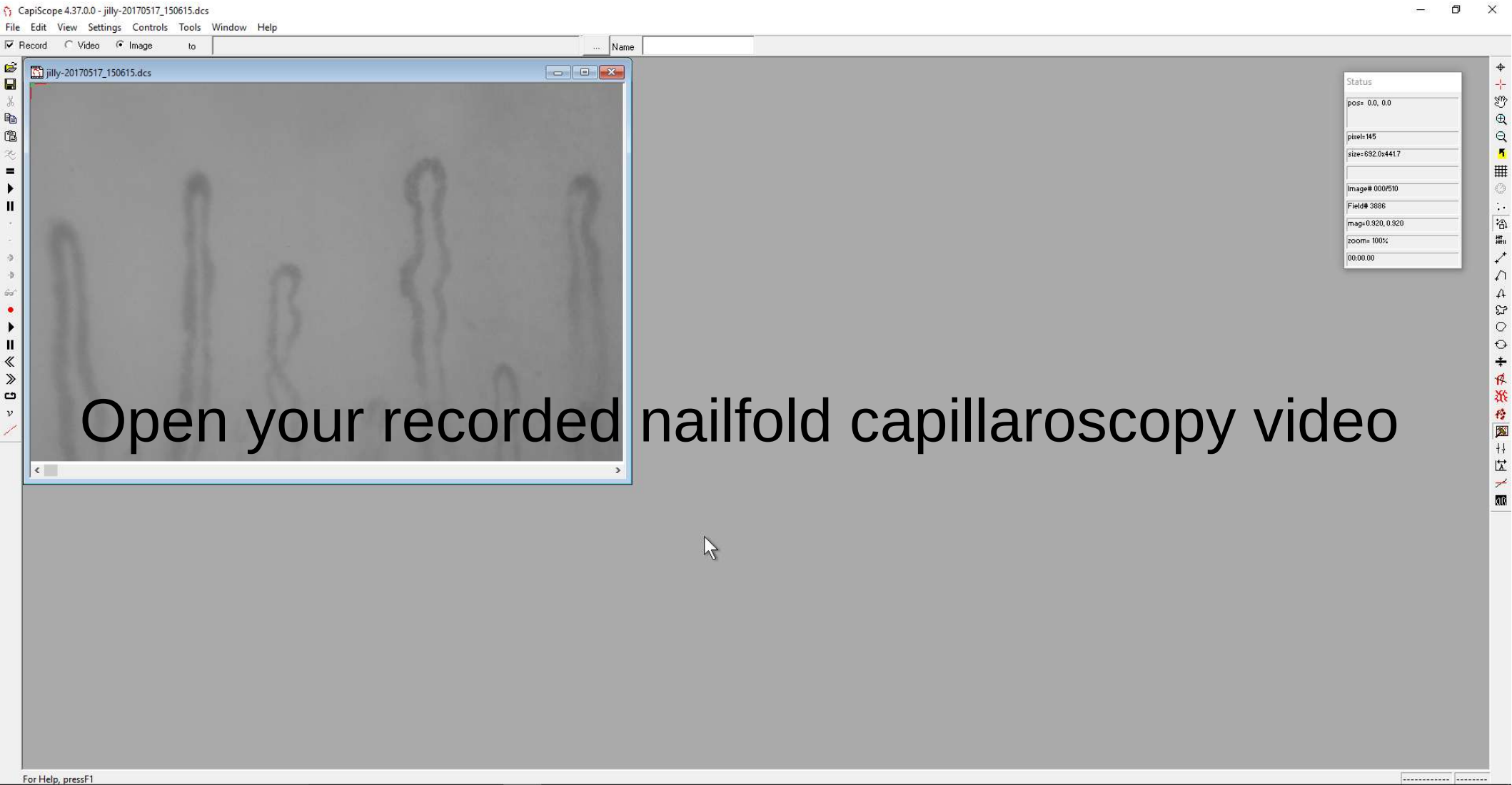
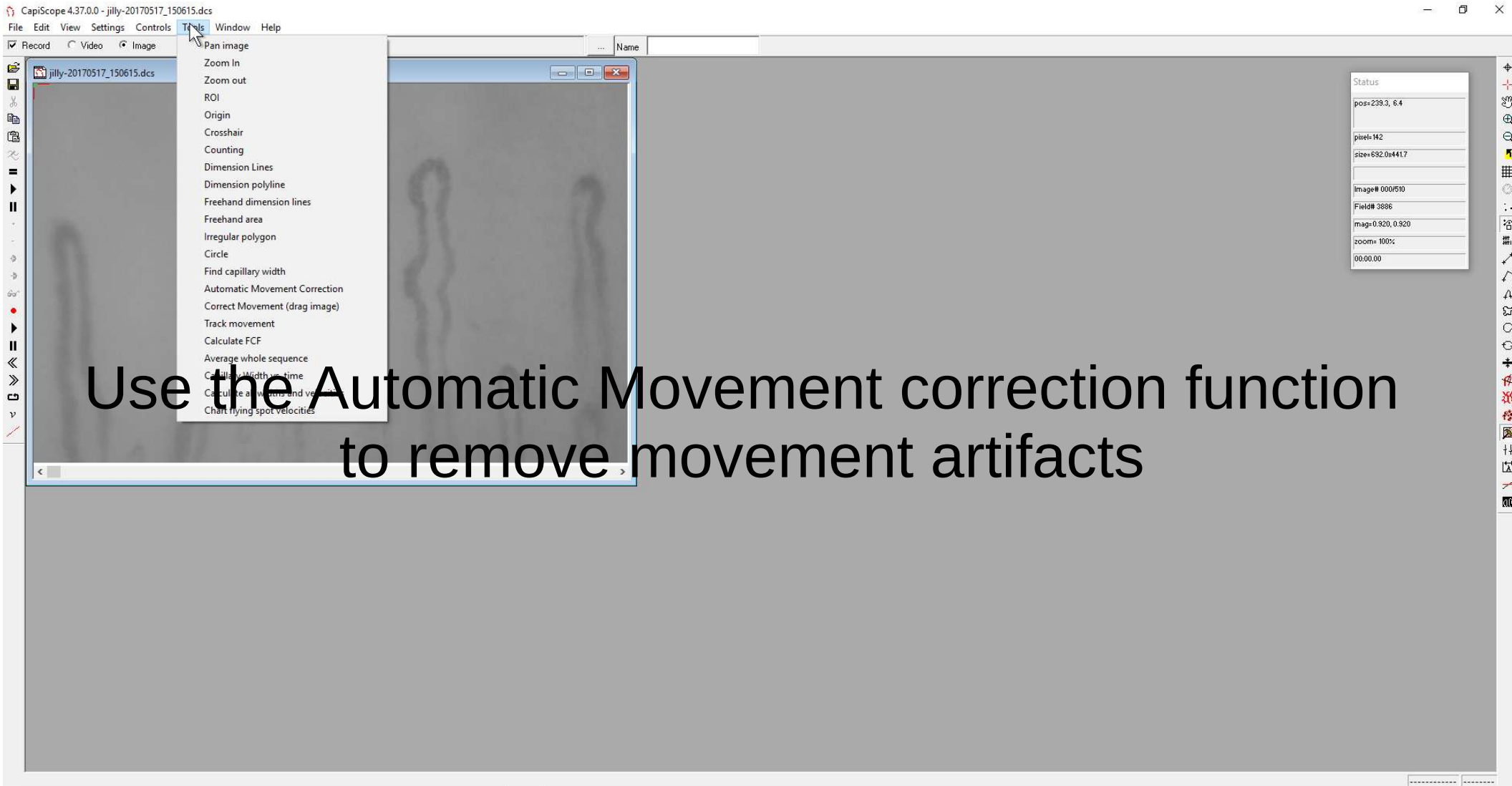


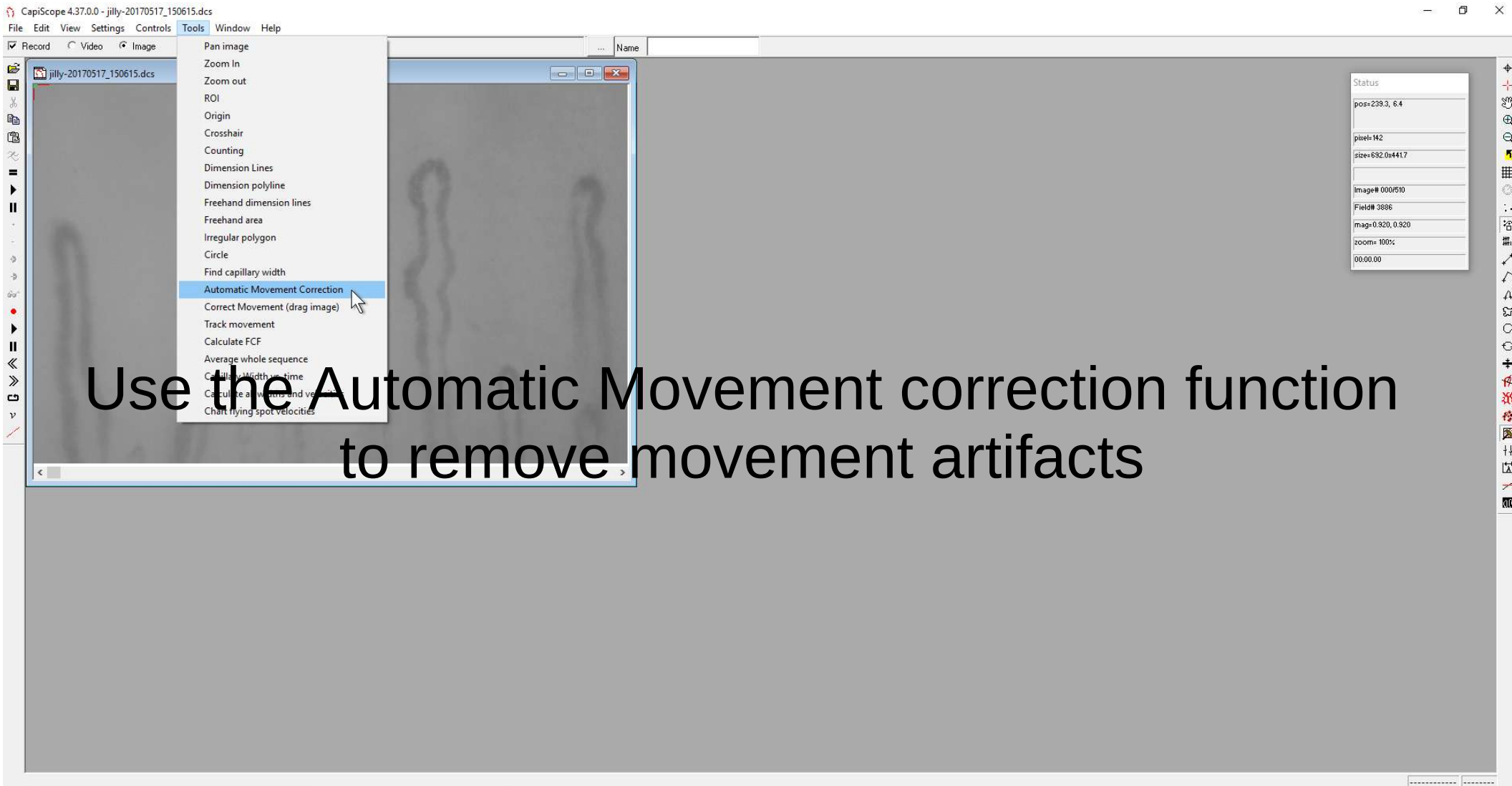
Capillary Velocity



Automatic Movement correction



Automatic Movement correction



Automatic Movement correction parameters

CapiScope 4.37.0.0 - jilly-20170517_150615.dcs

File Edit View Settings Controls Tools Window Help

Record Video Image to ... Name

jilly-20170517_150615.dcs

Status
pos=239.3, 6.4
pixels=142
size=692.0x441.7
image# 0001510
field# 3886
img=0.920, 0.920
zoom= 100%
00:00.00

Movement correction Parameters

Reference window size (% of image size, centred in image). Larger will slow processing, but may include more features to correlate to.

Step between pixels in resolution window. 1= use every pixel, 2 every other pixel etc. Increase this value to speed up processing.

Method
Random points
Grid of points
Grid of lines

Low pass filter window size. Filters image before correlating image. Use zero for no filtering.

Range to check movement over (% of image size). Larger will slow processing, but will follow faster movements.

Resolution (in pixels/lines). Coarser (larger value) will speed up processing but at expense of coarse movement correction.

Limit (% of range). When movement exceeds this limit, the current image becomes the new reference image.

