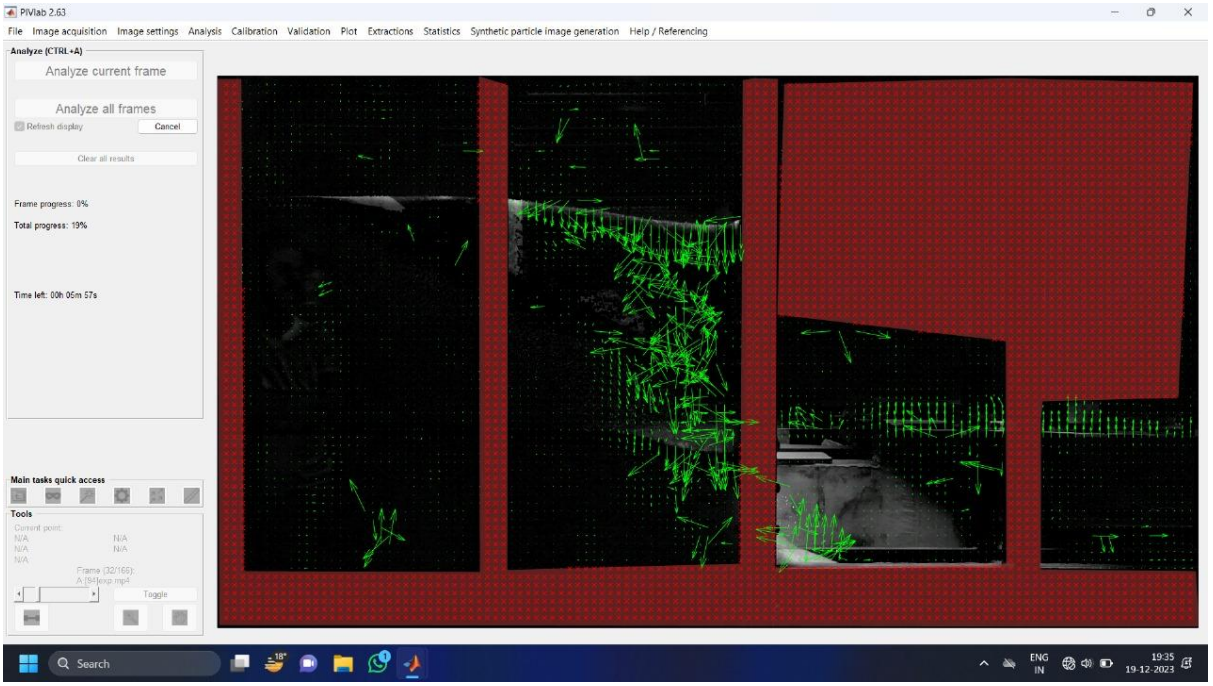
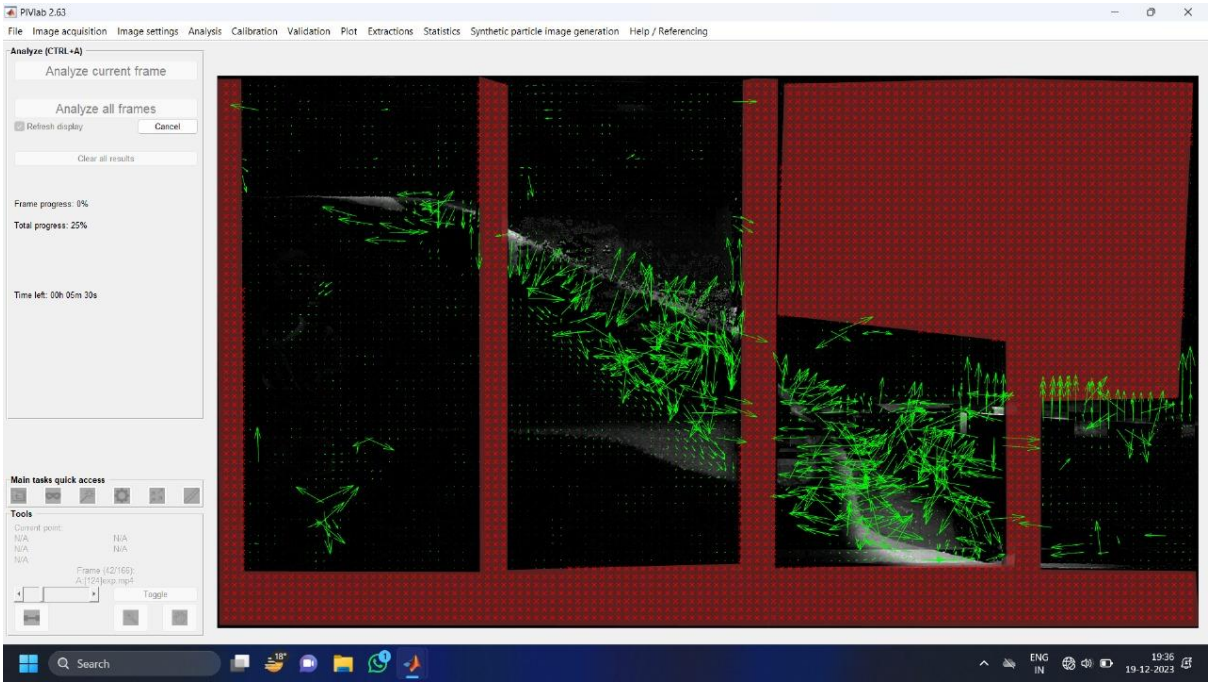
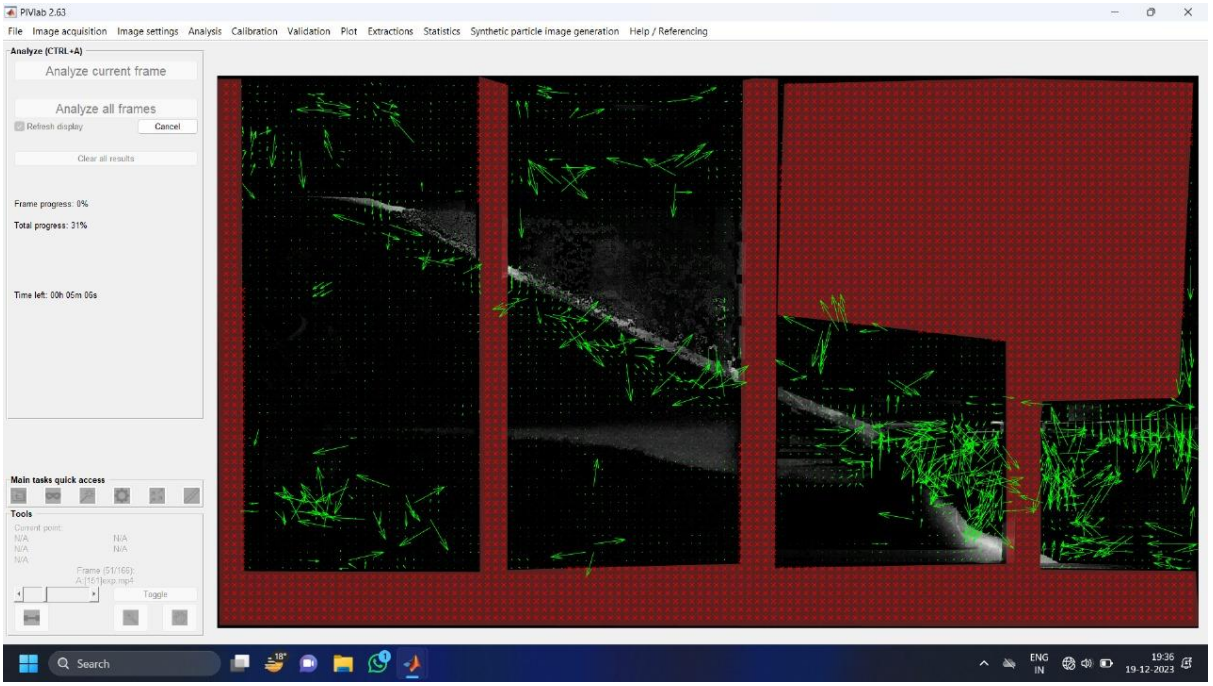
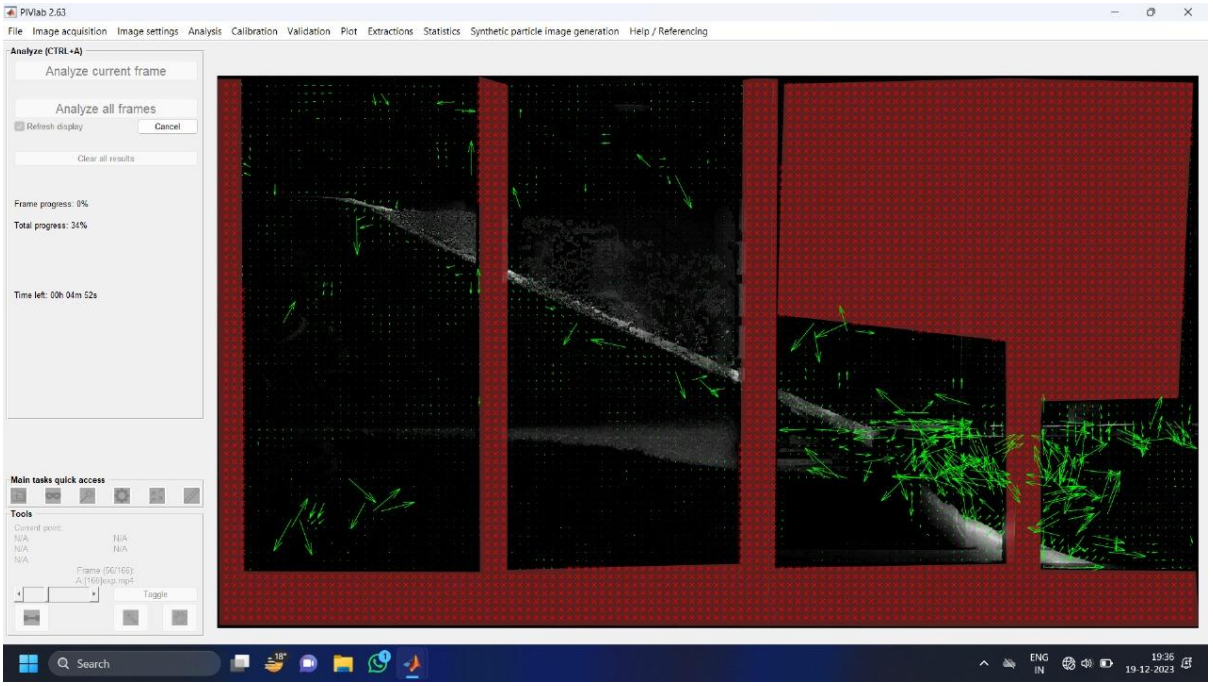
Analysis of granular media flow using PIV

For studying granular media flow, I employed PIV Lab's tools like the mask and image preprocessor to analyze video footage. The mask isolated the granular flow area, refining subsequent analysis. The image preprocessor enhanced clarity, crucial for accurate data extraction. Using PIV software within PIV Lab, I conducted detailed analysis. This software tracked particle movements via cross-correlation algorithms, extracting velocity fields and revealing flow patterns. The synergy of mask and preprocessor significantly enhanced the software's precision, offering insights into granular material behavior. This comprehensive approach facilitated a deeper understanding of flow dynamics and aided in drawing significant conclusions from the experimental data.


