

OPENFOAM®'A GİRİŞ ÇALIŞTAYI

Open△FOAM®

 ParaView



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- Opening a case and General GUI
- Mesh visualization
- Fields visualization
- Filters
- Opening multiple cases
- Saving data and Screenshot
- Plotting residuals



Opening a Case and General GUI

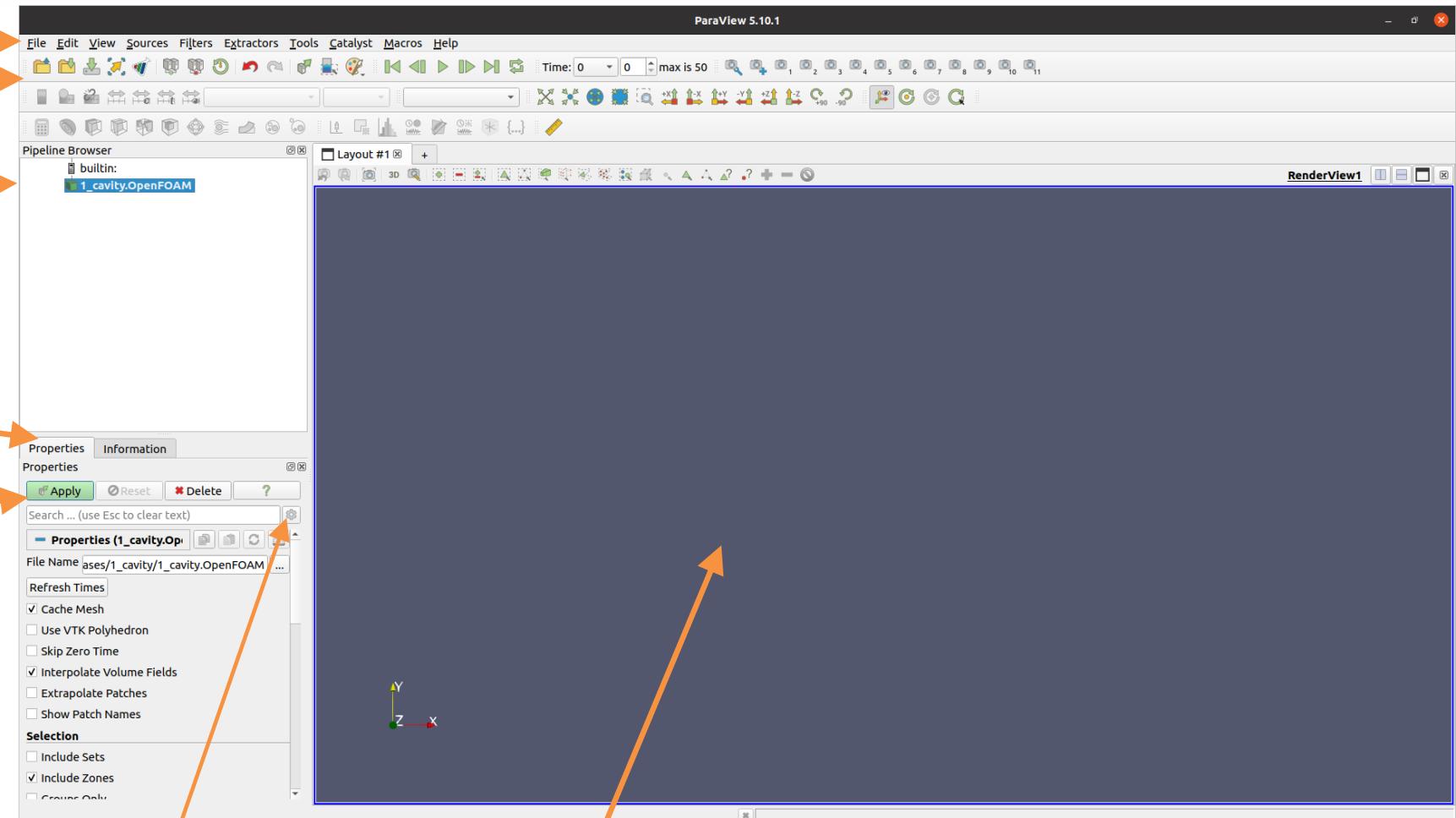
Menu Bar
Toolbars

Pipeline
Browser

Properties
panel

Apply button

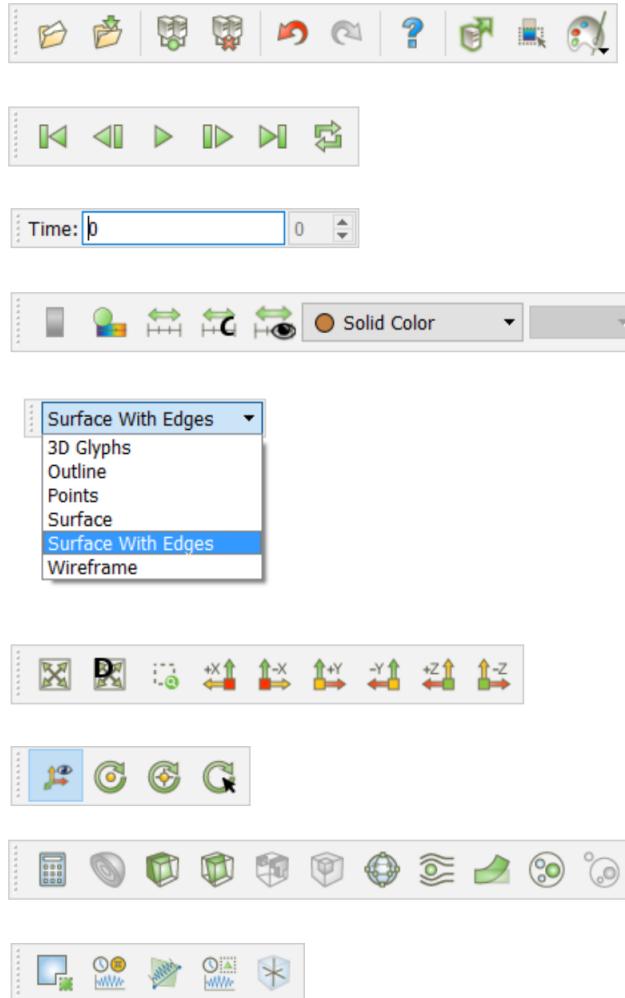
Press this button to
load the case or to
apply a filter



Advanced
Toggle

3D View/Canvas

Toolbars



- Main Controls
- VCR Controls (animation controls)
- Current Time Controls
- Active Variable Controls
- Representation Toolbar
- Camera Controls (view orientation)
- Center Axes Controls
- Common Filters
- Data Analysis Toolbar