OK Cancel

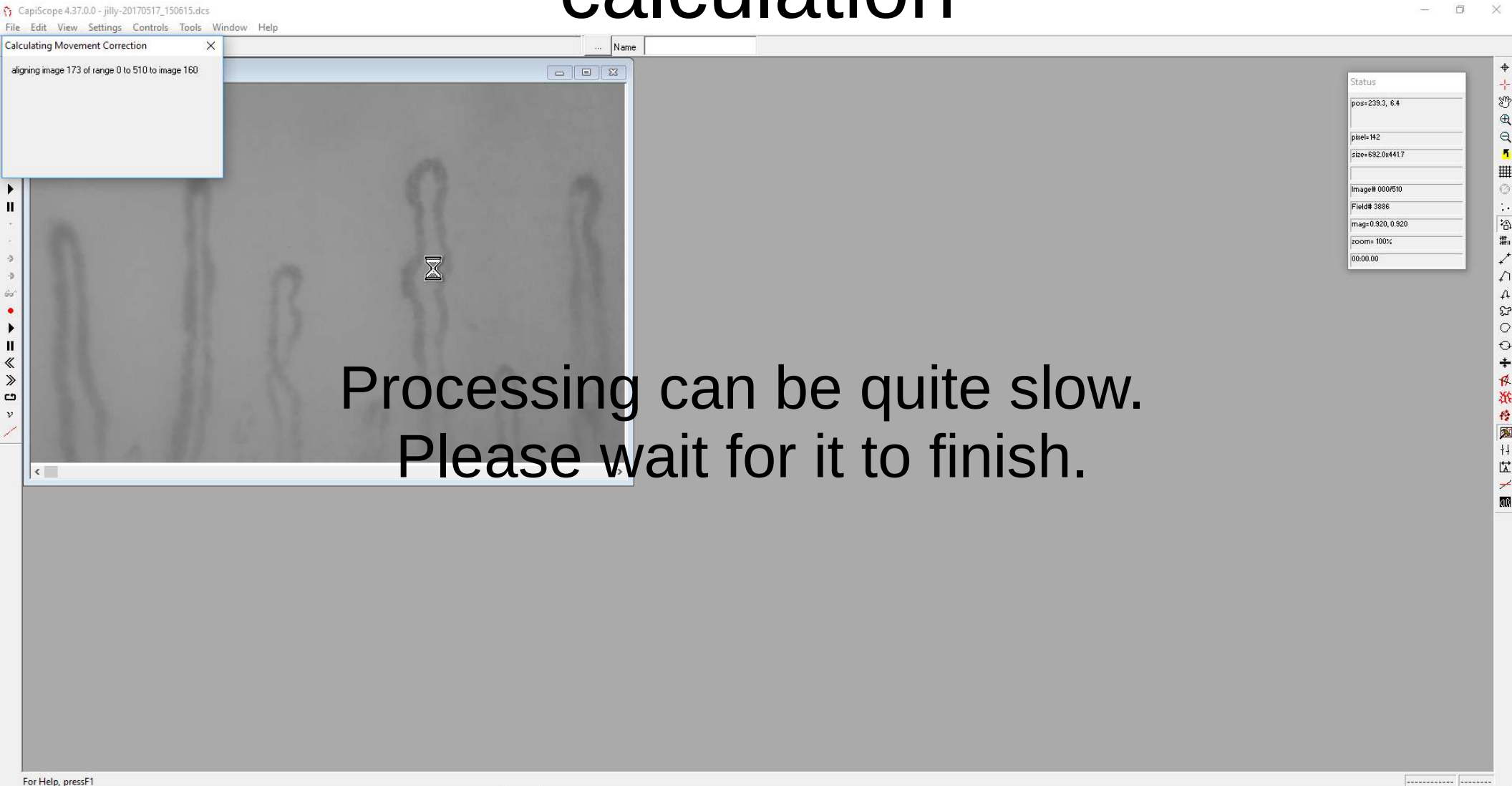
You can improve processing speed by reducing the reference window size if there are capillaries in the centre of the image...

...and by increasing the step between pixels...

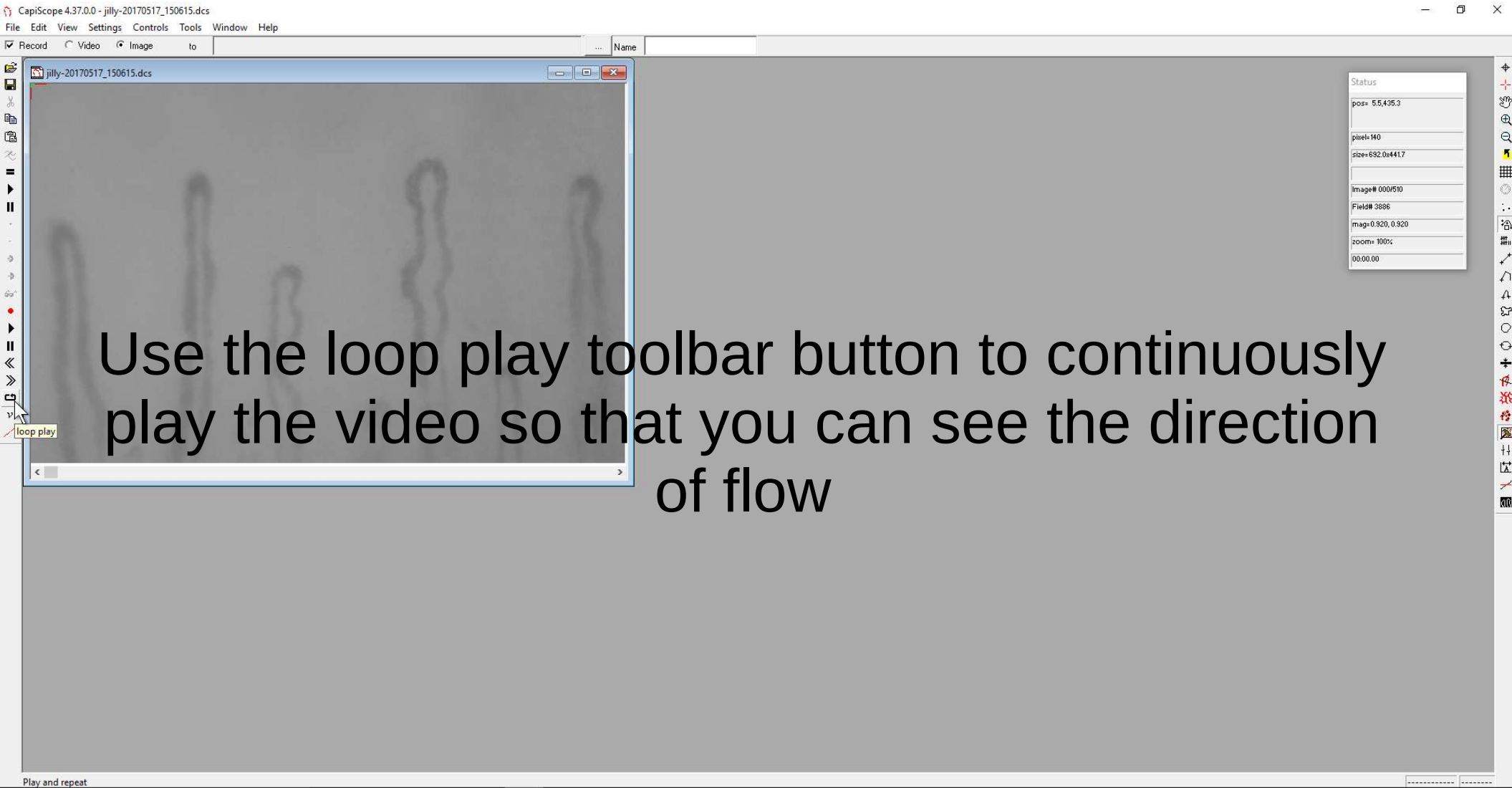
...and by reducing the range if the movement artifact is small or slow

For Help, press F1

Automatic Movement correction calculation



Loop Play



CapiScope 4.37.0.0 - jilly-20170517_150615.dcs

File Edit View Settings Controls Tools Window Help

Record Video Image to ... Name

jilly-20170517_150615.dcs

Status

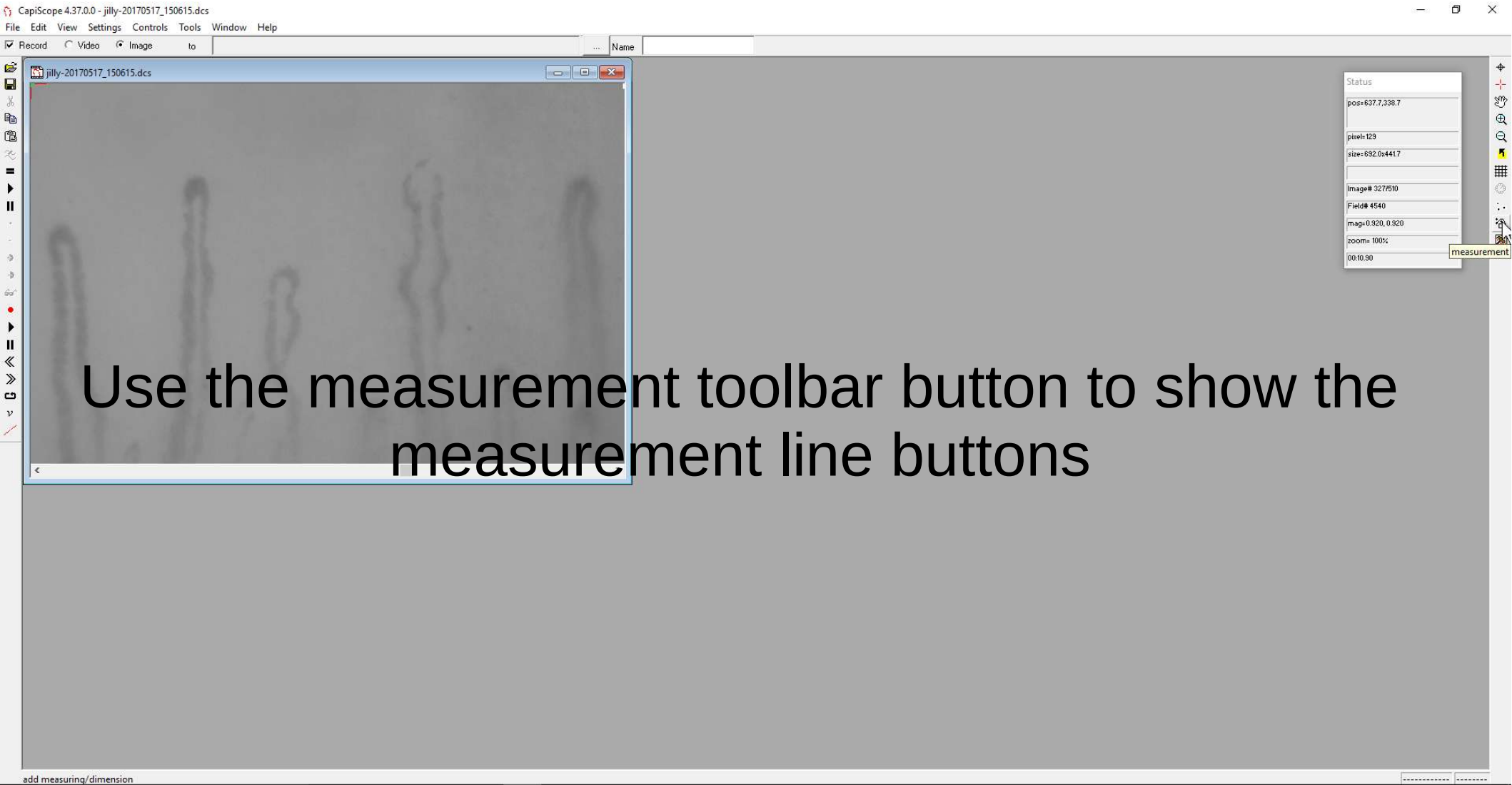
pos=	5.5,435.3
pixels	140
size=	632.0x441.7
image#	000/510
Field#	3886
mag=	0.920, 0.920
zoom=	100%
	00:00.00

Use the loop play toolbar button to continuously play the video so that you can see the direction of flow

