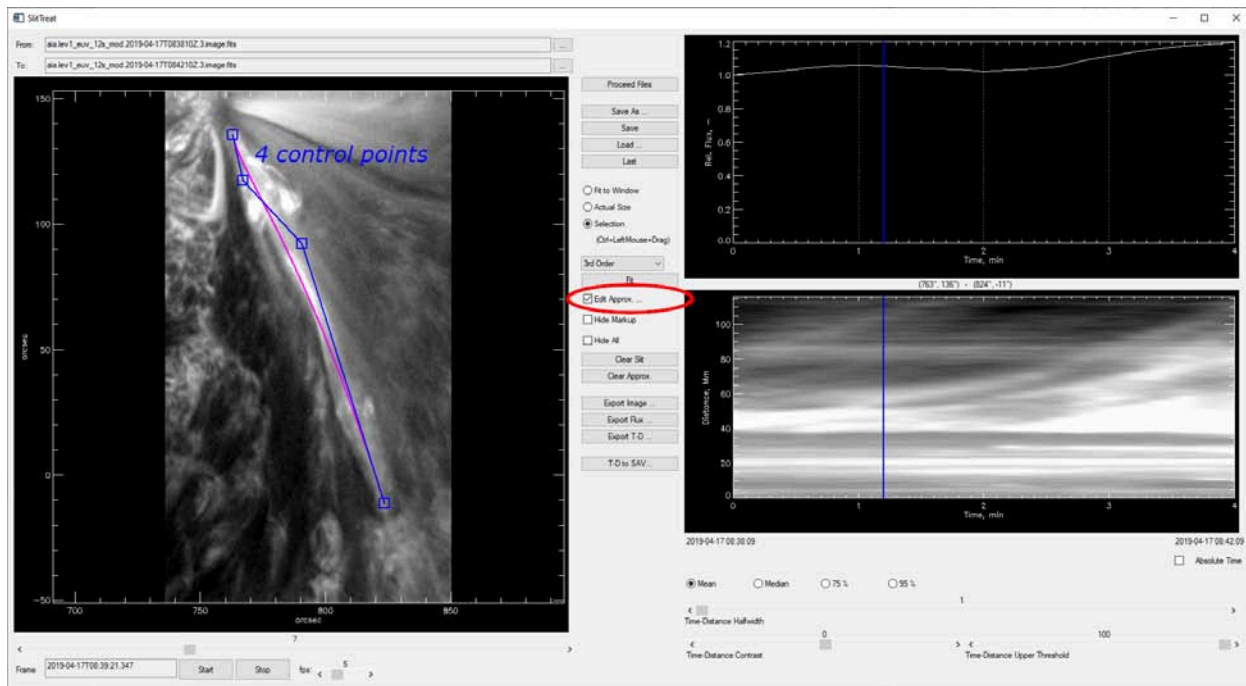
You can also try to approximate slit axis by curve (3rd order) line.



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.