Mesh Visualization

Select Solid Color in the Active Variable Controls

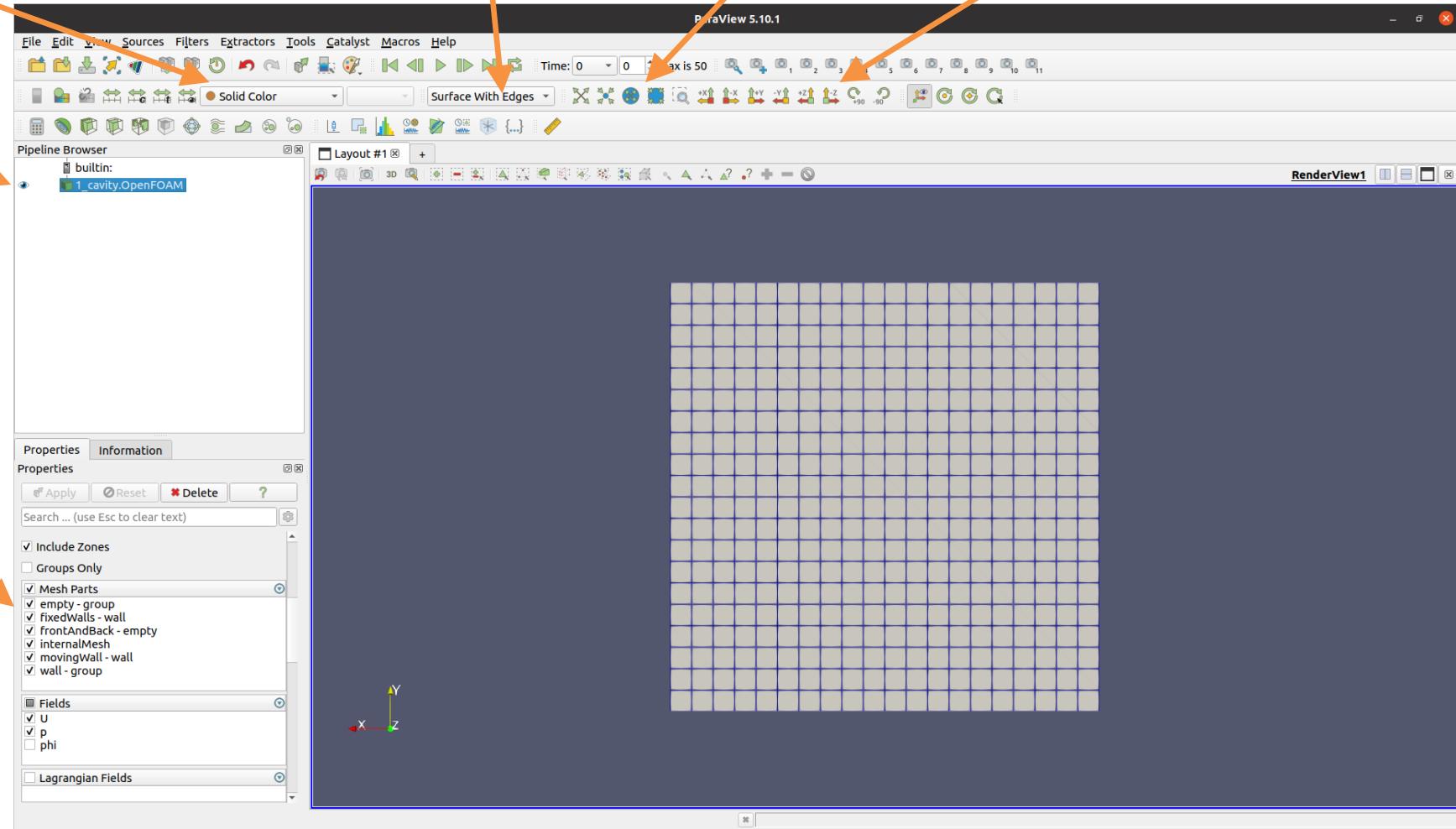
Click on the eyeball in the Pipeline Browser to hide/unhide the object

Select mesh parts to visualize. By default it will automatically select internalMesh

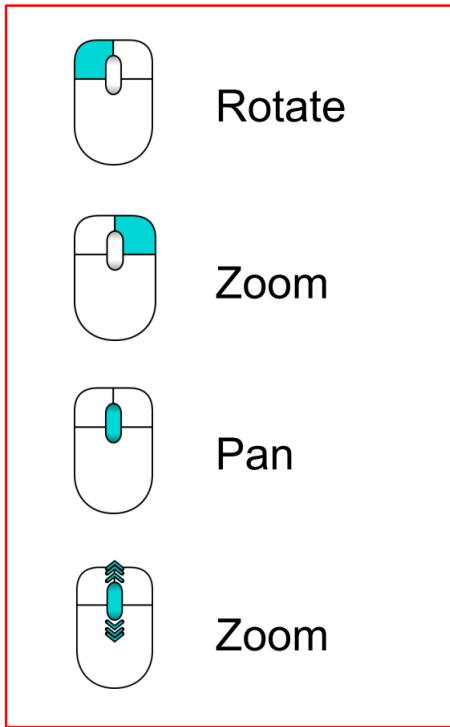
Select Surface With Edges in the Representation Toolbar