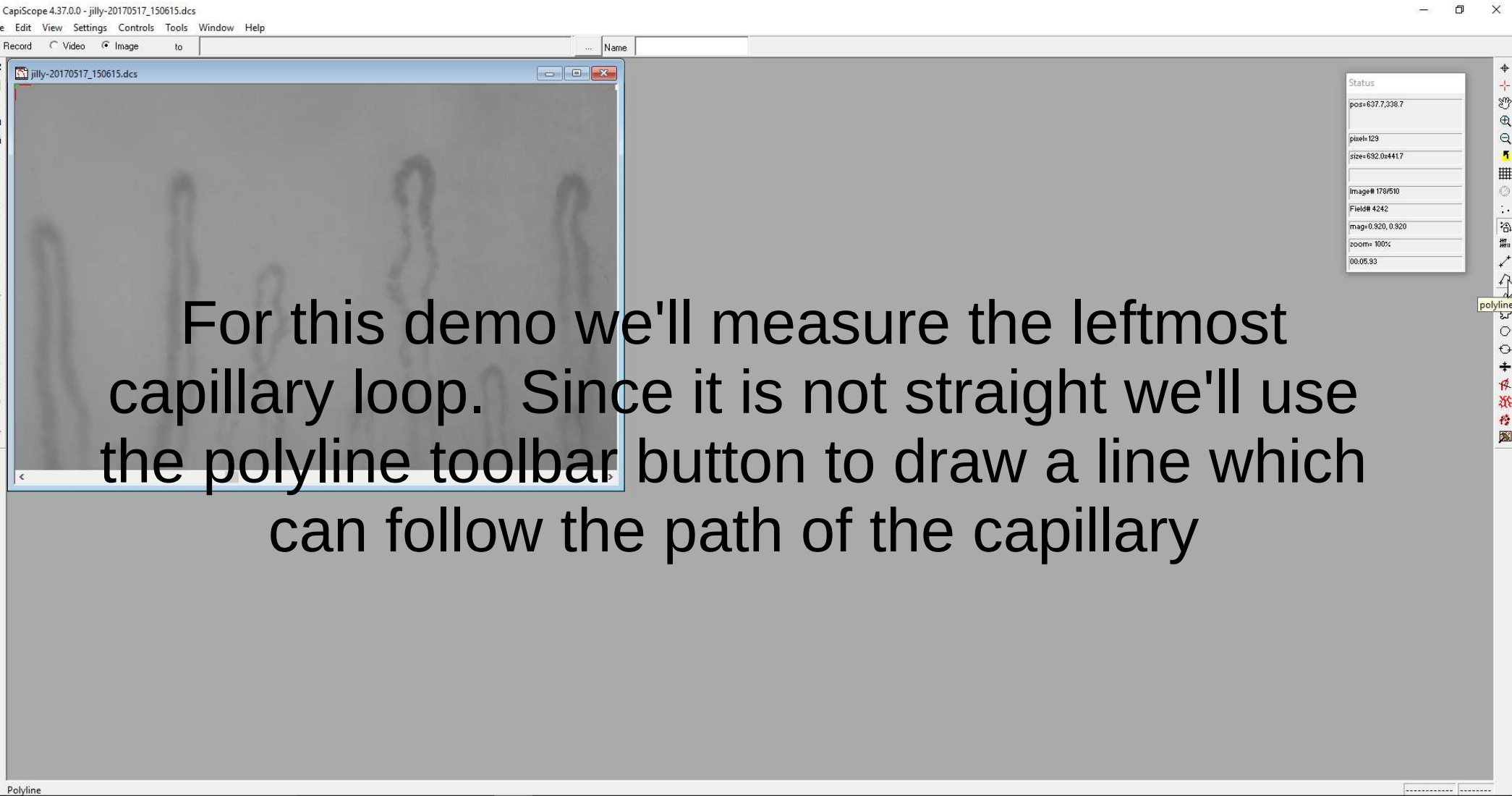
loop play

Play and repeat

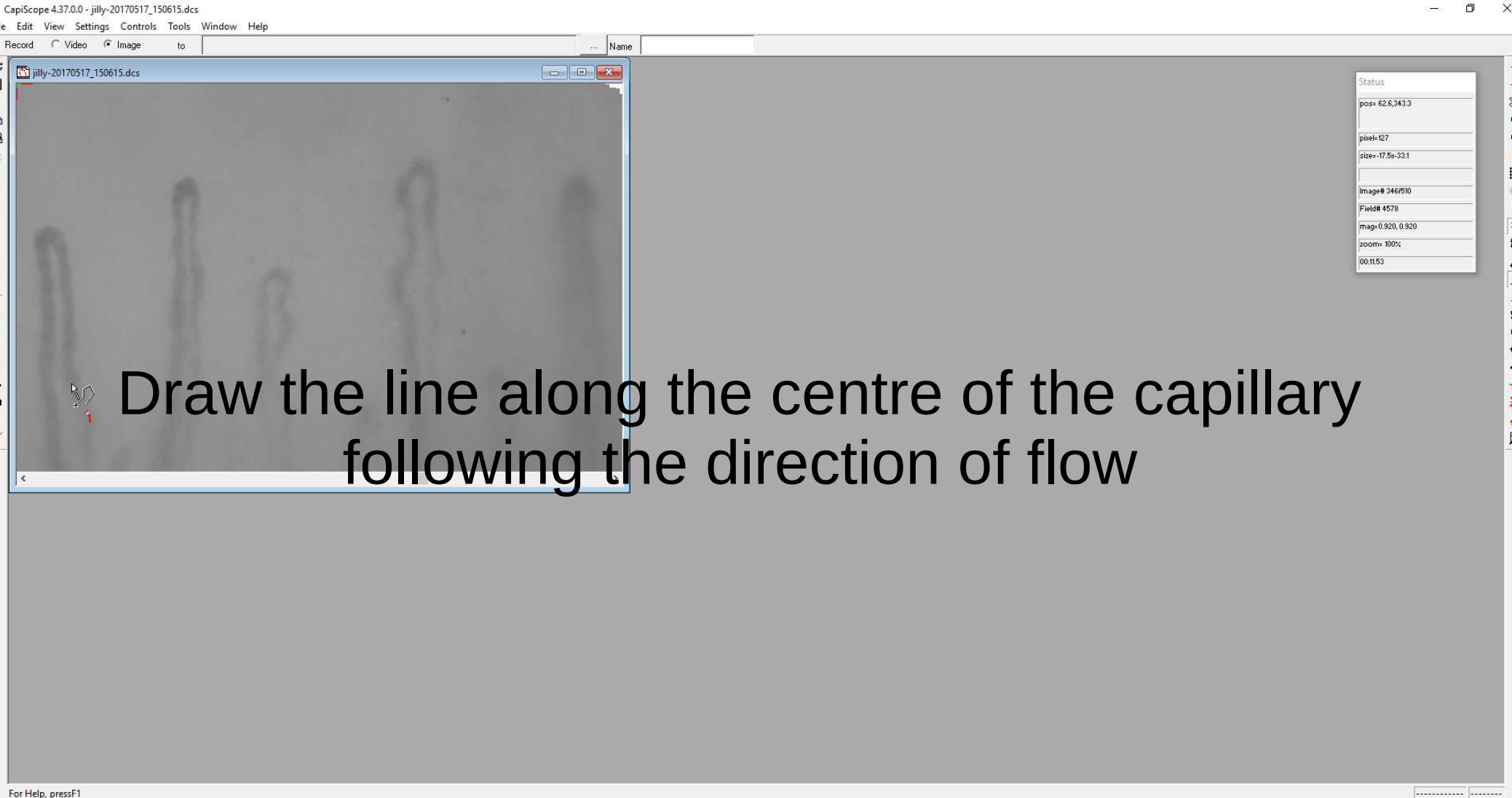
Measurement line



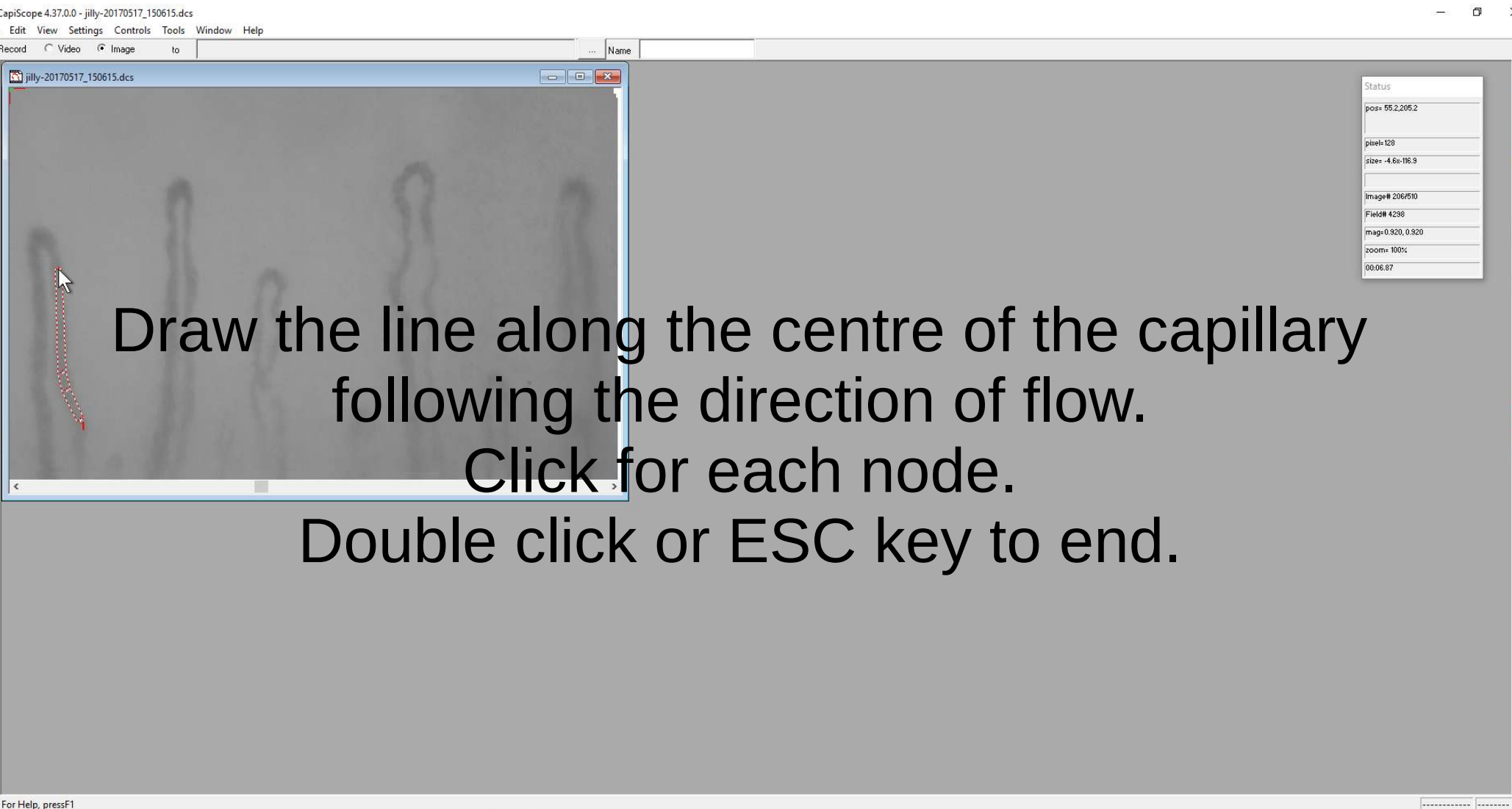
Measurement polyline



Drawing the Measurement line



Measurement line



The screenshot shows the CapiScope 4.37.0.0 interface. The main window displays a video frame with a measurement line drawn along a capillary. The line is composed of several red nodes connected by a dashed red line. A mouse cursor is positioned over the first node. The software's menu bar includes File, Edit, View, Settings, Controls, Tools, Window, and Help. The toolbar contains various icons for recording, video, image, and measurement. A status window on the right displays the following information:

Status	
pos=	55.2,205.2
pixels	128
size=	-4.6x-116.9
image#	206/510
Field#	4238
mag=	0.920, 0.920
zoom=	100%
	00:06.87

For Help, pressF1

Draw the line along the centre of the capillary following the direction of flow.
Click for each node.
Double click or ESC key to end.

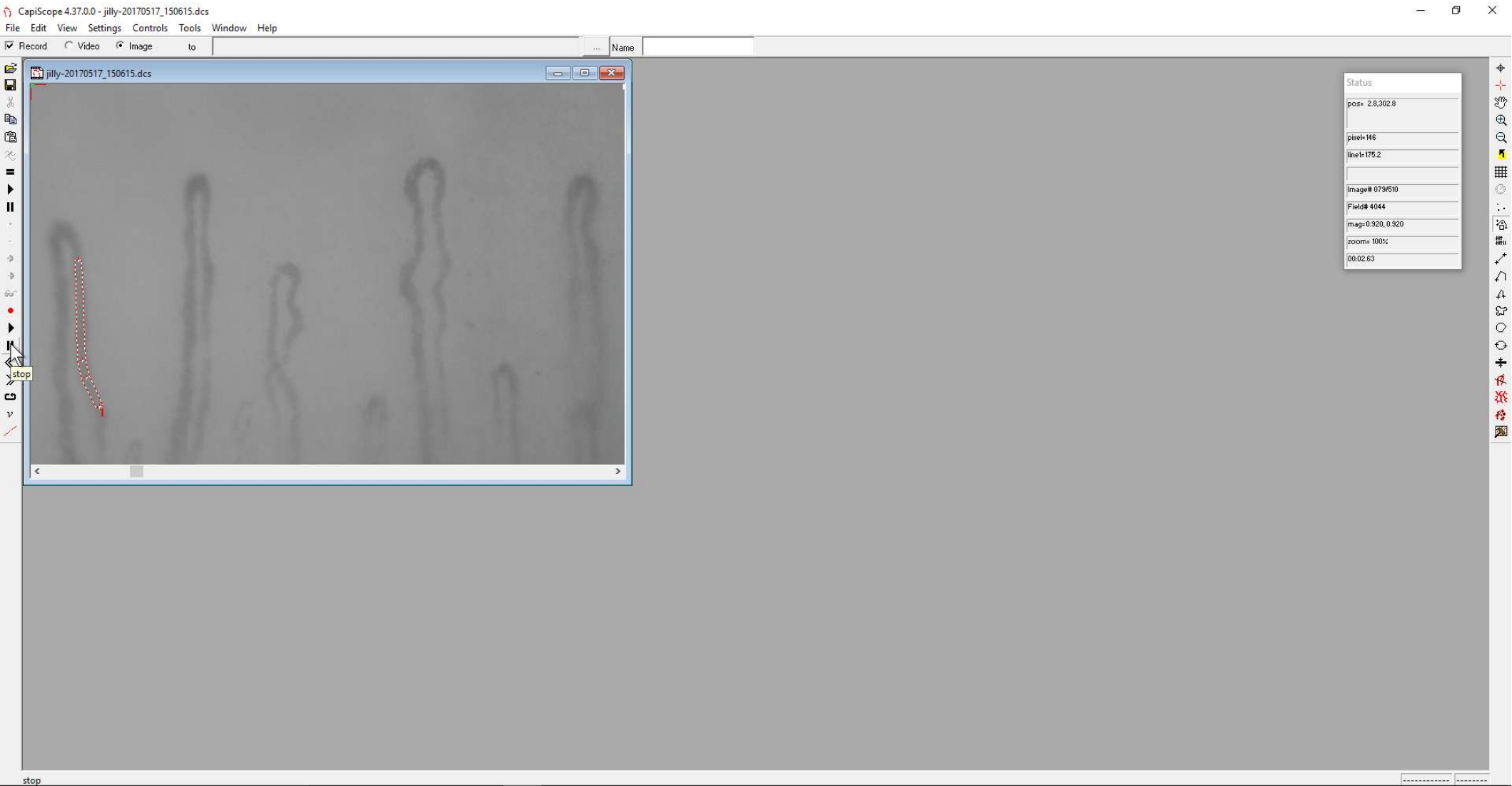
Line width

The screenshot displays the CapiScope 4.37.0.0 software interface. The main window shows a video frame with a red dashed measuring line. A context menu is open over the first node of the line, with the 'Set line width' option selected. To the right, a 'Histogram' window shows a distribution of pixel levels. Further right, a 'Status' panel displays various parameters. At the bottom, a 'Linescan' window shows a graph of velocity (um/s) versus time (seconds).