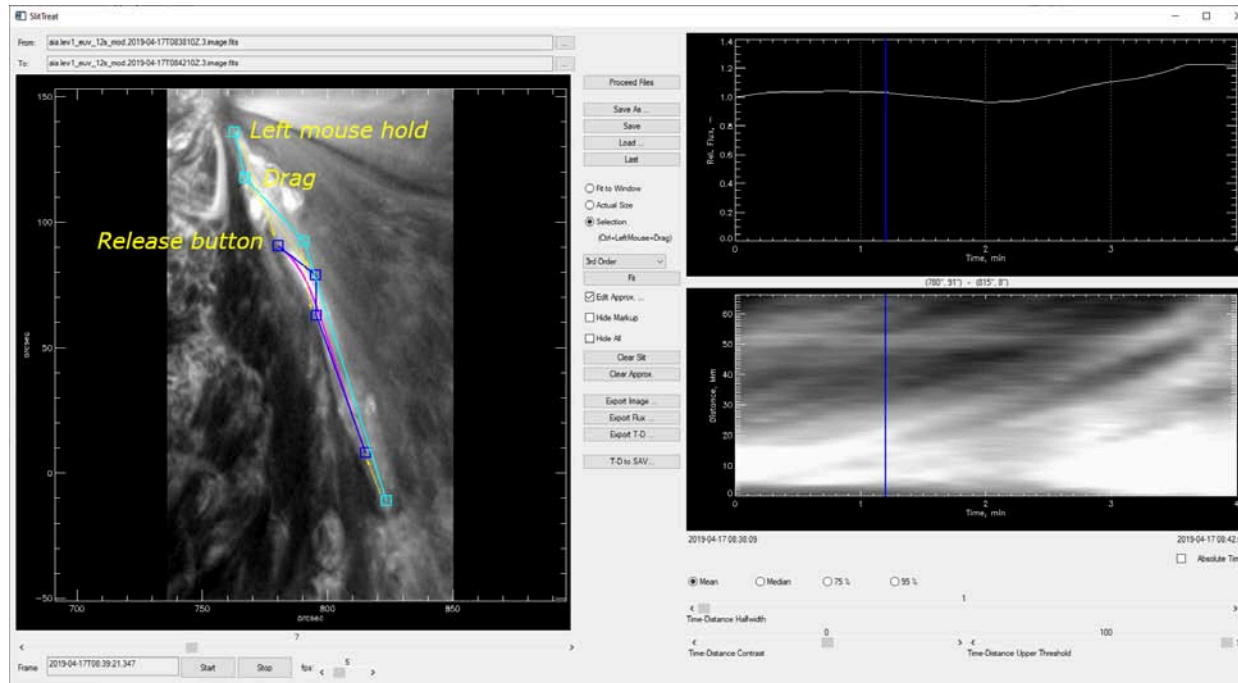
Edit Slit Axis

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:



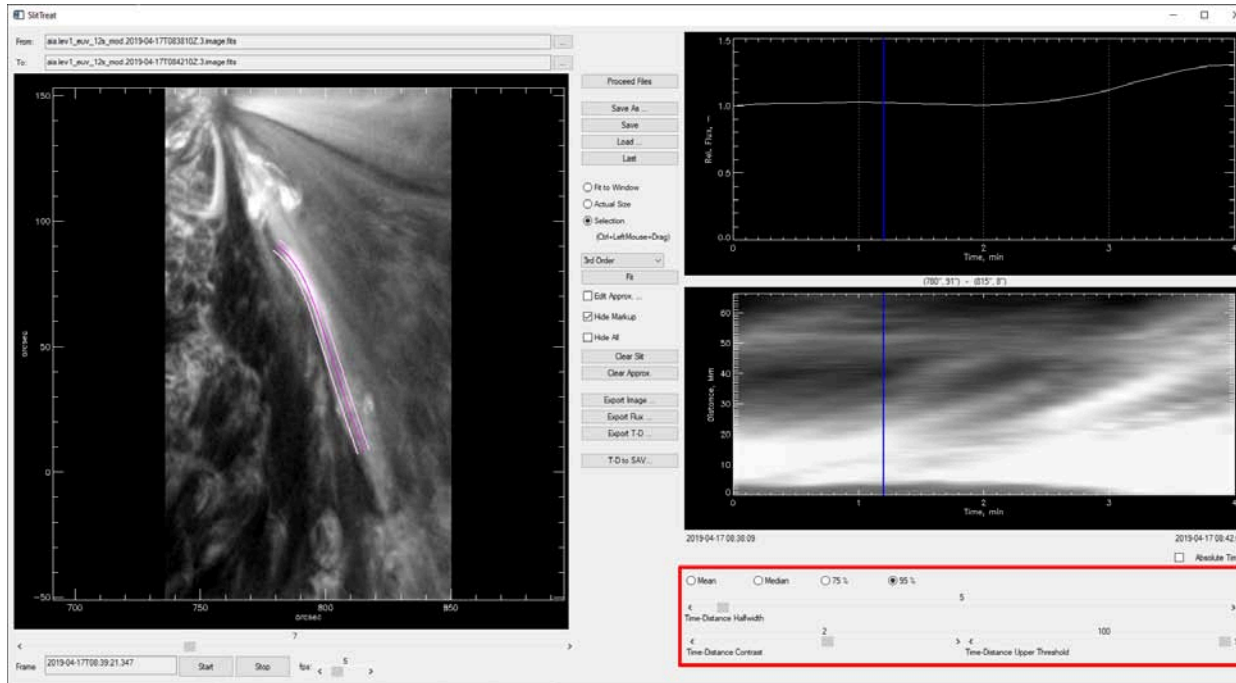
Stop Edit, Hide Markup

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:



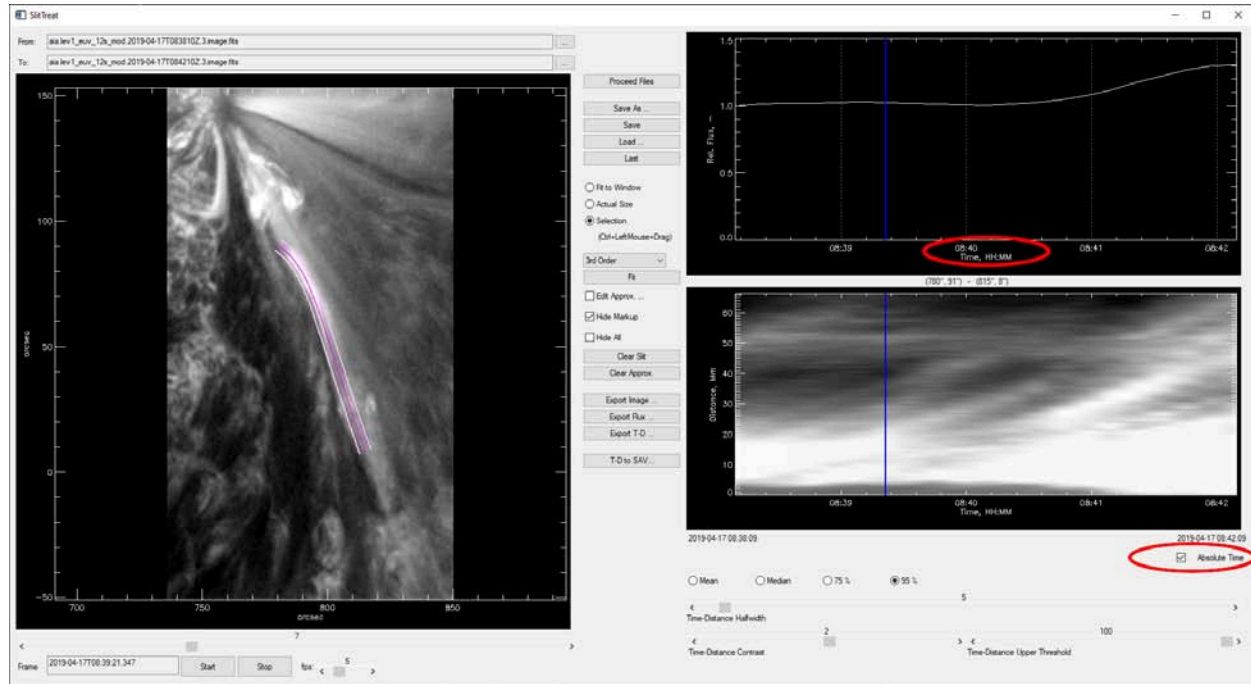
Halfwidth – halfwidth of the slit along normal to the slit axis. In the case $HW > 1$ central characteristics of the sample (**Mean**, **Median**, **75%**, **95%**) can be chosen.

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

Note that slit width (if > 1) is marked on the left pane by two pink lines.