Fit to screen

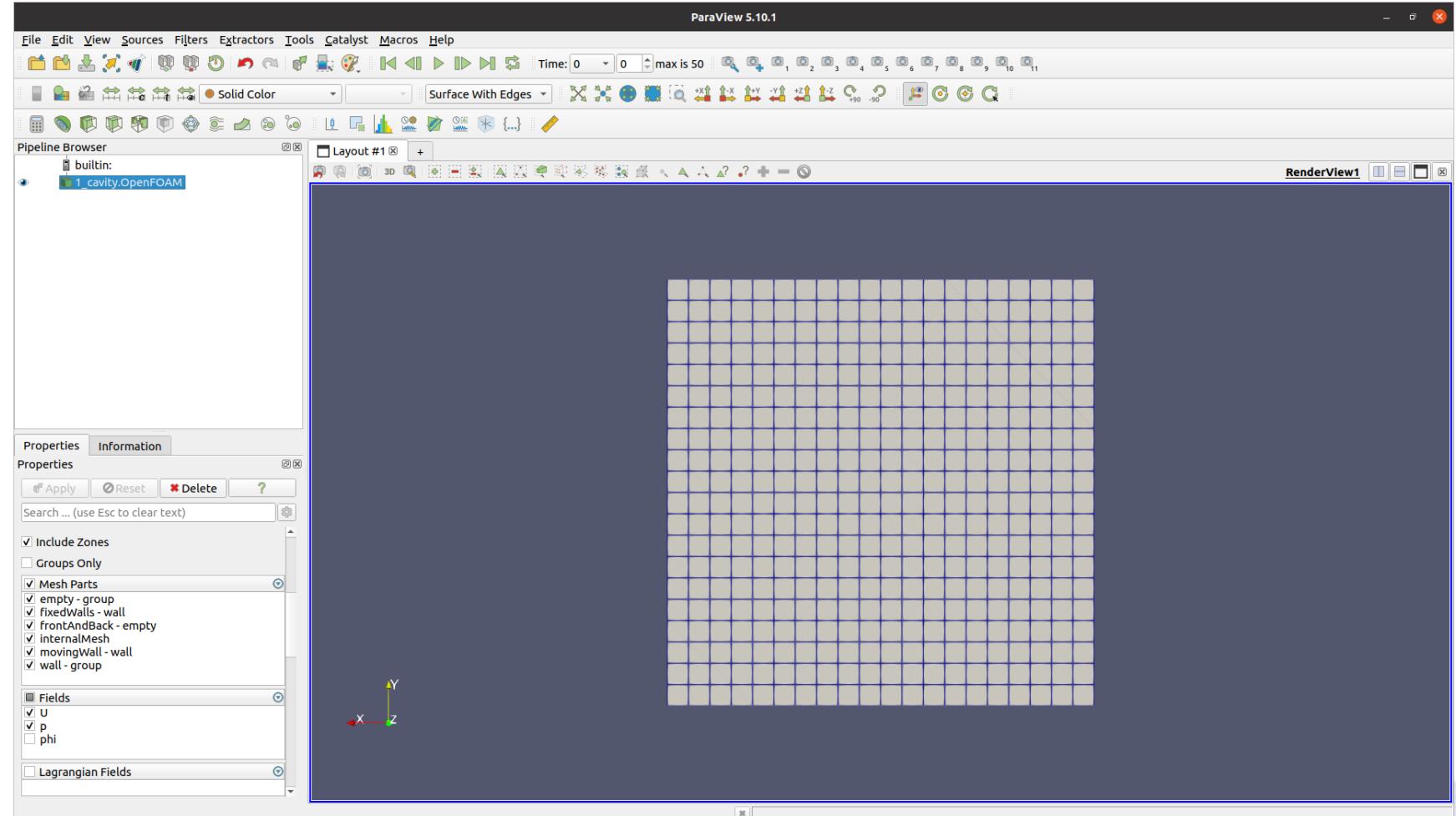
Select the -Z view



Mouse interaction
in the 3D view



Select view orientation in the Camera Controls



Select **U** in Active Variable Controls

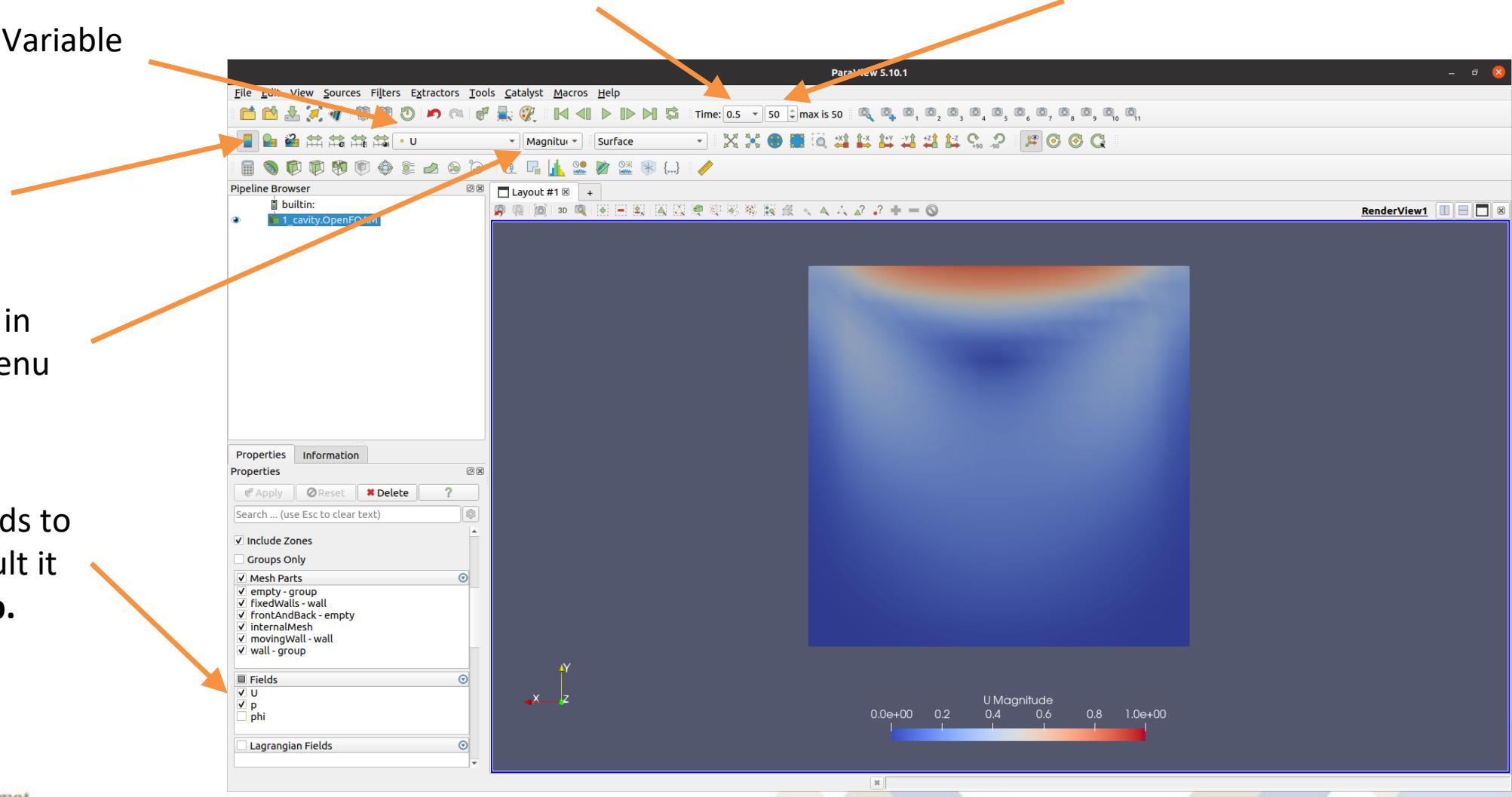
Turn on/off color bar

Select Magnitude in the drop down menu

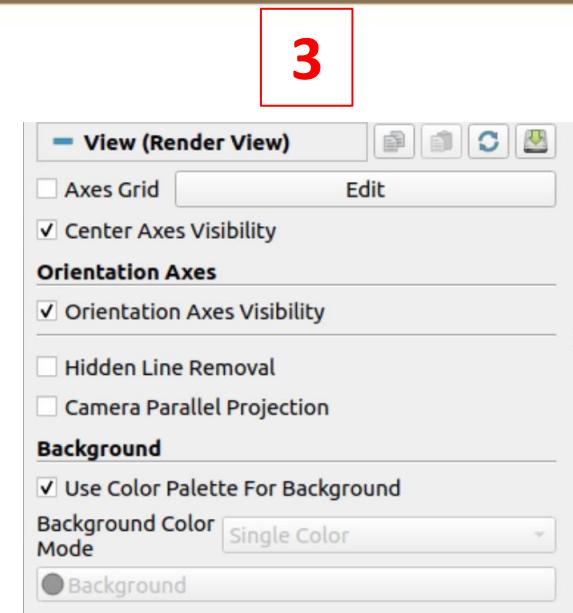
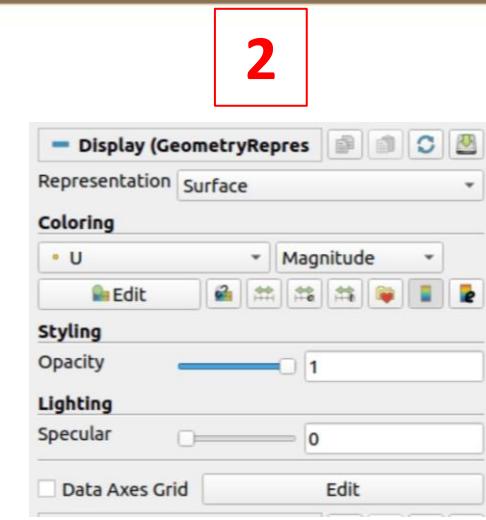
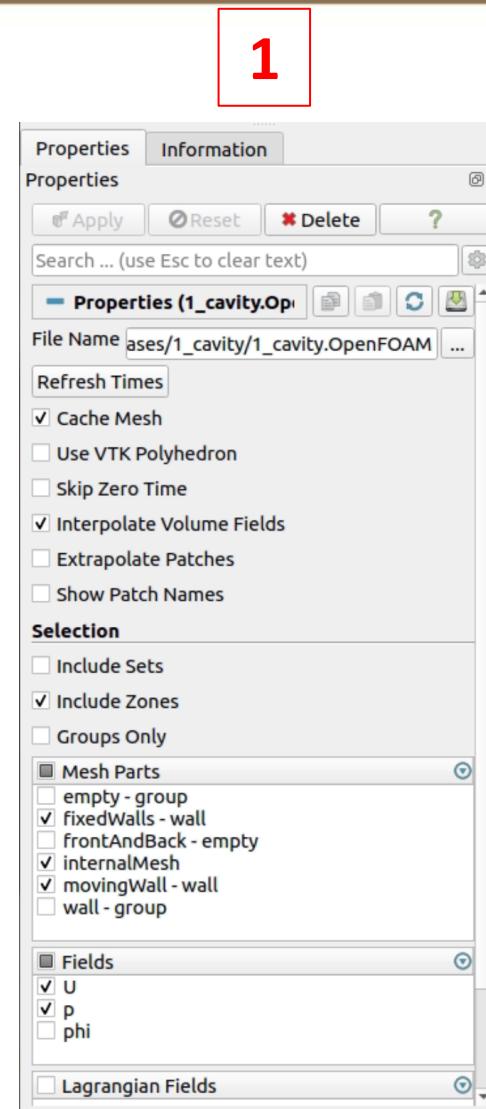
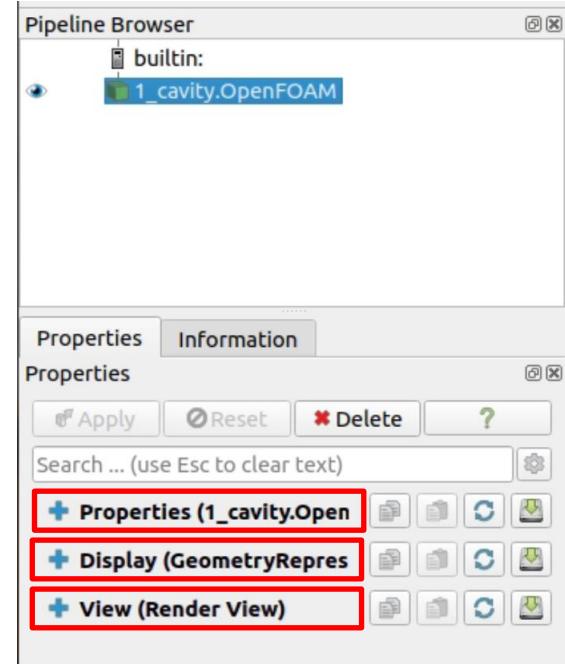
Select volume fields to visualize. By default it will select **U** and **p**.