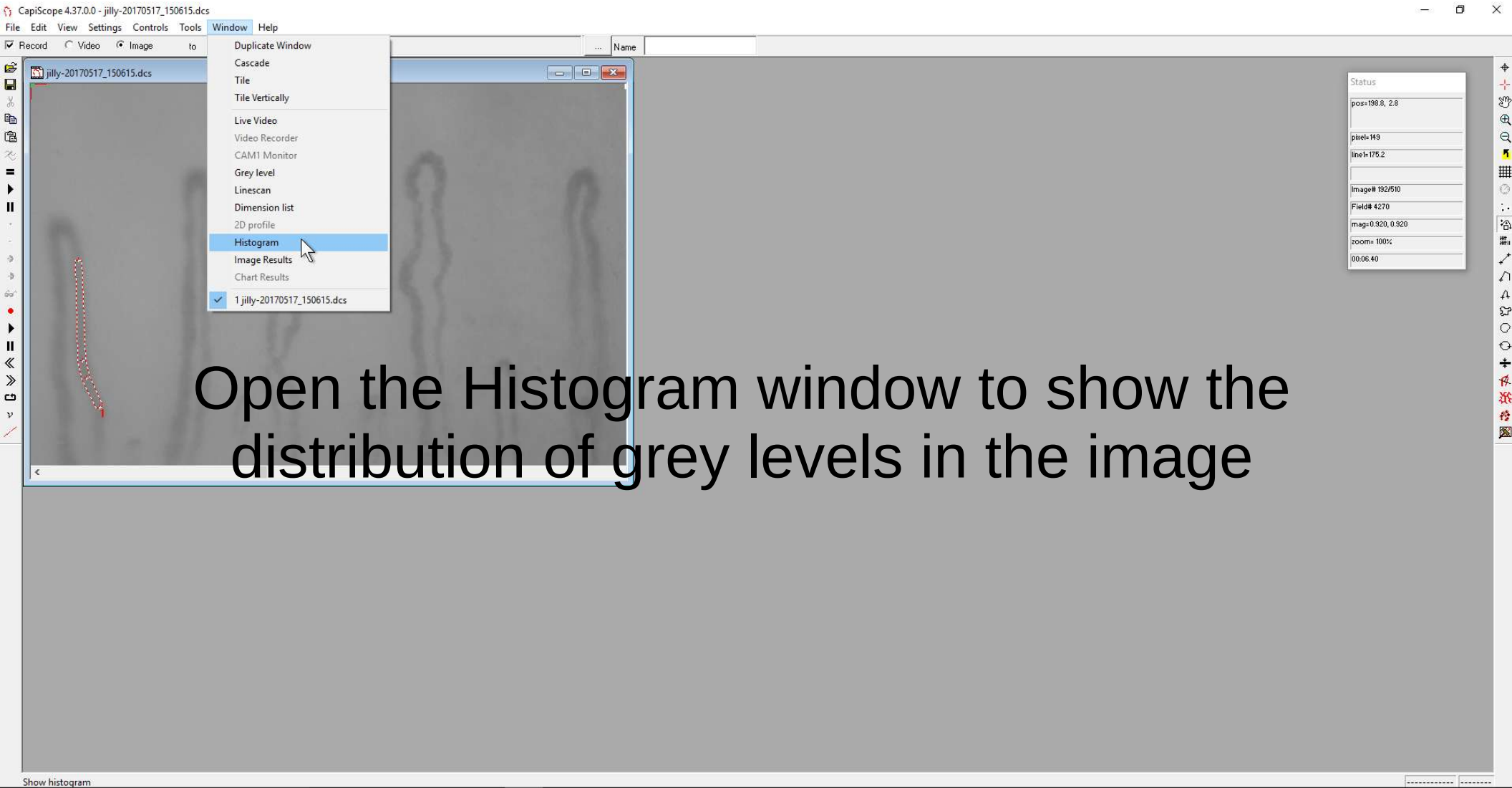
Set the measurement line width by right click on the first node of the line. Set the width to about the same width of the capillary. Enter line width in pixels.

Set line width

Stop loop play



Open Histogram Window



Open the Histogram window to show the distribution of grey levels in the image

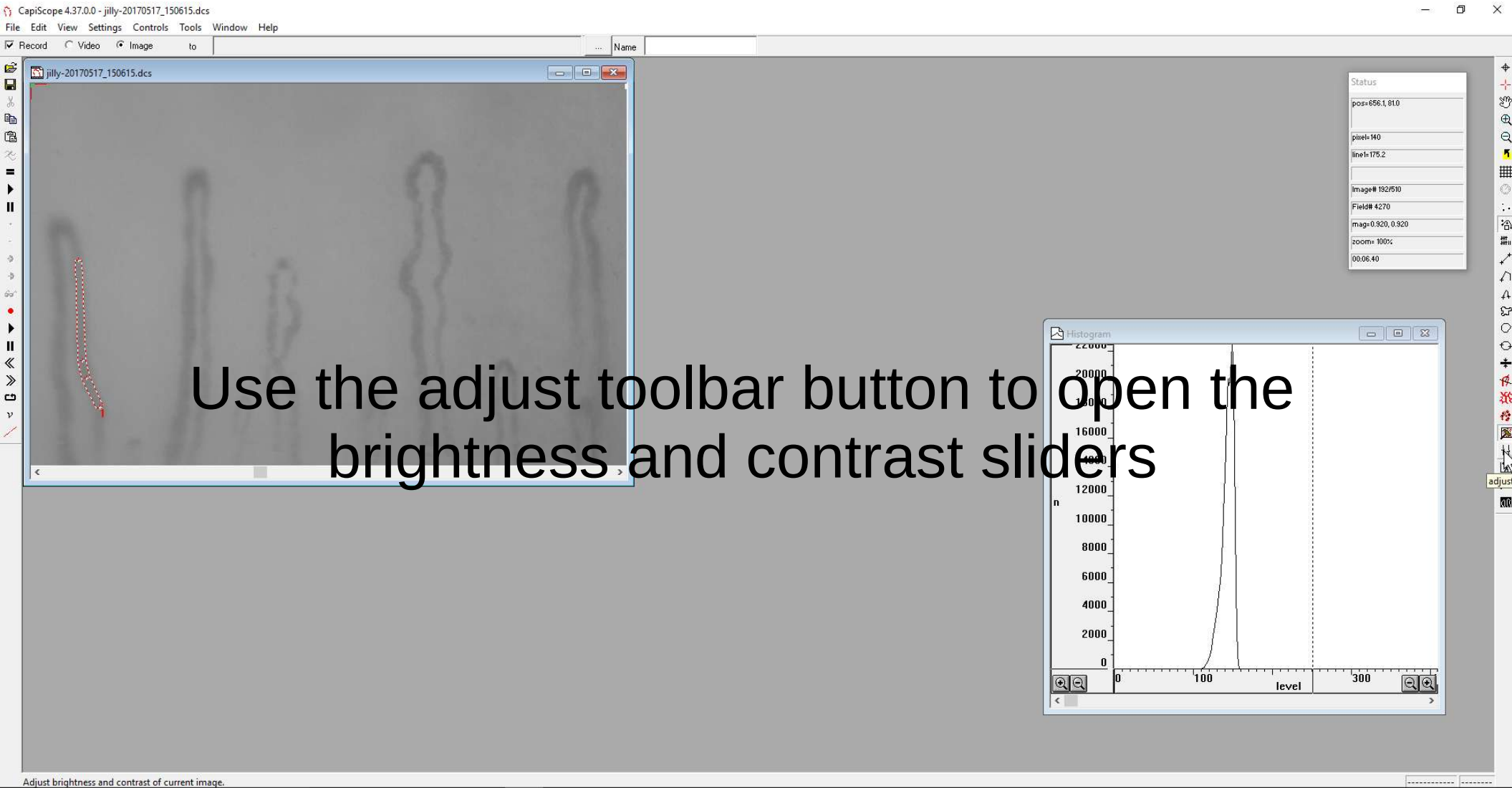
Adjusting brightness and contrast

The screenshot displays the CapiScope 4.37.0.0 software interface. The main window shows a grayscale image of a person's silhouette. A red dashed line is drawn on the image, indicating a region of interest. The histogram window is open, showing a sharp peak at a level of approximately 150. The histogram's y-axis is labeled 'n' and ranges from 0 to 22000. The x-axis is labeled 'level' and ranges from 0 to 300. The status window in the top right corner displays the following information:

Status	
0:jilly-20170517_150615.dcs	
x =	307.000 level
y =	0.000 n

Use the Tools toolbar button to show the image processing buttons

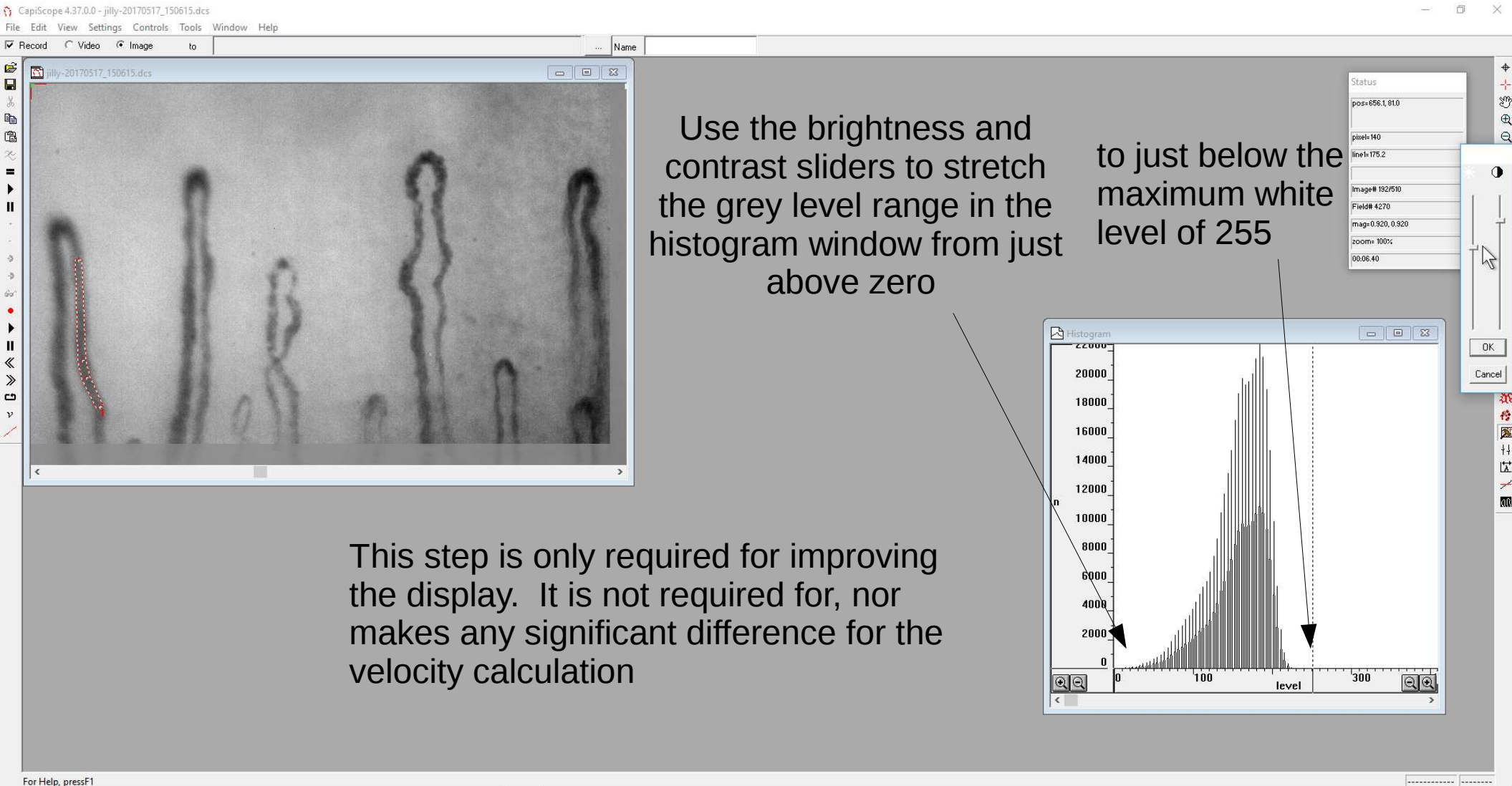
Adjusting brightness and contrast



The screenshot displays the CapiScope 4.37.0.0 software interface. The main window shows a grayscale image of a person's silhouette. A red dashed line is drawn on the left side of the image. A toolbar on the left contains various icons, including an 'adjust' button. A histogram window is open in the bottom right corner, showing a sharp peak at level 100. The histogram's y-axis is labeled 'n' and ranges from 0 to 22000. The x-axis is labeled 'level' and ranges from 0 to 300. A status window in the top right corner displays the following information: pos=856,1,810; pixels=140; line=175.2; image# 192/510; field# 4270; mag=0.920, 0.920; zoom= 100%; 00:06:40. At the bottom of the interface, a text box reads 'Adjust brightness and contrast of current image.'

Use the adjust toolbar button to open the brightness and contrast sliders

Adjusting brightness and contrast



Use the brightness and contrast sliders to stretch the grey level range in the histogram window from just above zero to just below the maximum white level of 255

This step is only required for improving the display. It is not required for, nor makes any significant difference for the velocity calculation

For Help, pressF1

Open the linescan window

The screenshot displays the CapiScope 4.37.0.0 software interface. The main window shows a grayscale image of a textured surface with a red dashed line indicating a linescan path. A 'Window' menu is open, listing various analysis tools. The 'Linescan' option is highlighted, and a mouse cursor is pointing at it. Below the menu, a list of open windows is shown, including '1 jilly-20170517_150615.dcs' and '2 Histogram'. In the bottom right corner, a 'Histogram' window is open, showing a bar chart of pixel intensity levels. The y-axis is labeled 'n' and ranges from 0 to 22000. The x-axis is labeled 'level' and ranges from 0 to 300. A vertical dashed line is positioned at approximately level 250. A 'Status' window in the top right corner displays image parameters: pos=199.7, 0.9; pixels=188; line=175.2; image# 192/510; field# 4270; mag=0.920, 0.920; zoom=100%; 00:06:40. At the bottom left, a status bar reads 'Show/hide linescan window'.

Window

- Duplicate Window
- Cascade
- Tile
- Tile Vertically
- Live Video
- Video Recorder
- CAM1 Monitor
- Grey level
- Linescan
- Dimension list
- 2D profile
- Histogram
- Image Results
- Chart Results
- 1 jilly-20170517_150615.dcs
- 2 Histogram

Status

pos=199.7, 0.9

pixels=188

line=175.2

image# 192/510

field# 4270

mag=0.920, 0.920

zoom=100%

00:06:40

Histogram

n

level

22000

20000

18000

16000

14000

12000

10000

8000

6000

4000

2000

0

0 100 200 300

Show/hide linescan window

Interlace

The screenshot displays the CapiScope 4.37.0.0 software interface. The 'Settings' menu is open, with 'Use Interlace' selected. A histogram window shows a distribution of 'level' values. The 'Linescan' window contains the following text:

If your video recording was recorded from a camera with interlaced video (RS170, CCIR, PAL, SECAM, etc), then set the *Use Interlace* option.