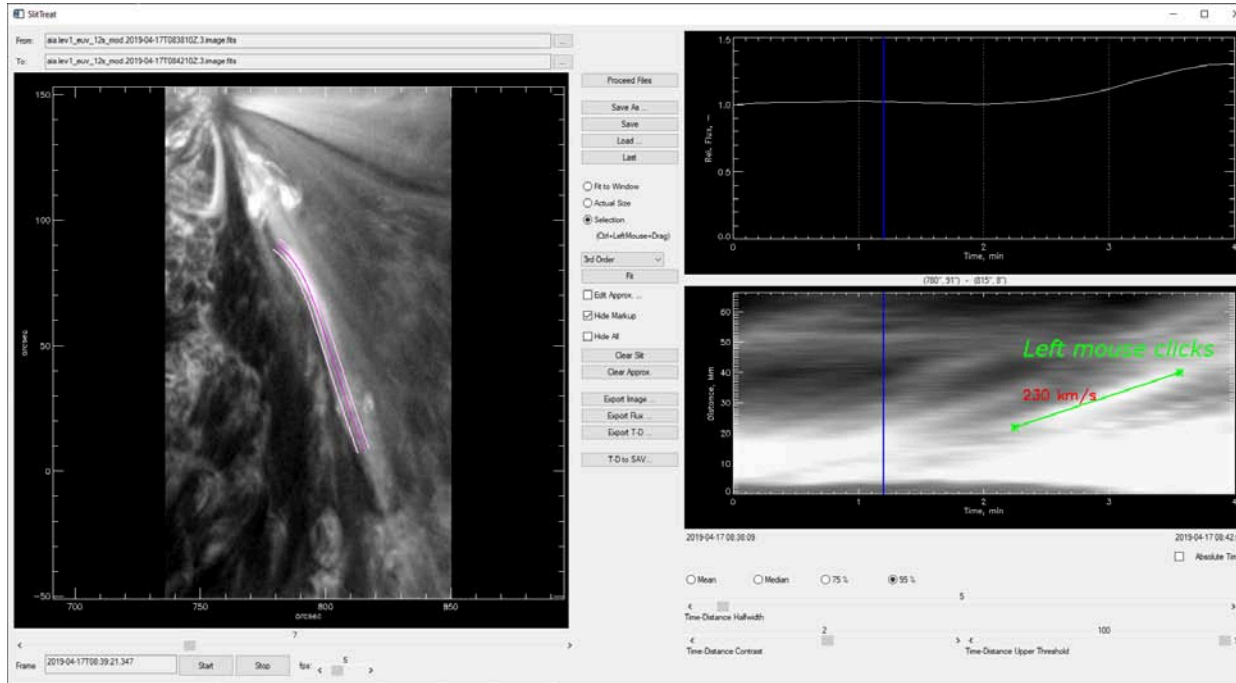
Absolute time

Switch “Absolute Time” to show time scales in UT:



Measure Jet Speed

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



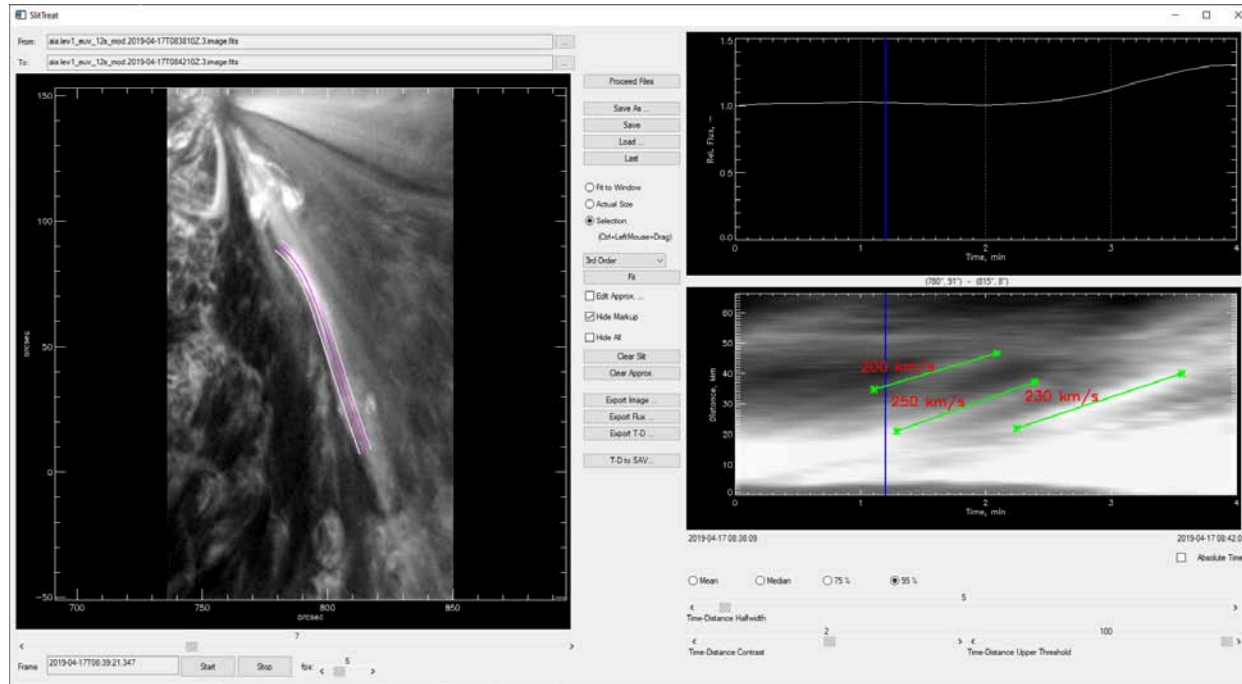
Value of the speed appears automatically after selecting of the 2nd point.