Select Last Frame in the VCR Controls

Current Time Controls



Properties



Filters

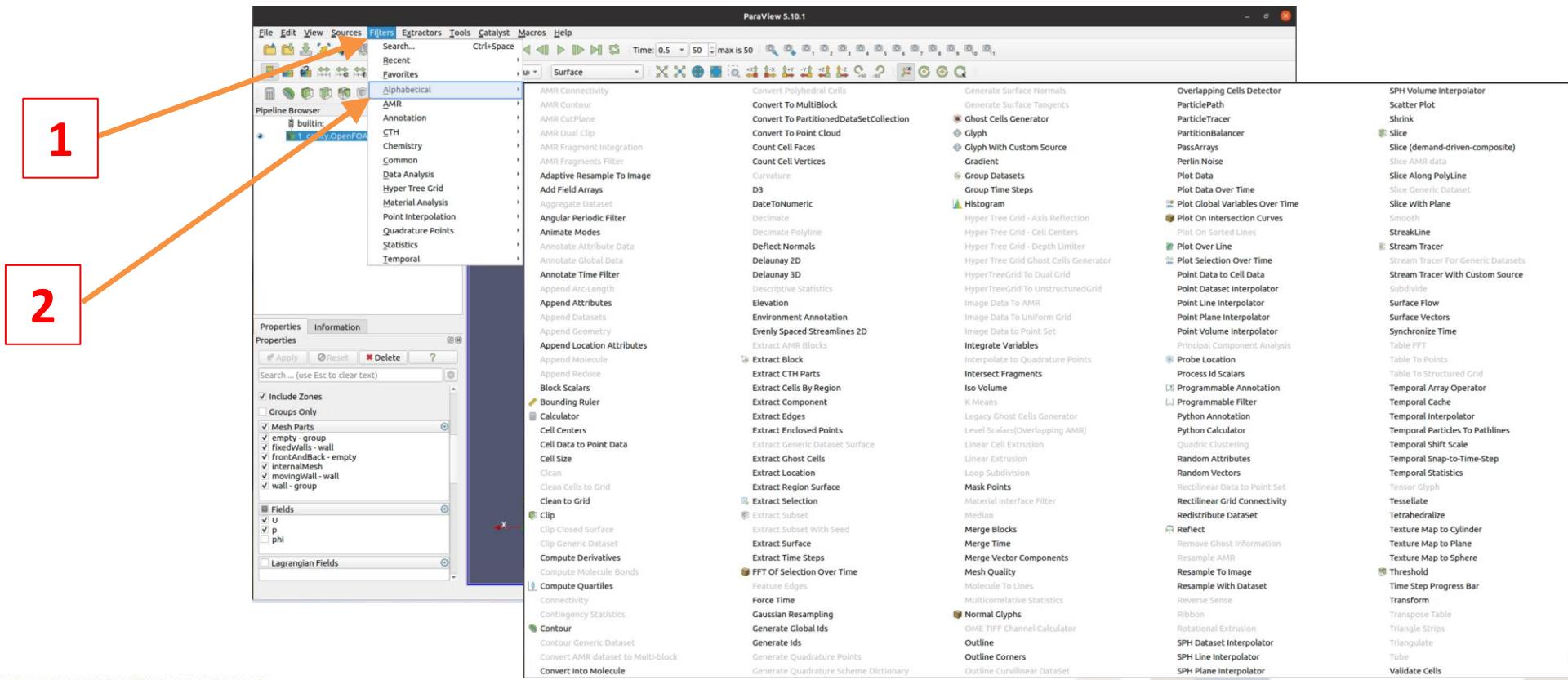
Filters are functions that generate, extract or derive features from the input data.

They are attached to the input data.

You can access the most commonly used filters from the Common Filters toolbar. →



You can access all the filters from the menu Filter.



Common Filters



Calculator



Glyph



Contour



Stream Tracer



Clip



Warp (vector)