PIVlab 2.63
File Image acquisition Image settings Analysis Calibration Validation Plot Extractions Statistics Synthetic particle image generation Help / Referencing
Analyze (CTRL+A)
Analyze current frame
Analyze all frames
Refresh display
Cancel
Clear all results
Frame progress: 0%
Total progress: 19%
Time left: 00h 05m 57s
Main tasks quick access
Tools
Current point:
N/A
N/A
N/A
N/A
N/A
Frame (32/166):
A:[84]exp.mp4
Toggle
Search
ENG
IN
19:35
19-12-2023

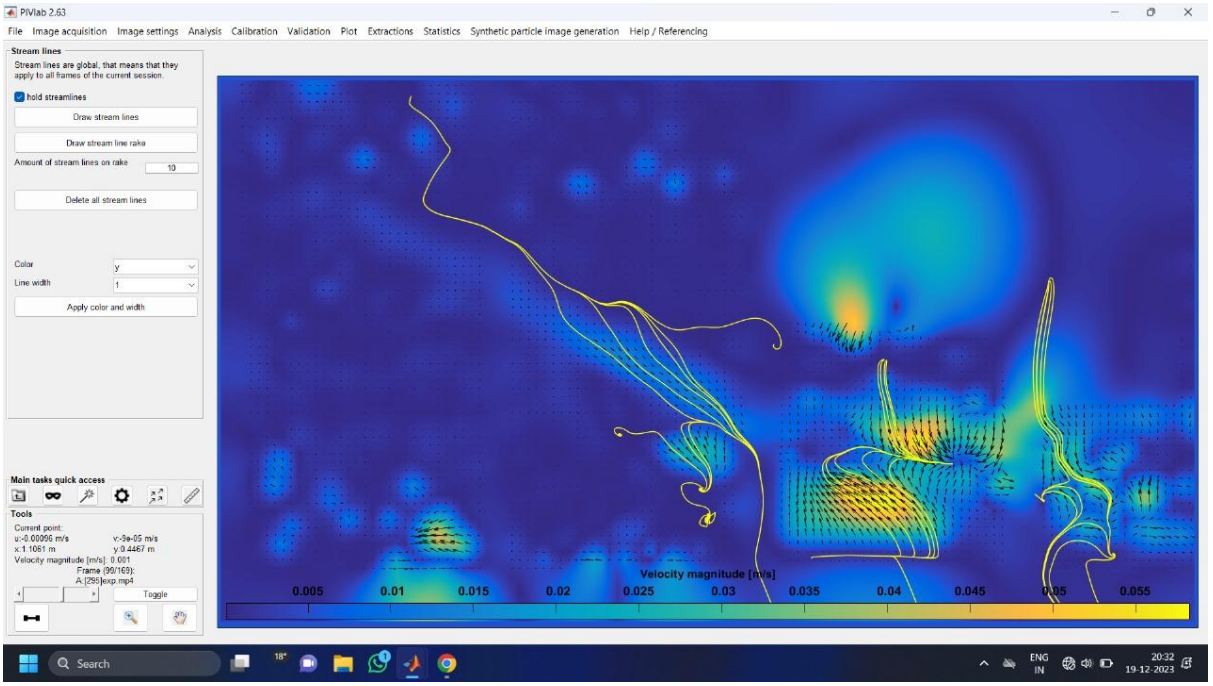

PIVlab 2.63
File Image acquisition Image settings Analysis Calibration Validation Plot Extractions Statistics Synthetic particle image generation Help / Referencing
Analyze (CTRL+A)
Analyze current frame
Analyze all frames