For undo the last selected point use right mouse click.

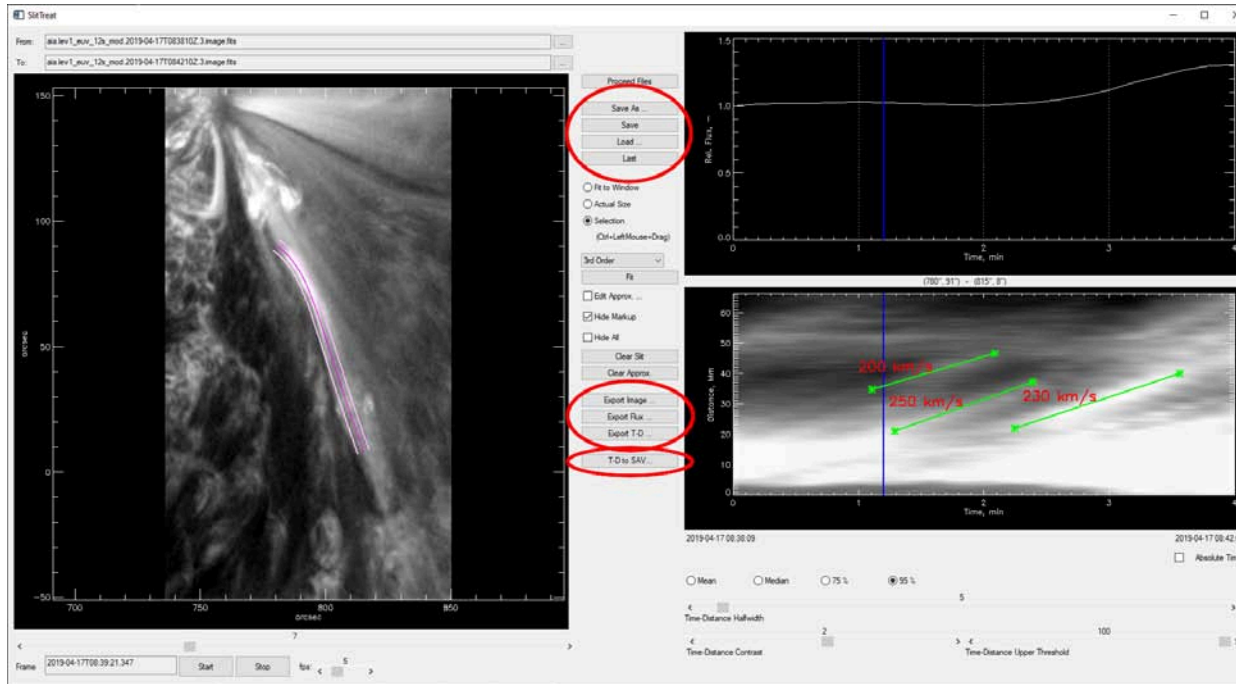
Measure Several Speeds

You can measure speeds of several streams in the same slit.



Export, Save, Load

You can export all images as PNG-files.