Slice



Group Datasets



Threshold



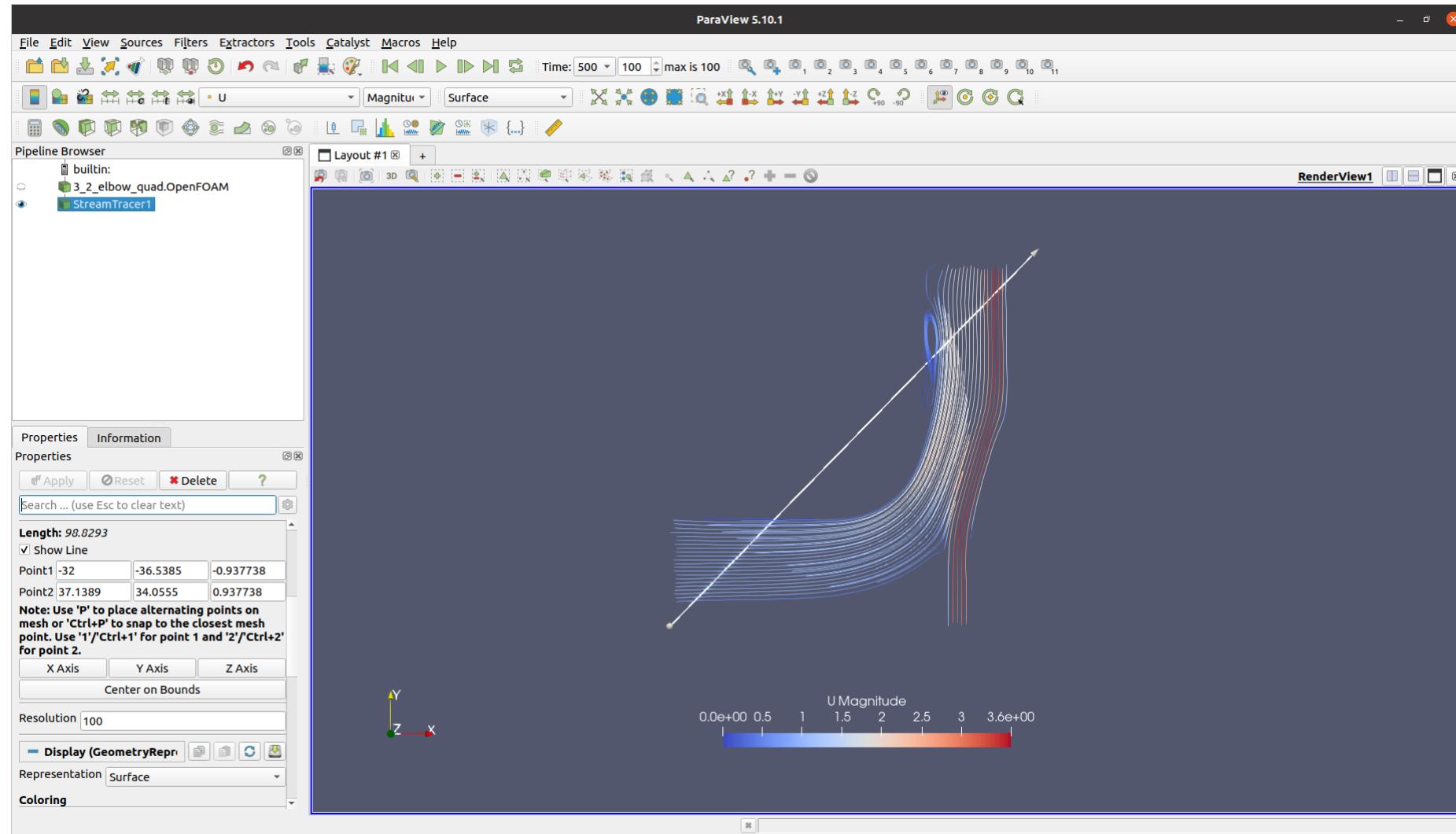
Extract Level



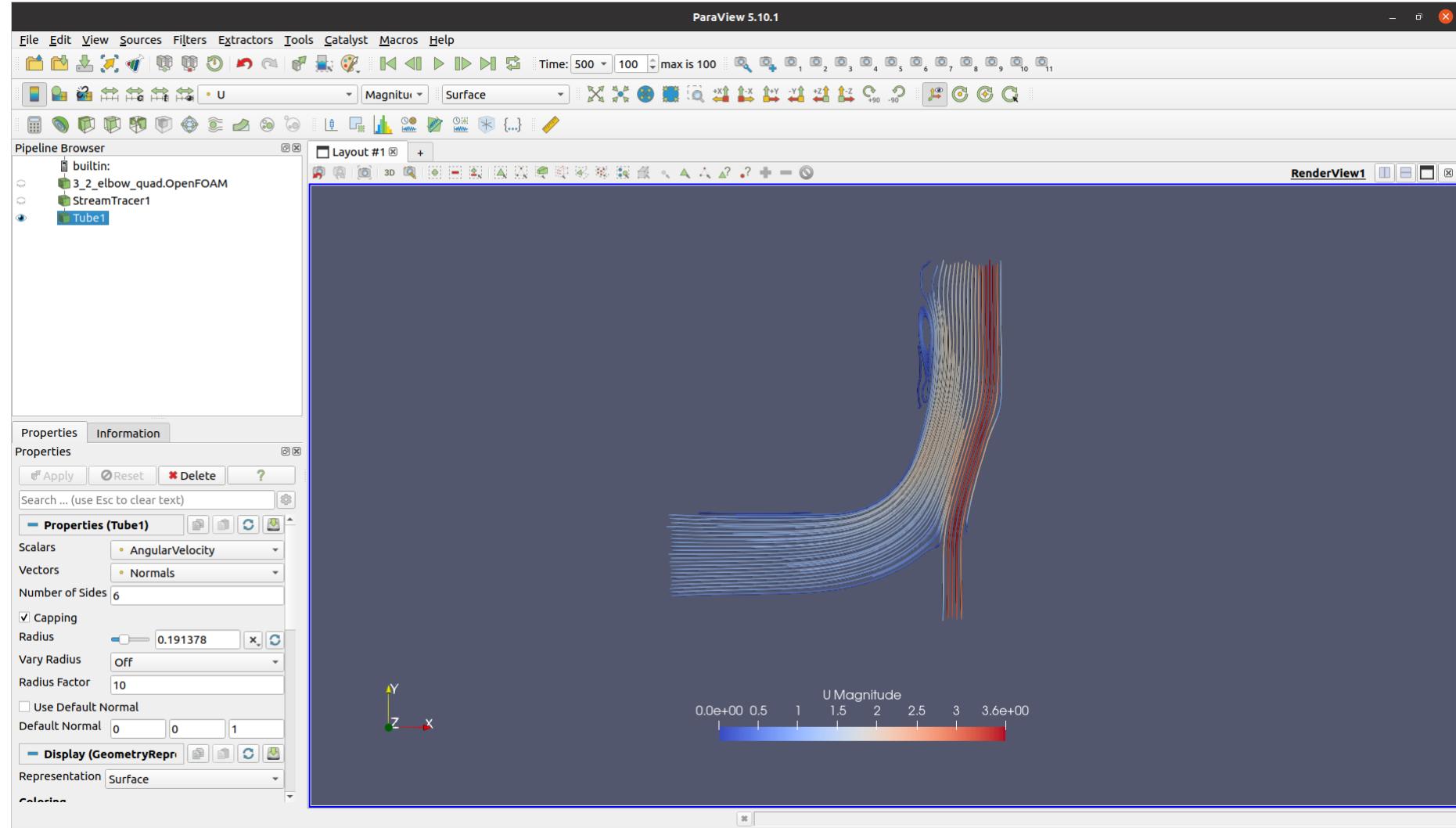
Extract Subset



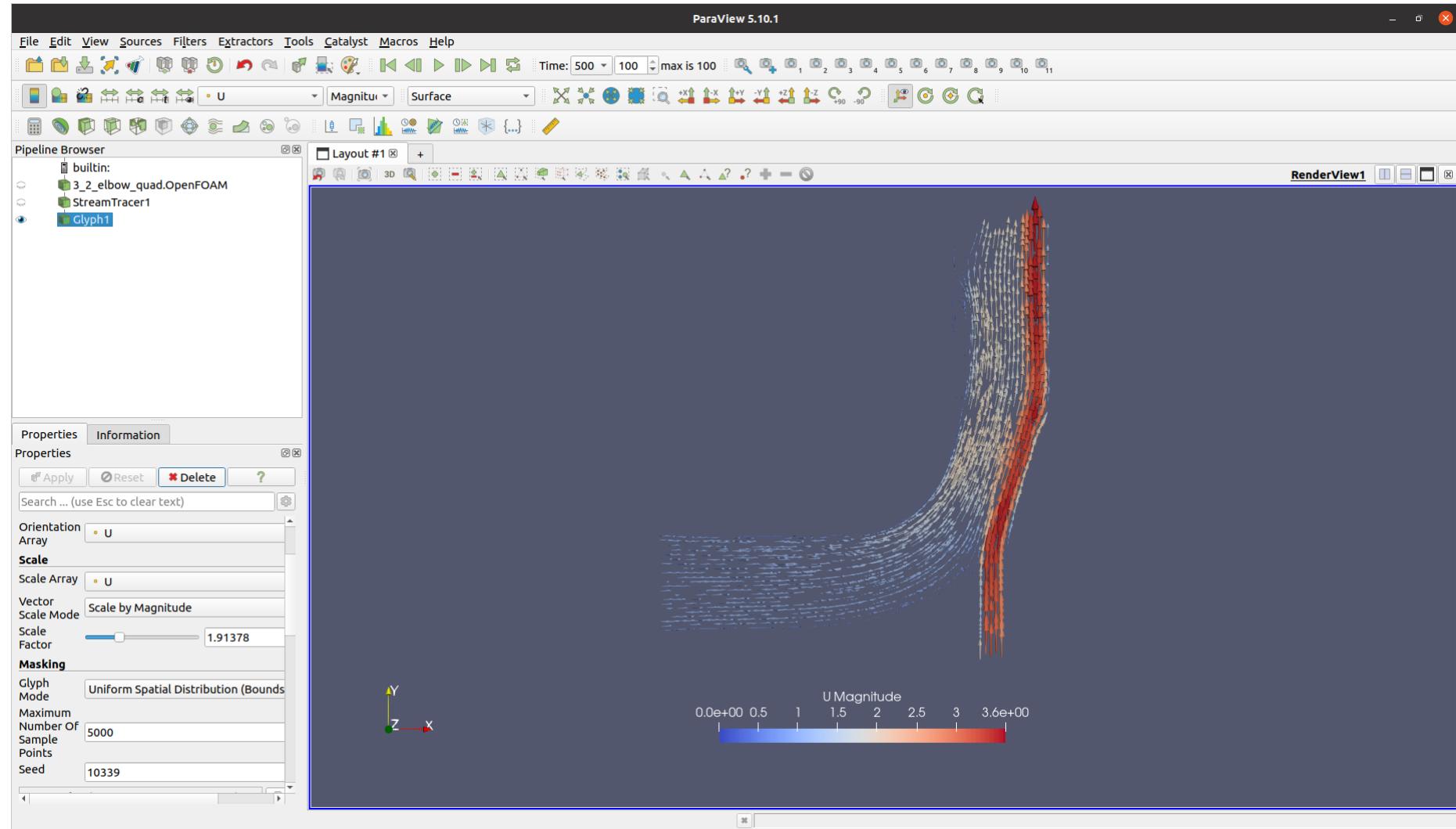
Stream Tracer



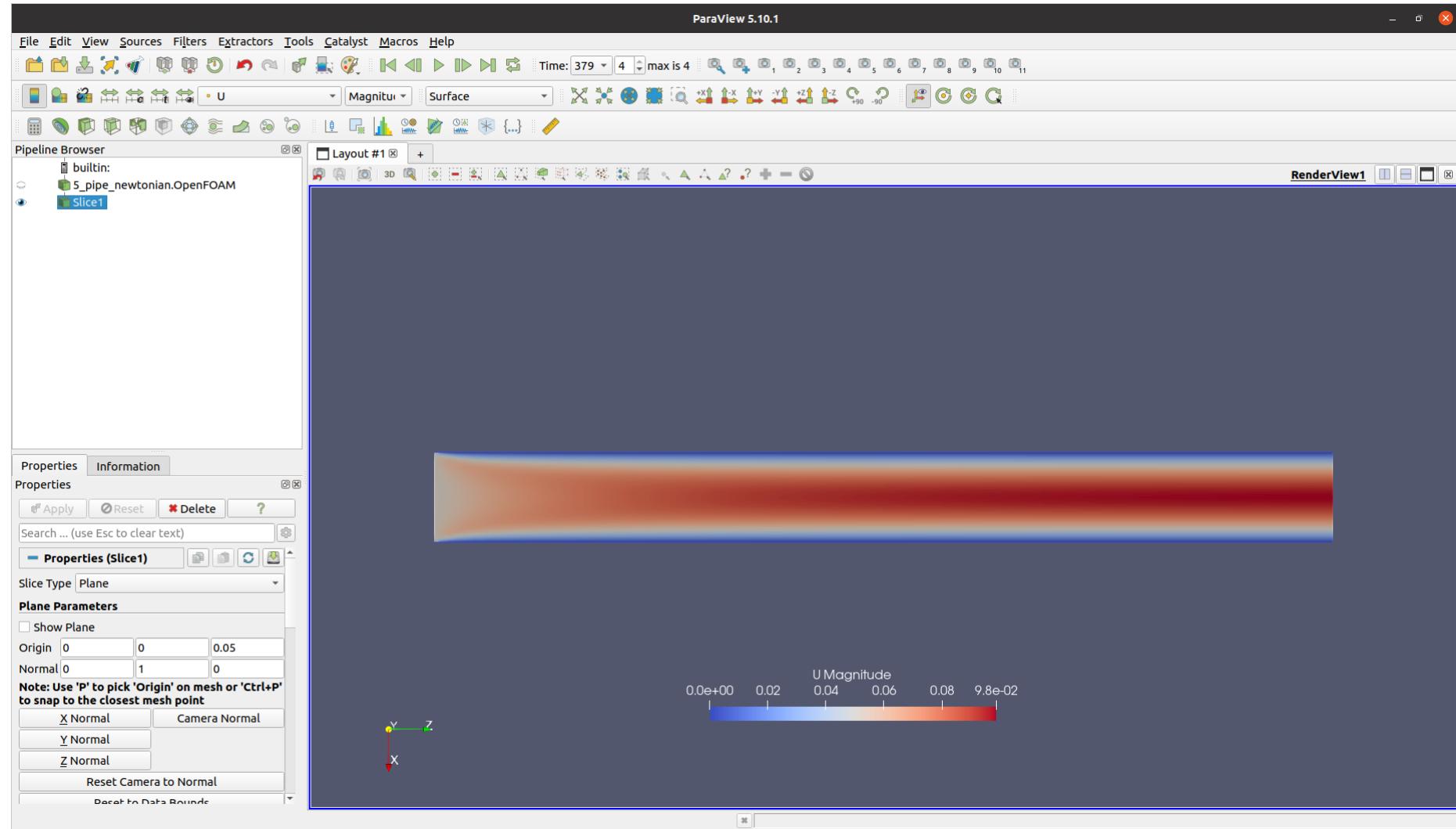