Refresh display
Cancel
Clear all results
Frame progress: 0%
Total progress: 25%
Time left: 00h 05m 30s
Main tasks quick access
Tools
Current point:
N/A
N/A
N/A
N/A
N/A
Frame (42/166):
A:[124]exp.mp4
Toggle
Search
ENG
IN
19:36
19-12-2023

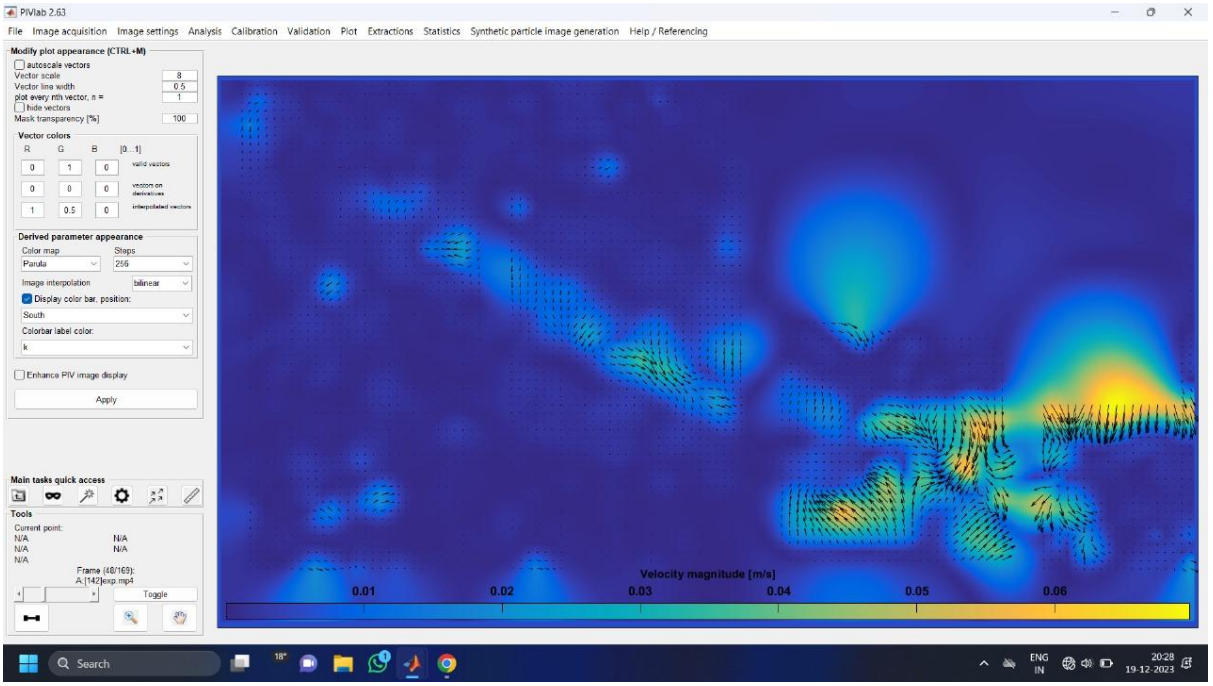


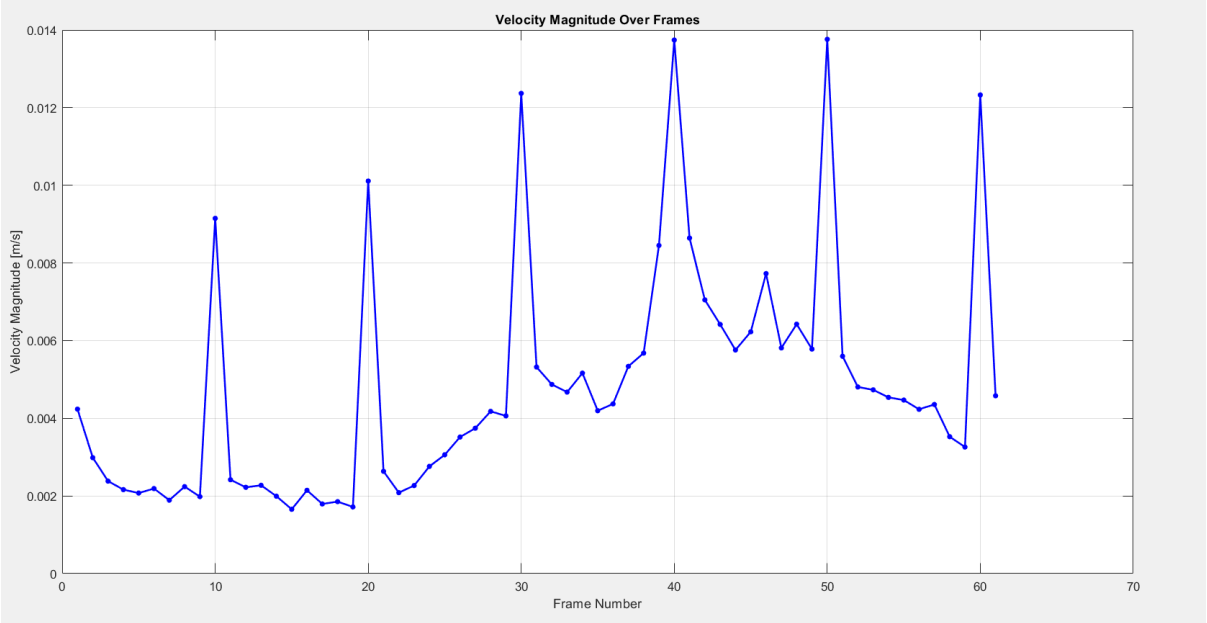


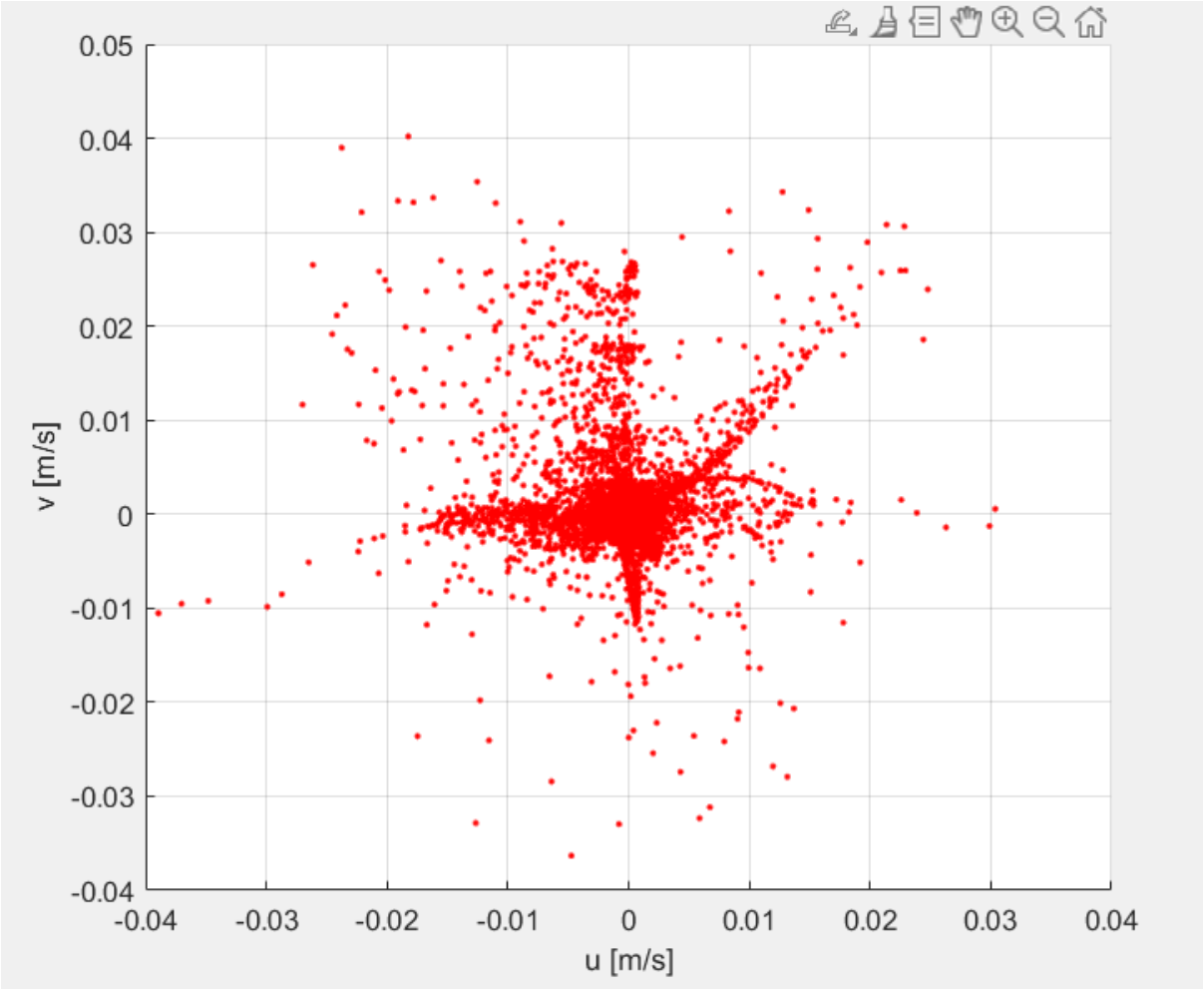
Post initial analysis, I crafted velocity plots via velocity-based and image-based validation in PIV Lab. These methods ensured data accuracy and image fidelity. Extracting vital statistics, including mean velocities and fluctuations, I generated graphs and histograms. These visual representations offered insights into granular flow dynamics, depicting velocity profiles and