At the bottom left of the interface, there is a note: "use separate samples for each interlaced field".

Acquiring the linescan

The screenshot displays the CapiScope 4.37.0.0 software interface. The main window shows a video feed of a textured surface with a red dashed line indicating a scan path. A text overlay reads: "Click on the title bar of the video window to make it the activate window". To the right, a "Histogram" window shows a distribution of pixel levels, with the x-axis labeled "level" and the y-axis labeled "n". Below the histogram is a "Status" panel with the following data: pos=168.4, 0.9; pixels=175; line=175.2; image# 000/510; Field# 3886; mag=0.920, 0.920; zoom=100%; 00:00.00. At the bottom, a "Linescan" window shows a plot of intensity in $\mu\text{m/s}$ versus time in seconds, with a vertical dashed line at approximately 2.5 seconds.

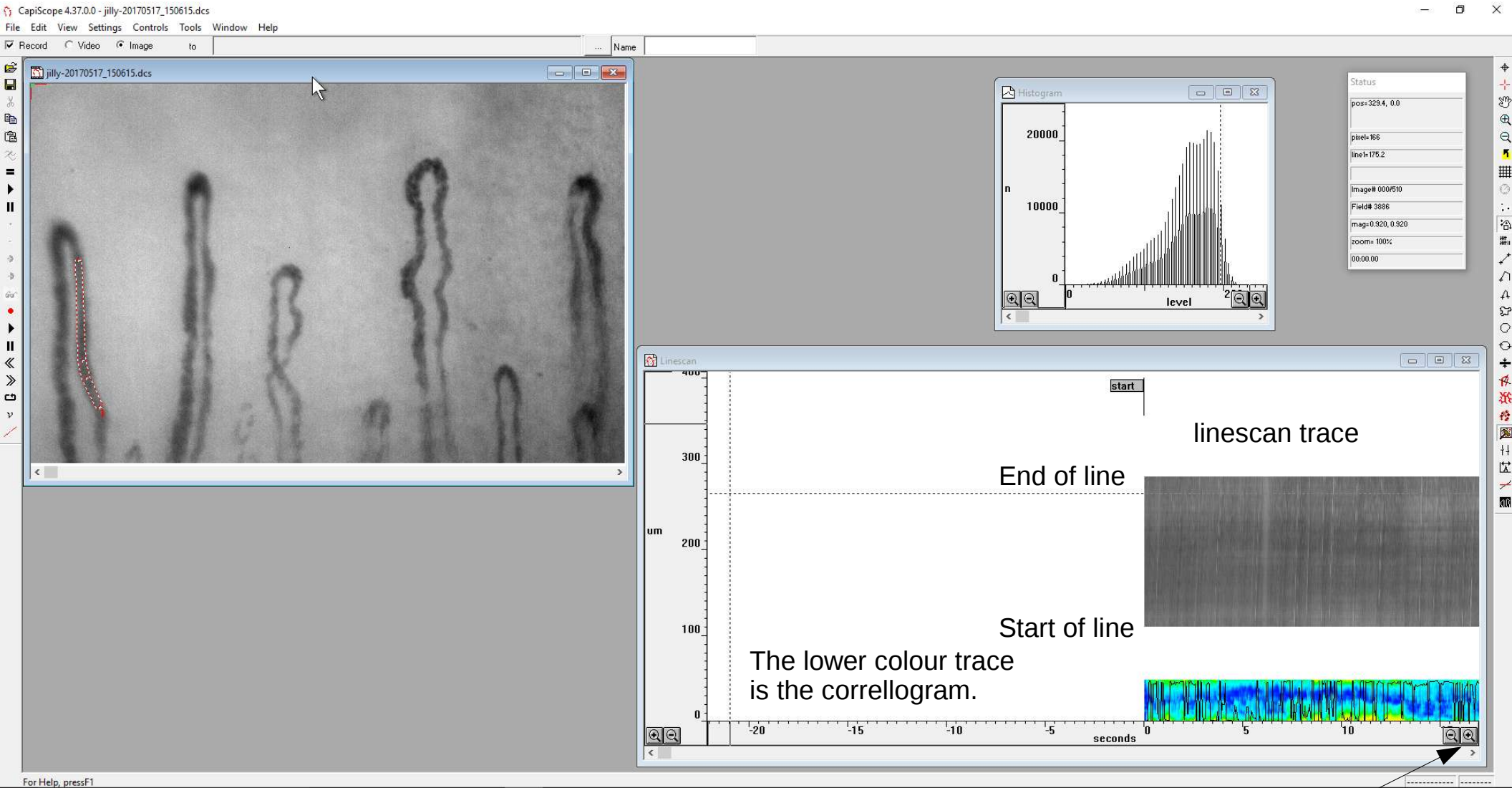
For Help, pressF1

Acquiring the linescan

The screenshot displays the CapiScope 4.37.0.0 software interface. The main window shows a video playback area with a red dashed line indicating the current video position. A 'play sequence' button is visible in the bottom-left corner of the video area. To the right, a 'Histogram' window shows a graph of pixel intensity (level) versus frequency (n), with a peak around level 2. A 'Status' window on the far right displays various parameters: pos= 0.0244.8, pixels=179, line=175.2, image# 000/510, Field# 3886, mag=0.920, 0.920, zoom= 100%, and 00:00.00. Below the video area, a 'Linescan' window is open, showing a graph of velocity (um/s) versus time (seconds). The y-axis ranges from 0 to 10000 um/s, and the x-axis ranges from 0 to 35 seconds. A vertical dashed line is positioned at approximately 2.5 seconds, and a horizontal dashed line is at approximately 9500 um/s.

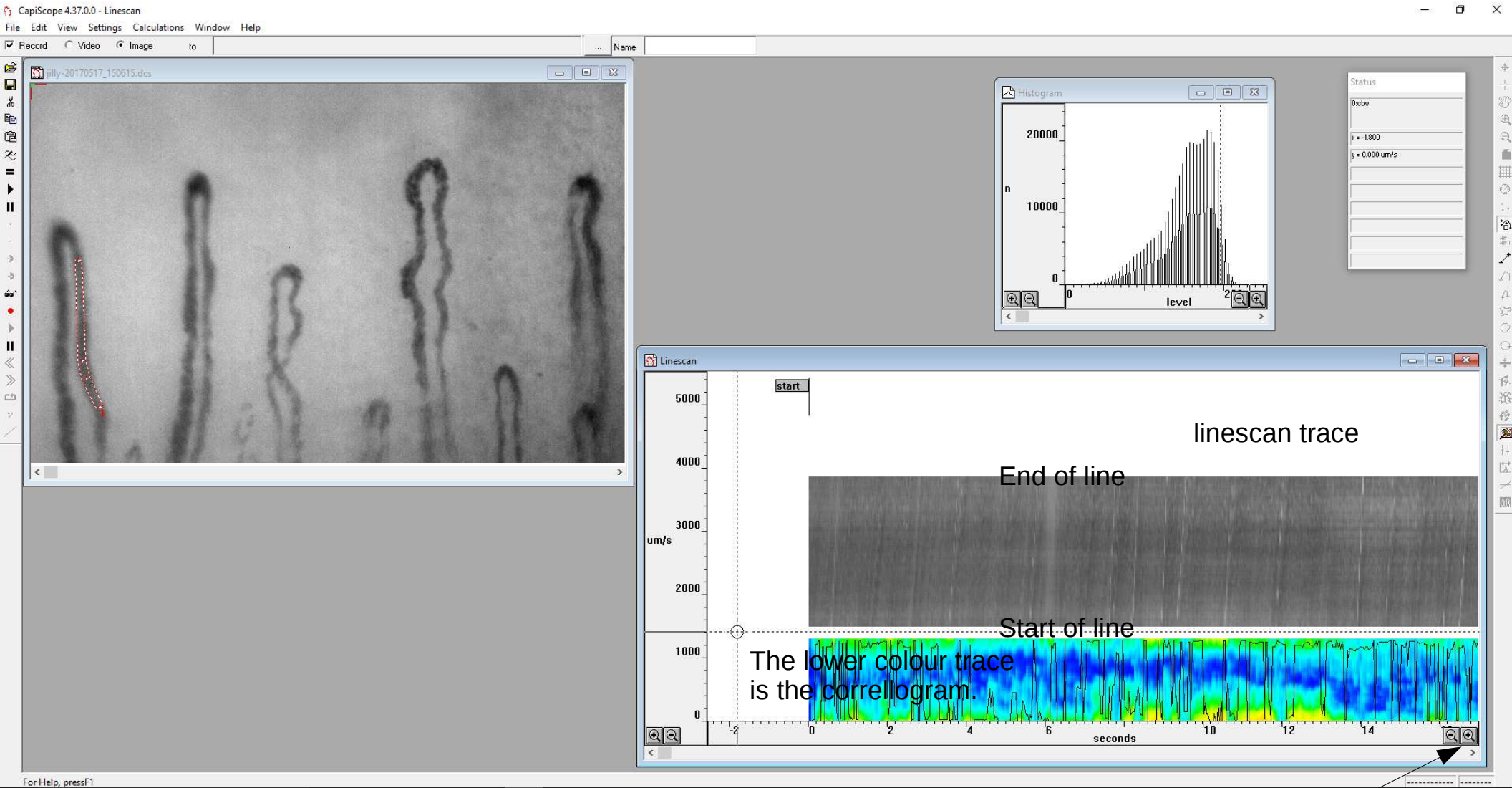
Click on the Play toolbar button to play the video and record the linescan. The linescan will start from the current video position. Any previous linescan will be overwritten.