1. Open the case
2. Add Stream tracer filter
3. Choose line or sphere location
4. Play with setting



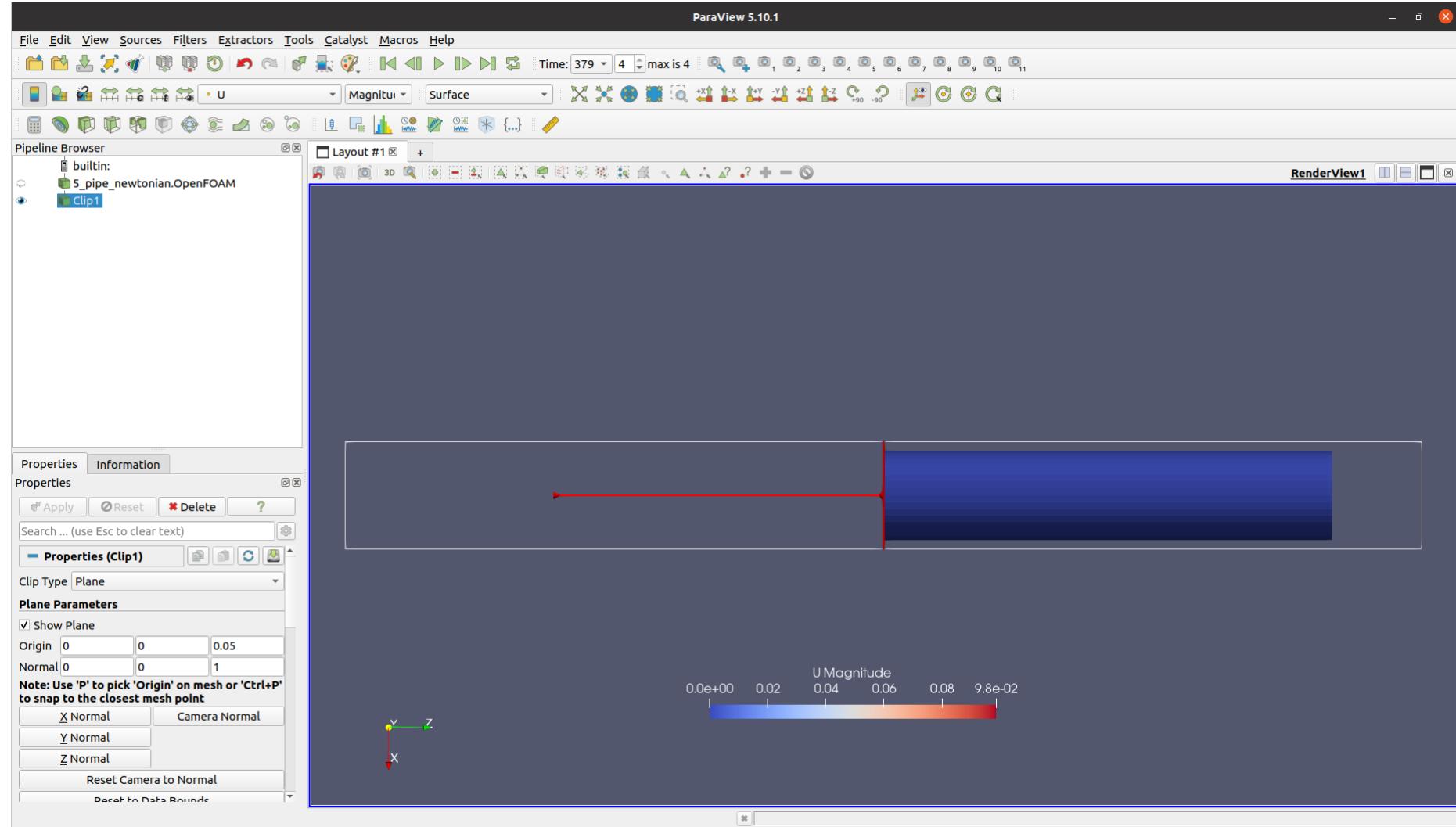
1. Open the case
2. Add Stream tracer filter
3. Add Tube filter
4. Play with setting