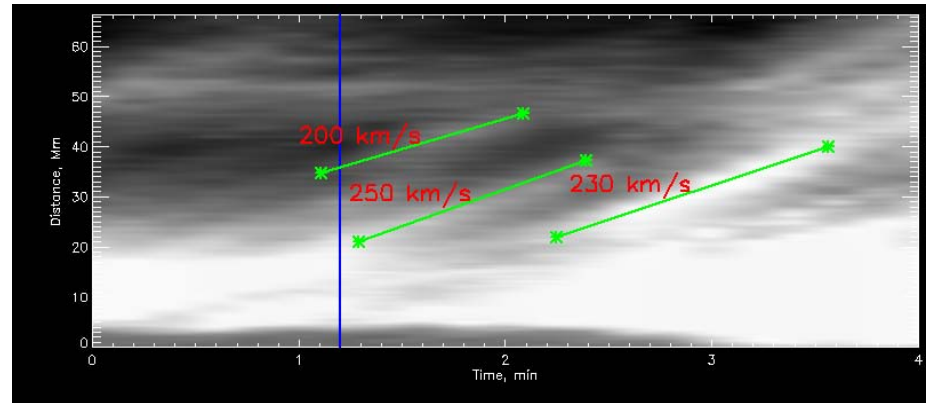
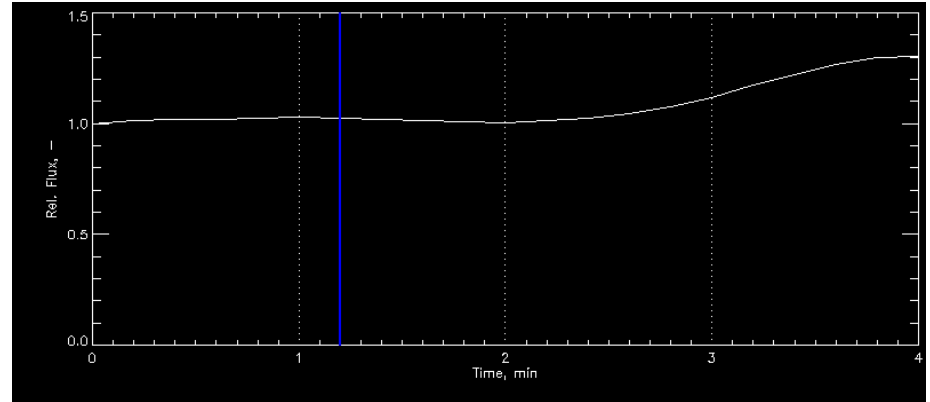
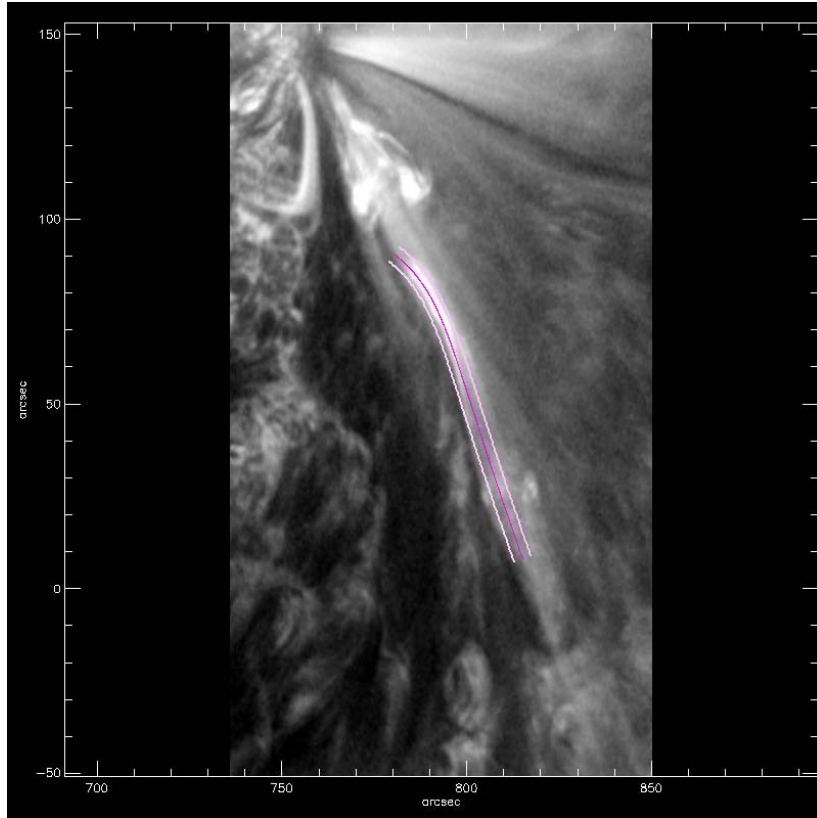


You can also export time-distance as the SAV-file. Structure of the file listed at the end of the document.



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, pixels*
HALF_WIDTH_ARC *Slit halfwidth, arcsec*
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)*