Analysing the linescan



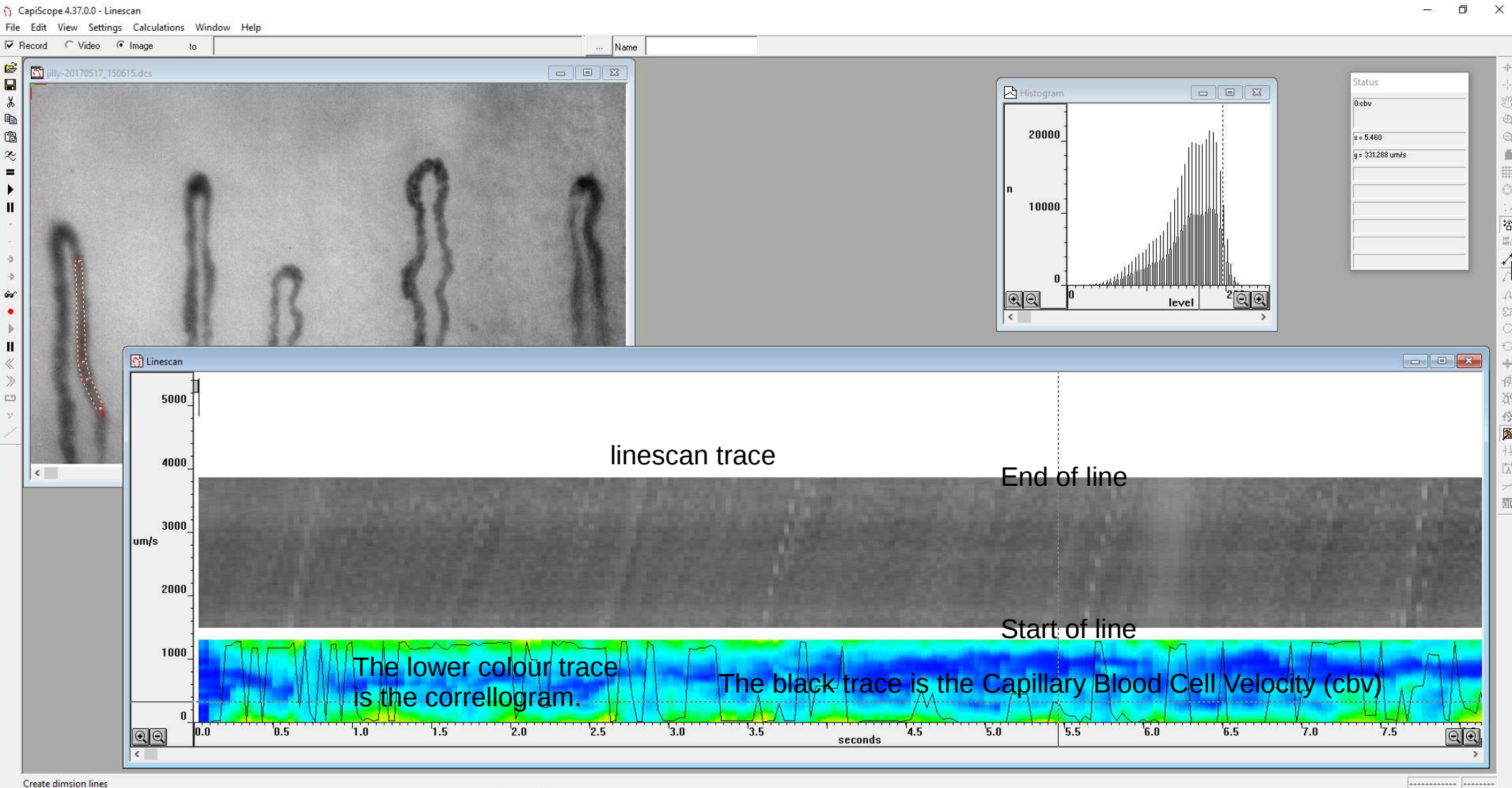
Expand the linescan traces

Linescan chart

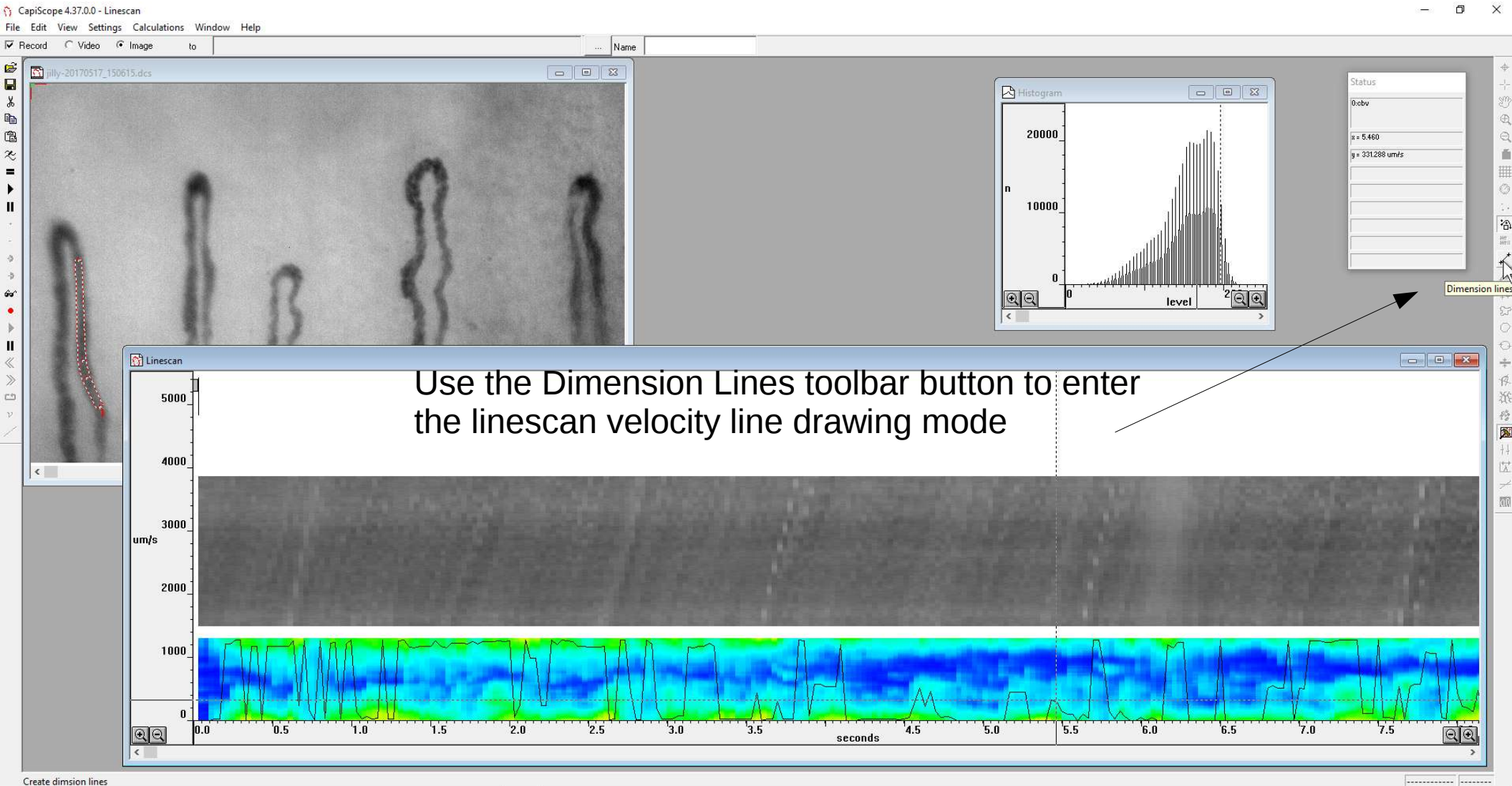


Expand the linescan traces

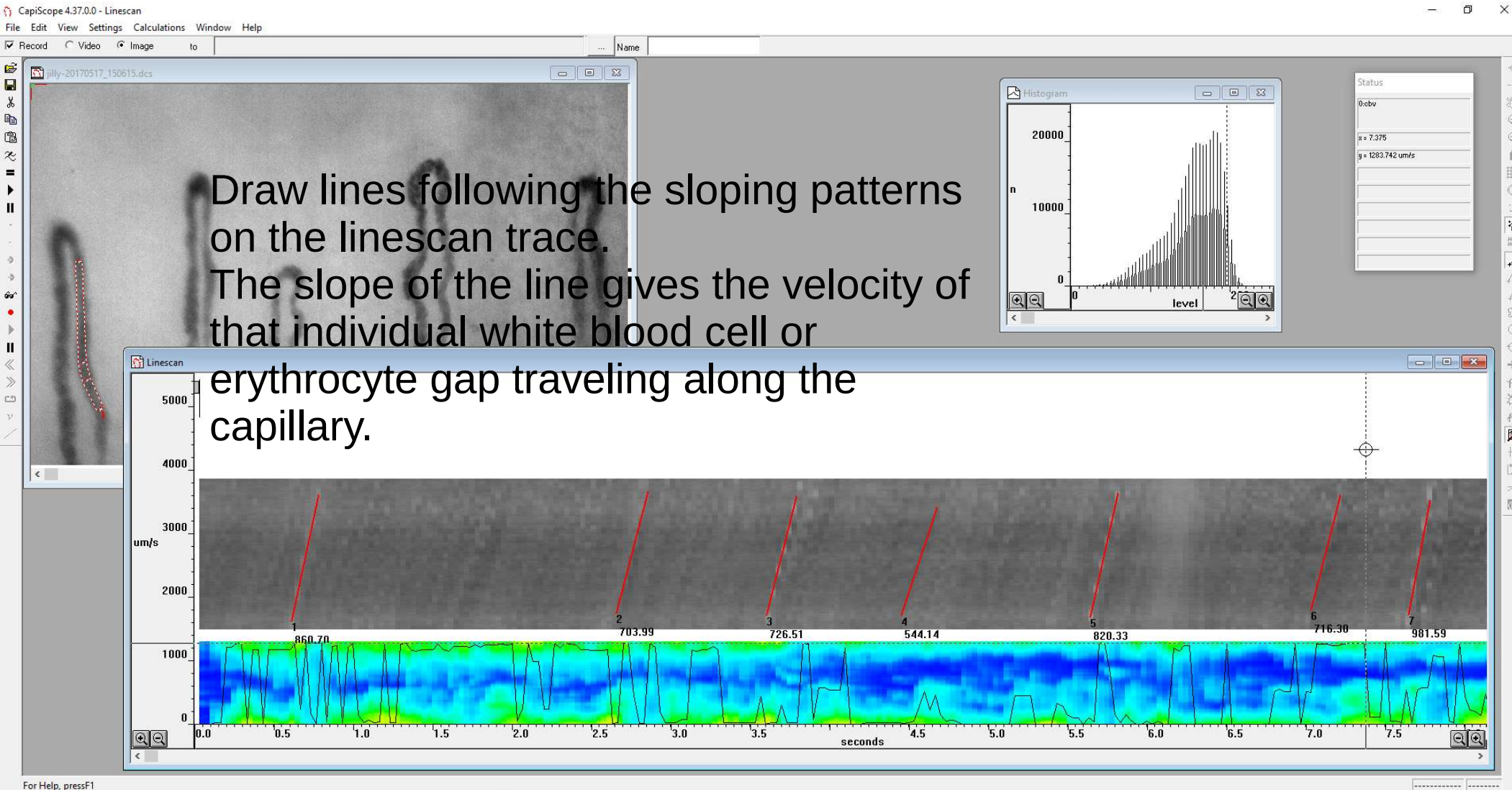
Linescan traces



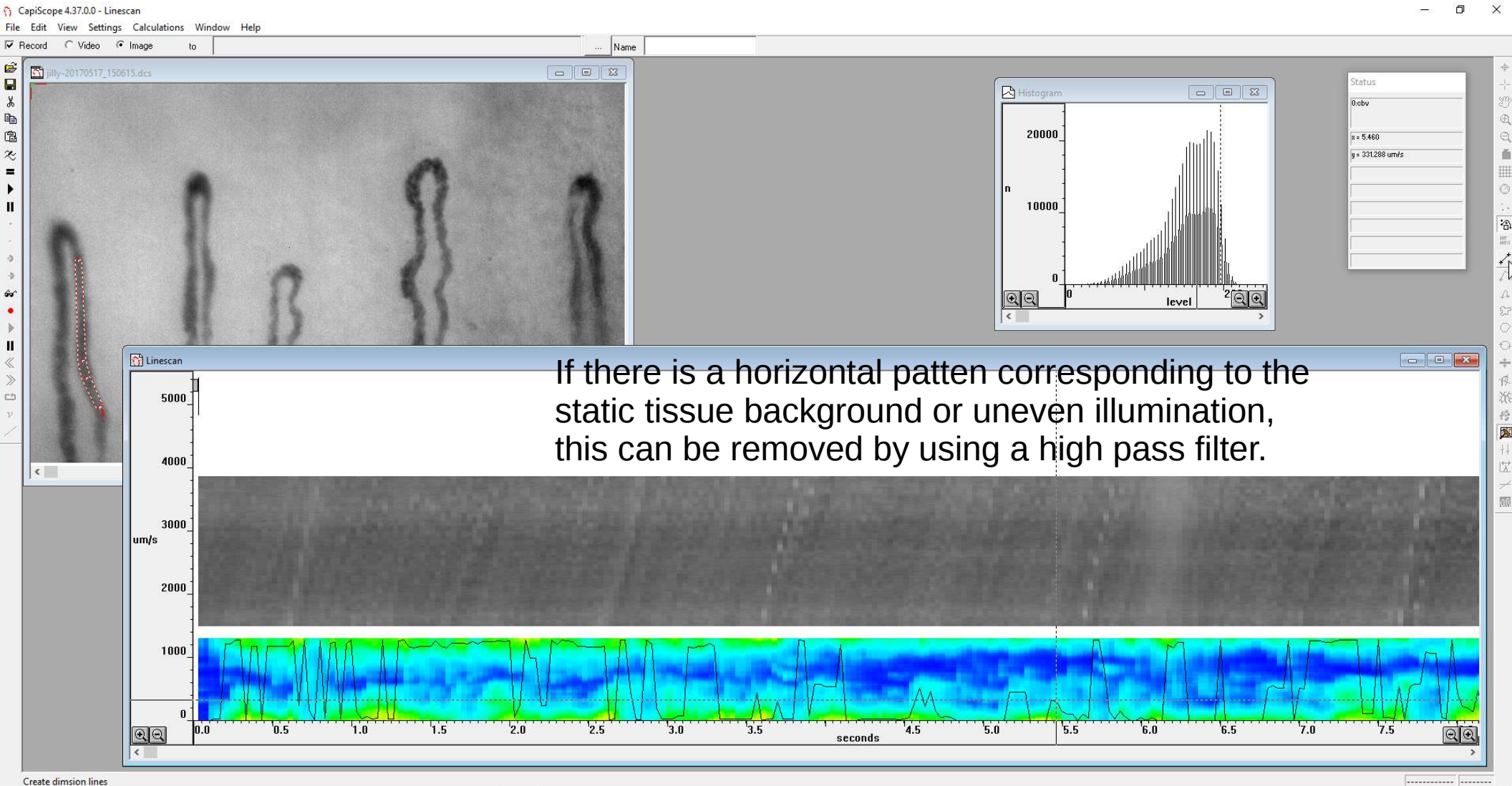
Estimating cbv



Estimating cbv



Analysing the linescan



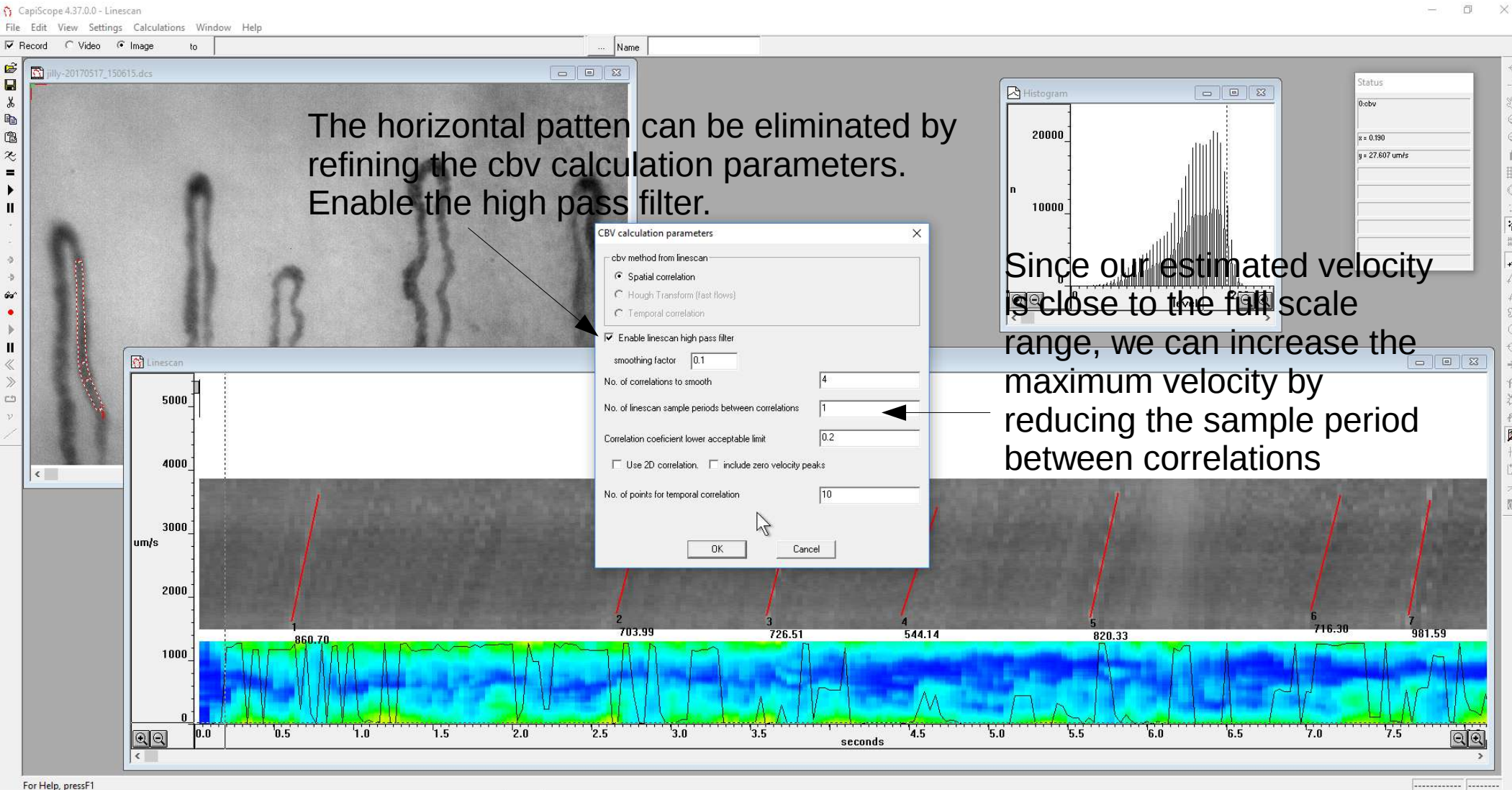
Refining cbv parameters

The screenshot displays the CapiScope 4.37.0.0 software interface. The main window shows a video frame with a red dashed line indicating a path. A menu is open over the video frame, listing options: "CBV calculation parameters...", "Edit new marks", "Set sample rate", "Subtract scans", "Use Interlace", and "Calculate cbv". A text overlay on the video frame reads: "The horizontal pattern can be eliminated by refining the cbv calculation parameters".