1. Open the case
2. Add Stream tracer filter
3. Add Glyph filter
4. Play with setting



1. Open the case
2. Add Slice filter
3. Choose Normal
4. Choose Plane location
5. Play with setting



1. Open the case

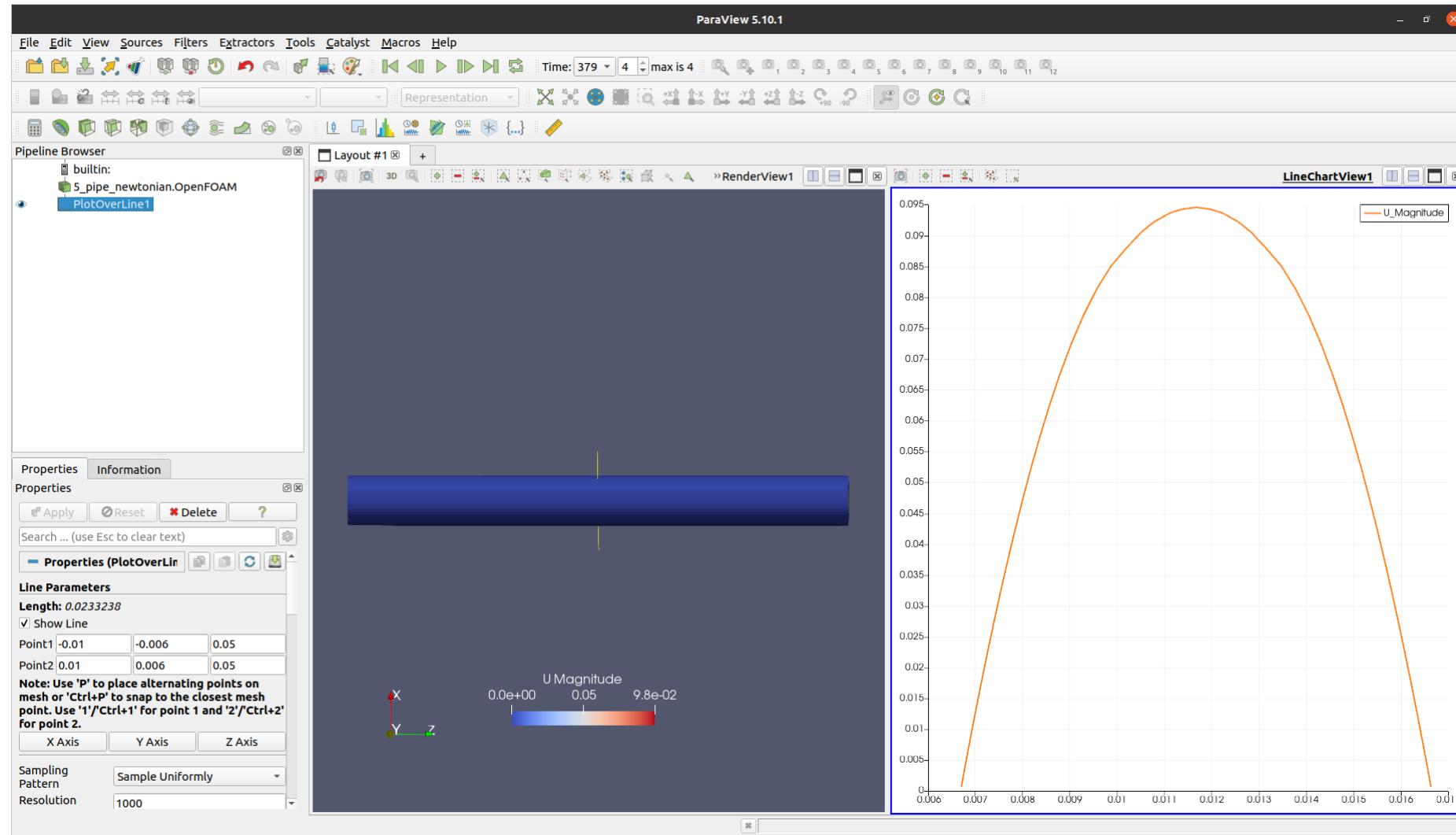
2. Add Clip filter

3. Choose Normal

4. Choose Plane location

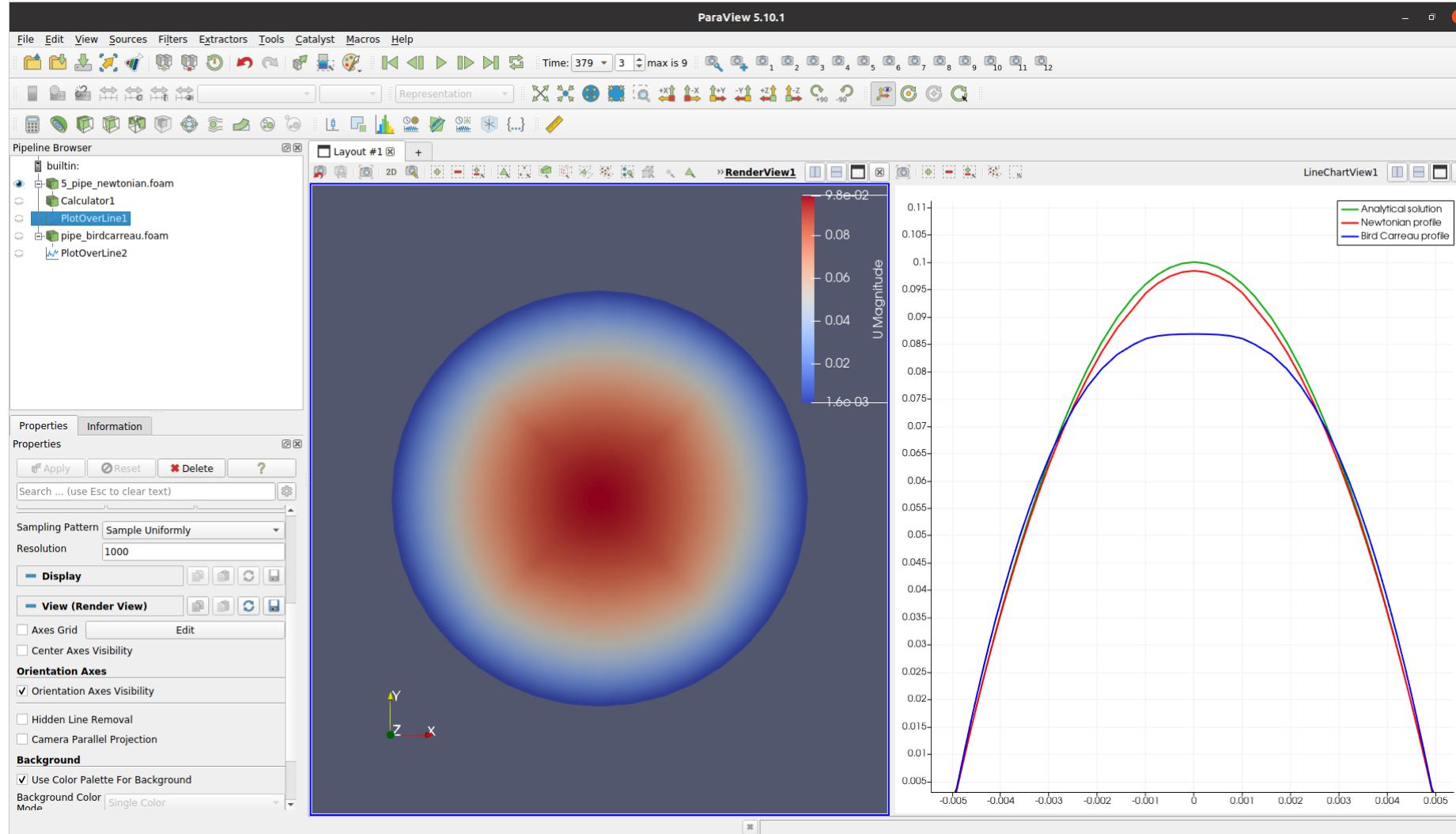
5. Play with setting

Plot over Line



1. Open the case
2. Add Plot over line filter
3. Choose line location
4. Choose variables to plot
5. Play with setting