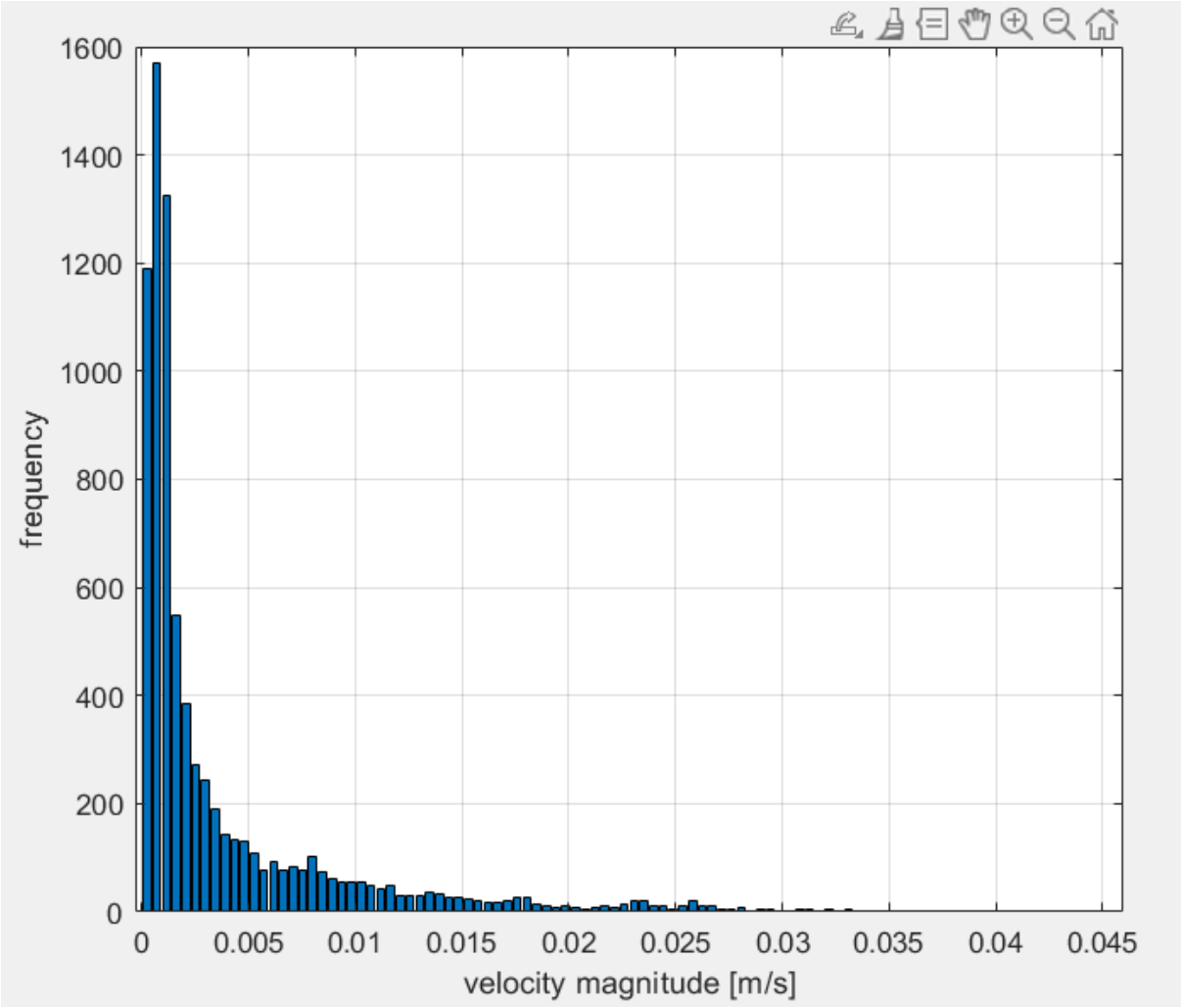
distributions. The meticulous data-driven approach facilitated clearer interpretations, enabling comparisons between flow conditions and aiding in comprehending the nuances of the experimental outcomes.


PIVlab 2.63
File Image acquisition Image settings Analysis Calibration Validation Plot Extractions Statistics Synthetic particle image generation Help / Referencing
Stream lines
Stream lines are global, that means that they apply to all frames of the current session.
hold streamlines
Draw stream lines
Draw stream line rake
Amount of stream lines on rake
10
Delete all stream lines
Color
y
Line width
1
Apply color and width
Main tasks quick access