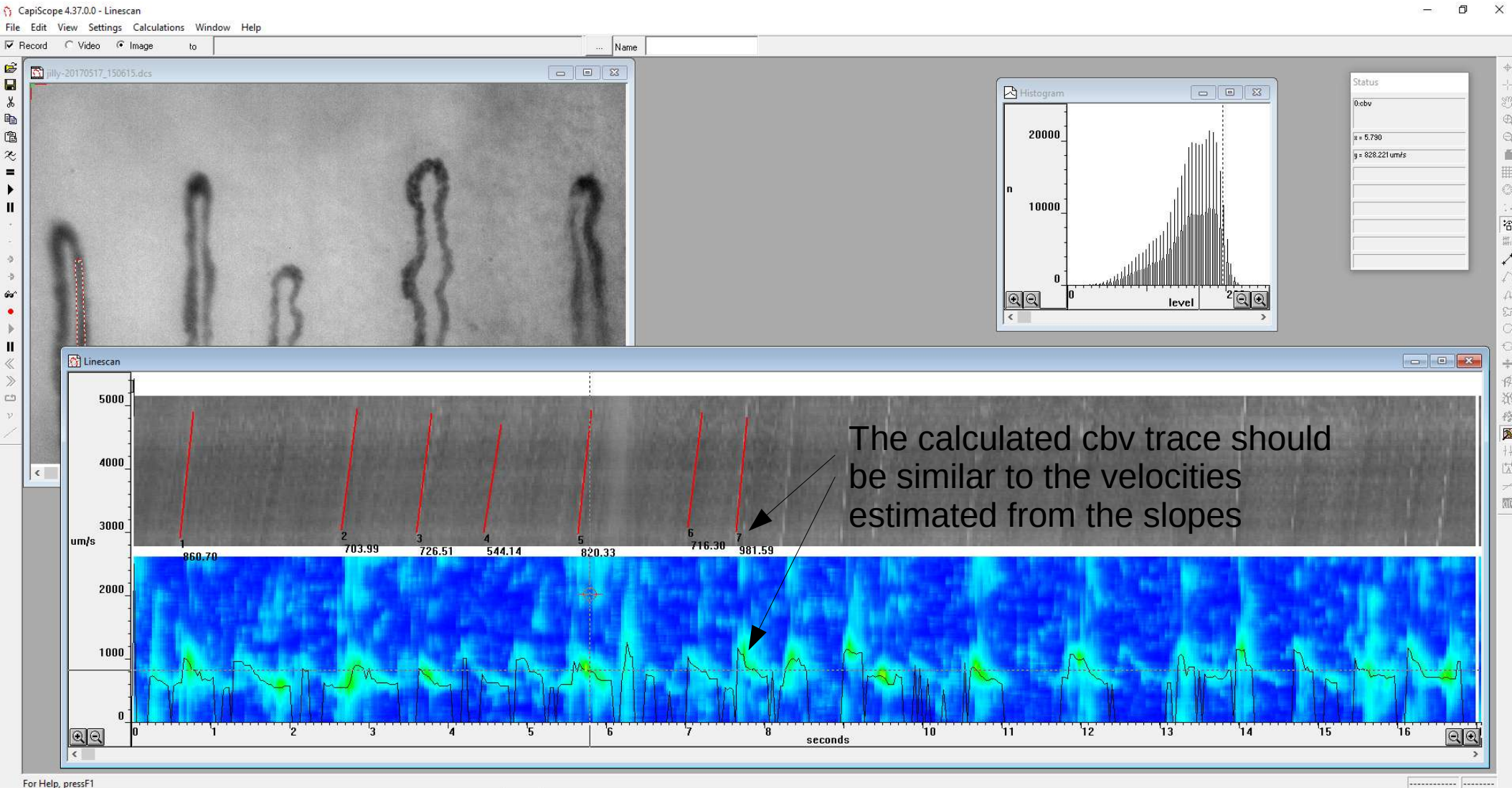
In the top right, a "Histogram" window shows a distribution of values with a peak around 20000. The x-axis is labeled "level" and the y-axis is labeled "n".

In the bottom right, a "Linescan" window shows a plot of velocity in $\mu\text{m/s}$ versus time in seconds. The y-axis ranges from 0 to 5000, and the x-axis ranges from -2 to 14. A "start" marker is visible at approximately 0.5 seconds. The plot shows a horizontal band of data between approximately 1000 and 3500 $\mu\text{m/s}$ from 0 to 14 seconds, with a color-coded intensity scale from blue to red.

Refining cbv parameters



Recalculated cbv



average cbv

The screenshot displays the CapiScope 4.37.0 interface. At the top, the menu bar includes File, Edit, View, Settings, Calculations, Window, and Help. Below the menu bar, there are buttons for Record, Video, Image, and a Name field. The main window shows a video frame of a biological specimen. A toolbar on the left contains various icons, including one labeled 'average'. A text box with an arrow points to this toolbar button, stating: "Use the keyboard = key or average toolbar button".

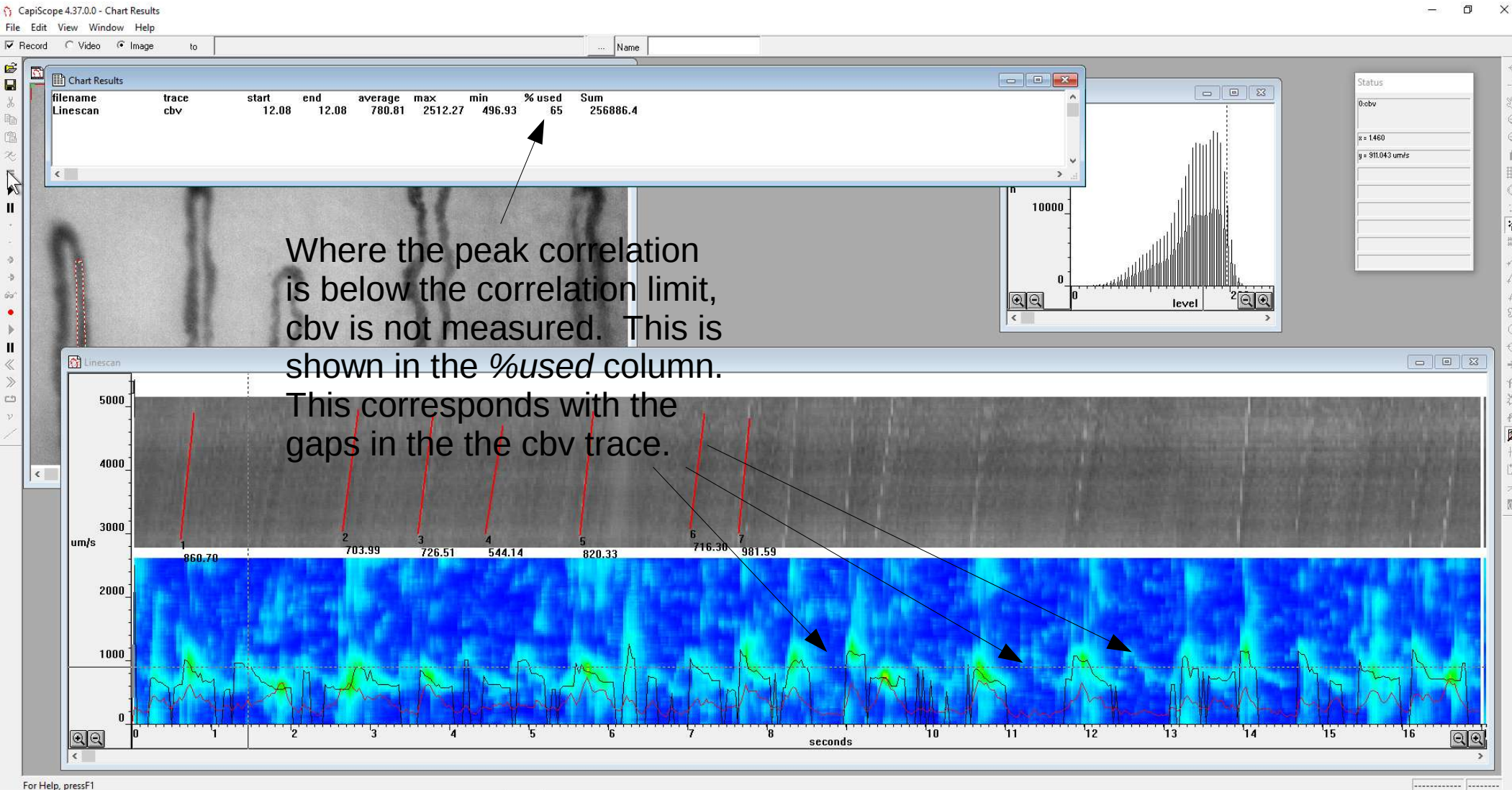
Overlaid on the video frame is a histogram window. The histogram shows a distribution of pixel values, with a vertical dashed line indicating the current selection level. A text box with an arrow points to the histogram, stating: "Use the keyboard TAB key to step through the linescan traces until the cbv trace is active".

At the bottom of the interface is the 'Linescan' window. It displays a plot of velocity (um/s) versus time (seconds). The plot shows a series of red vertical lines representing individual linescan traces. Below these lines, numerical values are listed: 960.70, 703.99, 726.51, 544.14, 820.33, 716.30, and 981.59. The plot also shows a heatmap of the data and a line graph overlaid on it. A status window on the right side of the interface displays the following information:

Status
0:cbv
x = 1460
y = 911.043 um/s

At the bottom left of the interface, there is a button labeled "Calculate average of selection".

average cbv



Correlation trace

Use the keyboard TAB key to step through the linescan traces until the *correlation* trace is active.