Tools
Current point:
u:-0.00096 m/s
v:-9e-05 m/s
x:1.1061 m
y:0.4467 m
Velocity magnitude [m/s]: 0.001
Frame (99/169):
A:[256]exp.mp4
Toggle
Velocity magnitude [m/s]
0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04 0.045 0.05 0.055
Search
ENG
IN
20:32
19-12-2023


PIVlab 2.63
File Image acquisition Image settings Analysis Calibration Validation Plot Extractions Statistics Synthetic particle image generation Help / Referencing
Modify plot appearance (CTRL+M)
autoscale vectors
Vector scale
8
Vector line width
0.5
plot every nth vector, n =
1
hide vectors
Mask transparency [%]
100
Vector colors
R G B [0...1]
valid vectors
vectors on derivatives
interpolated vectors
Derived parameter appearance
Color map
Parula
Steps
256
Image interpolation
bilinear
Display color bar, position:
South
Colorbar label color:
k
Enhance PIV image display
Apply
Main tasks quick access
Tools
Current point:
N/A
N/A
N/A
N/A
N/A
Frame (48/169):
A:[142]exp.mp4
Toggle
Velocity magnitude [m/s]
0.01 0.02 0.03 0.04 0.05 0.06
Search
ENG
IN
20:28
19-12-2023


Velocity Magnitude Over Frames
Velocity Magnitude [m/s]
Frame Number
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0
10
20
30
40
50
60
70


v [m/s]
u [m/s]
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.04
-0.03
-0.02
-0.01
0
0.01
0.02
0.03
0.04


frequency
velocity magnitude [m/s]
0
200
400
600
800
1000
1200
1400
1600
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045