Use the *hide trace* toolbar button to show the correlation trace

Status

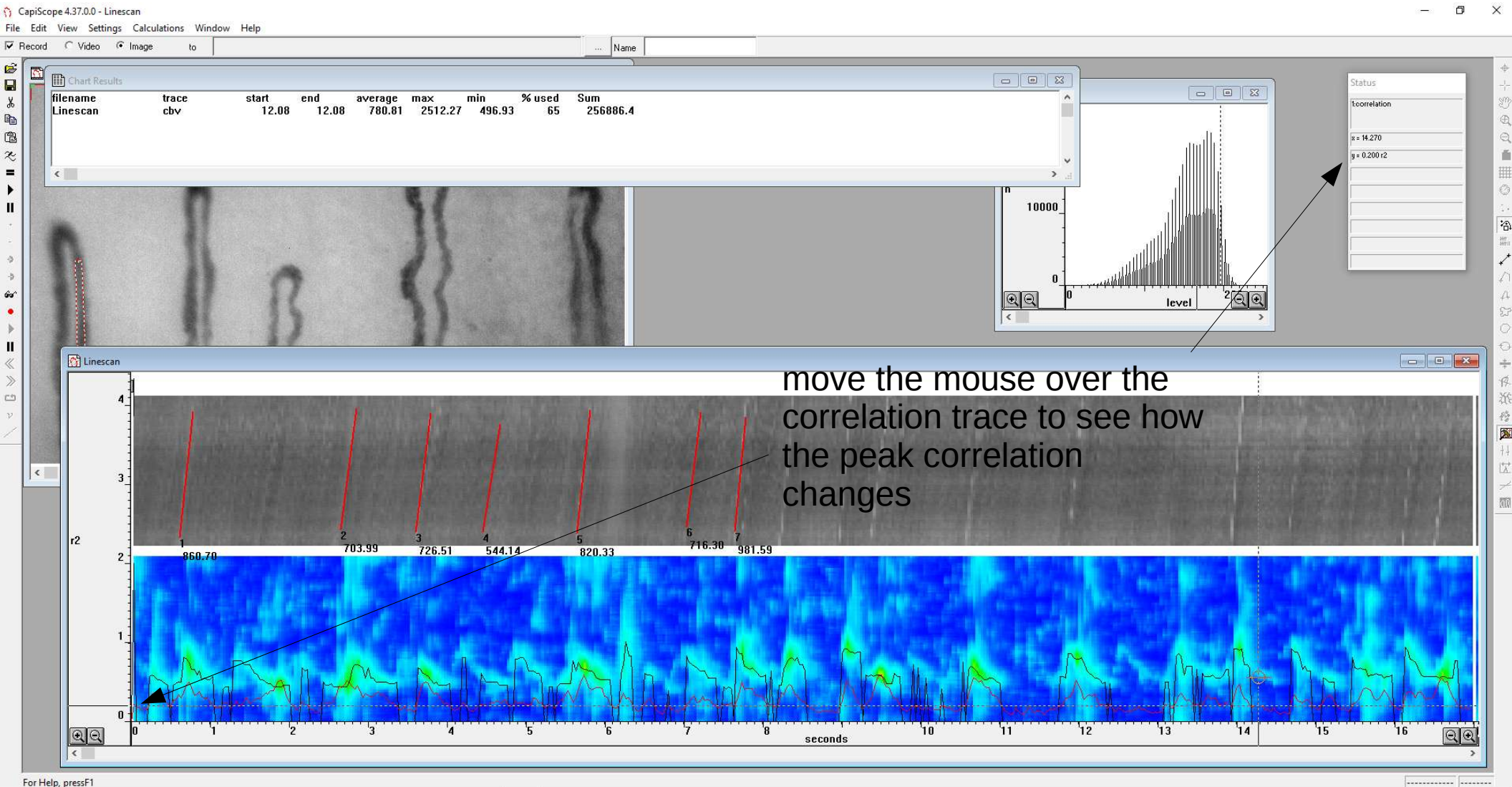
!correlation

$r = 0.350$

$g = 0.301r^2$

Hide/show Active Trace

Choosing a correlation limit



Open cbv vs peak correlation

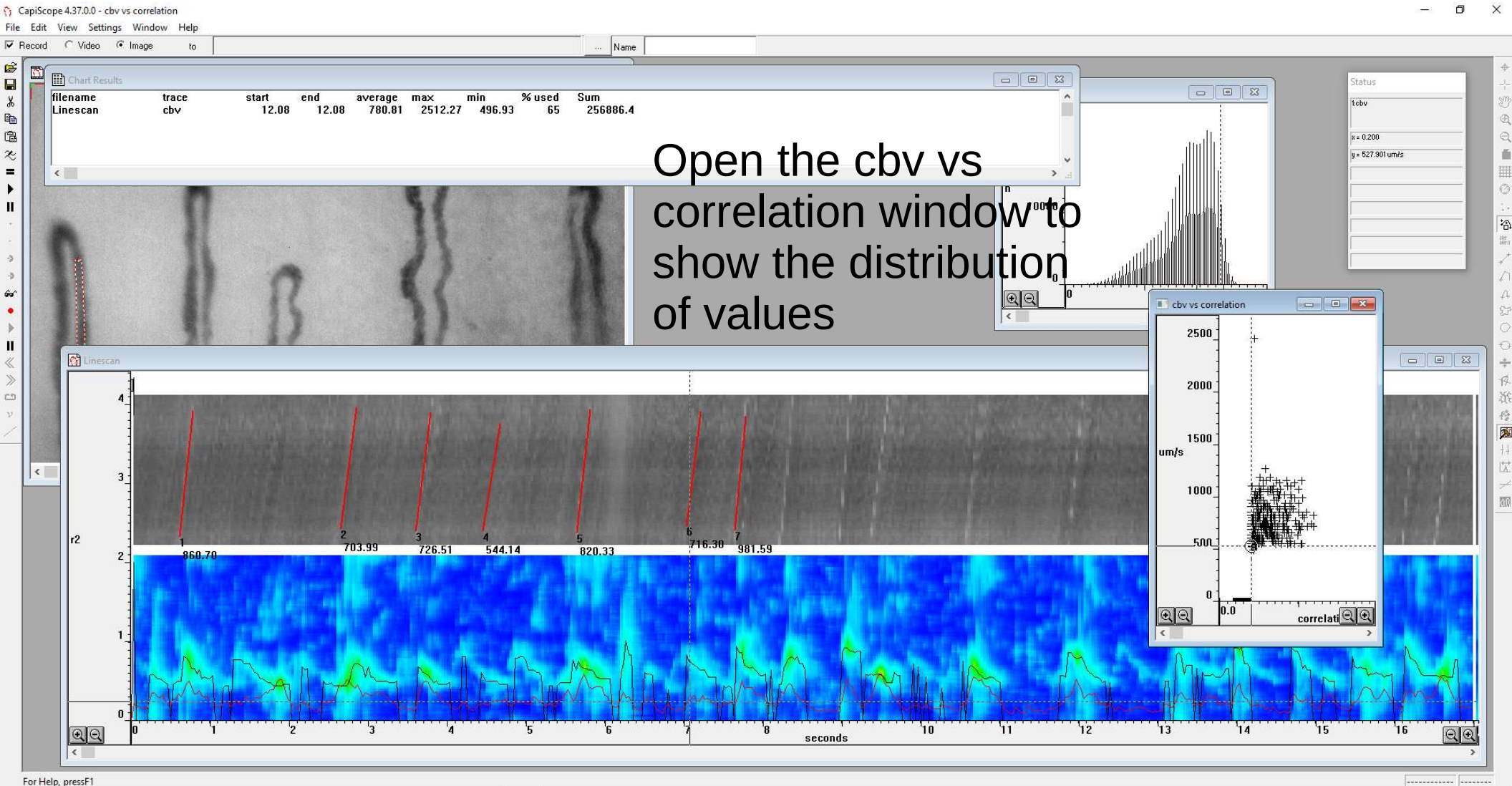
The screenshot displays the CapiScope 4.37.0.0 software interface. A 'Window' menu is open, highlighting the 'cbv vs correlation' option. A data table is visible in the background with the following values:

average	max	min	% used	Sum
80.81	2512.27	496.93	65	256886.4

Overlaid on the interface is the text: "Open the cbv vs correlation window to show the distribution of values".

The main window shows a heatmap chart titled "show cbv vs correlation chart". The x-axis is labeled "seconds" and ranges from 0 to 16. The y-axis is labeled "r2" and ranges from 0 to 4. The chart displays a series of peaks, with the following time values marked below the x-axis: 960.70, 703.99, 726.51, 544.14, 820.33, 716.30, and 981.59. A status panel on the right shows correlation statistics: $\mu = 7.070$ and $\sigma = 0.24412$.

cbv vs peak correlation



Adjusting the correlation limit

Chart Results

filename	trace	start	end	average	max	min	% used	Sum
Linescan	cbv	12.08	12.08	780.81	2512.27	496.93	65	256886.4

CBV calculation parameters

cbv method from linescan

- Spatial correlation
- Hough Transform (fast flows)
- Temporal correlation

Enable linescan high pass filter

smoothing factor

No. of correlations to smooth

No. of linescan sample periods between correlations

Correlation coefficient lower acceptable limit

Use 2D correlation. include zero velocity peaks

No. of points for temporal correlation

OK Cancel

Reduce the correlation limit to increase the number of cbv points.

Linescan

r2

seconds

For Help, press F1

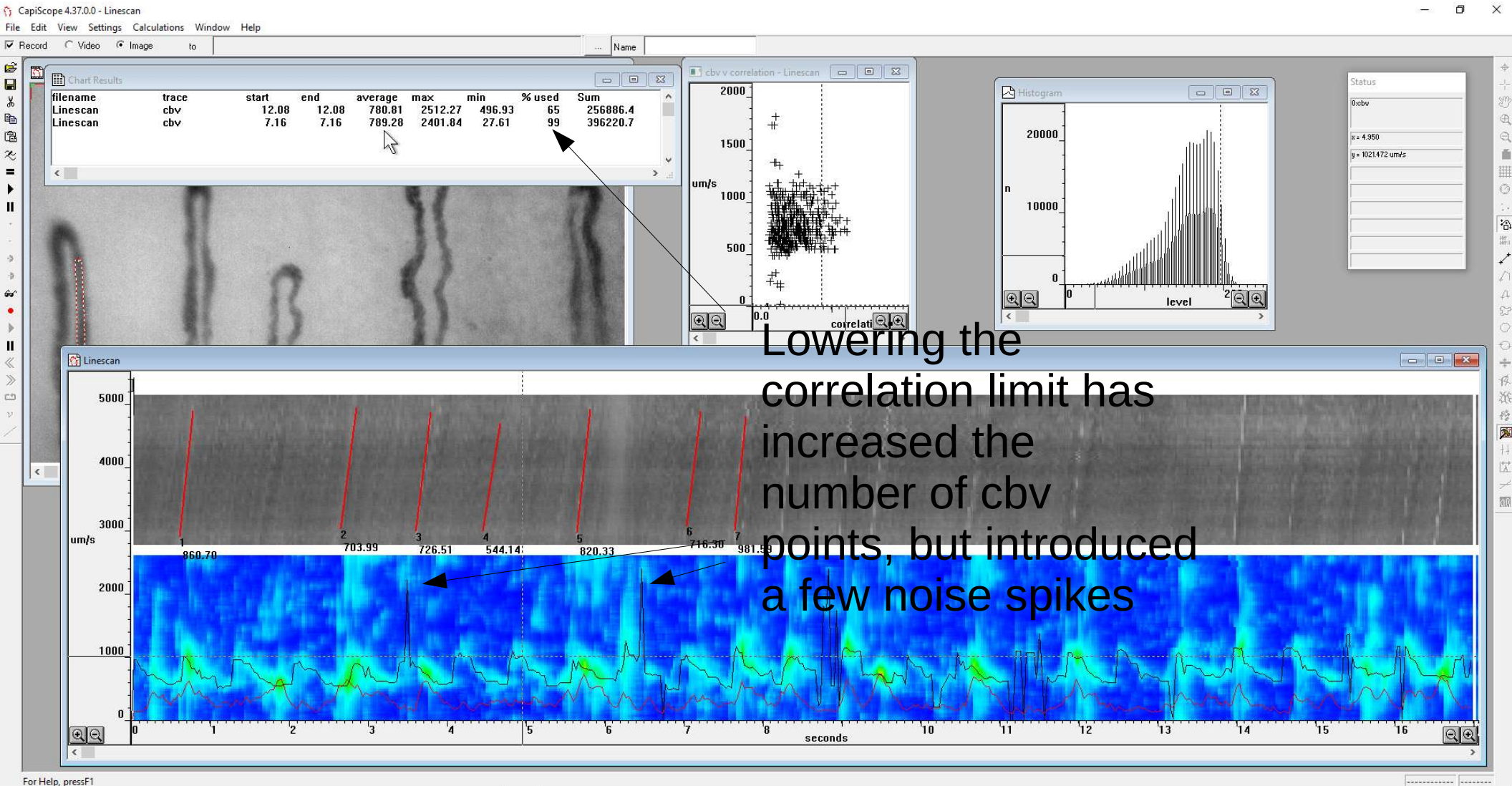
Status

r correlation

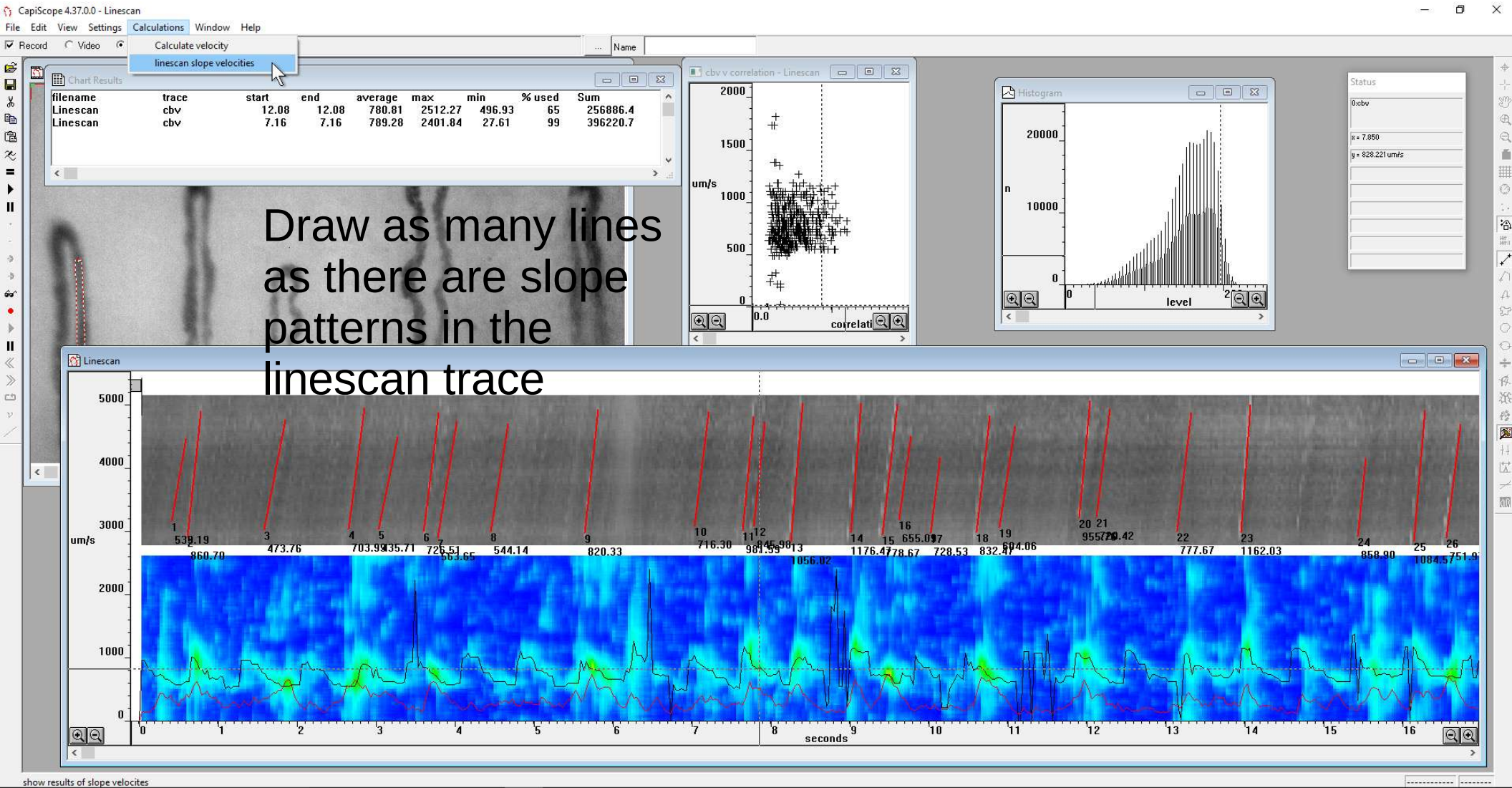
x = 7.070

y = 0.244 r2

Recalculated cbv



Cbv from velocity slopes



Cbv from velocity slopes