Comparing with Analytical Solution



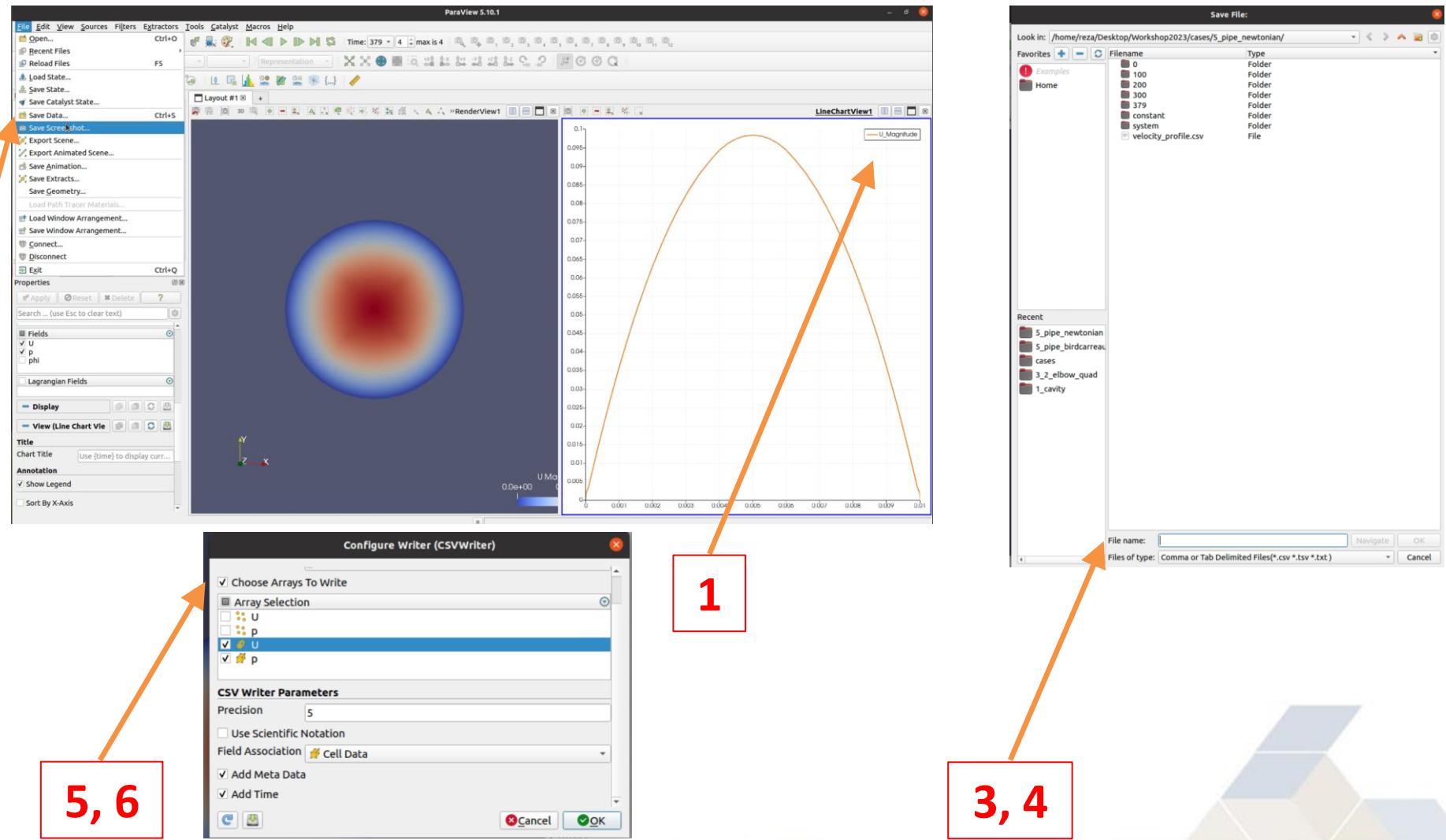
1. Open case 1
2. Add a calculator and enter formula below
3. Apply plot over line filer
4. Open case 2
5. Apply another plot over line filer

$$u_z = u_z \max \left(1 - \frac{r^2}{R^2} \right)$$

$$u_z \max = 2 u_z \text{ avg}$$

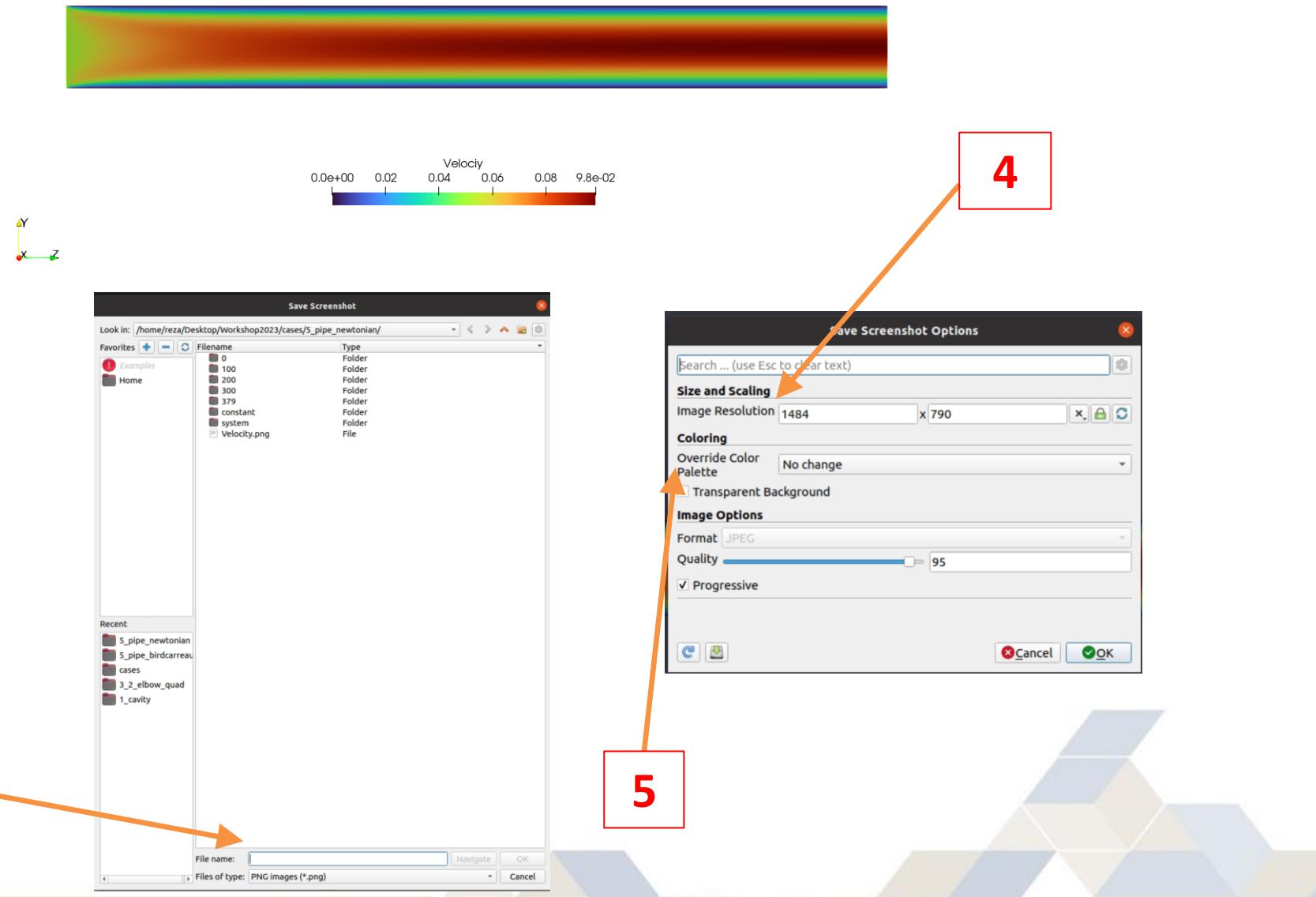
Save (export) Data

1. Choose Data
2. Go to > File > Save data
3. Enter file name and format
4. Choose time step/steps
5. Choose desirable variables
6. Choose if you need time and coordinate data



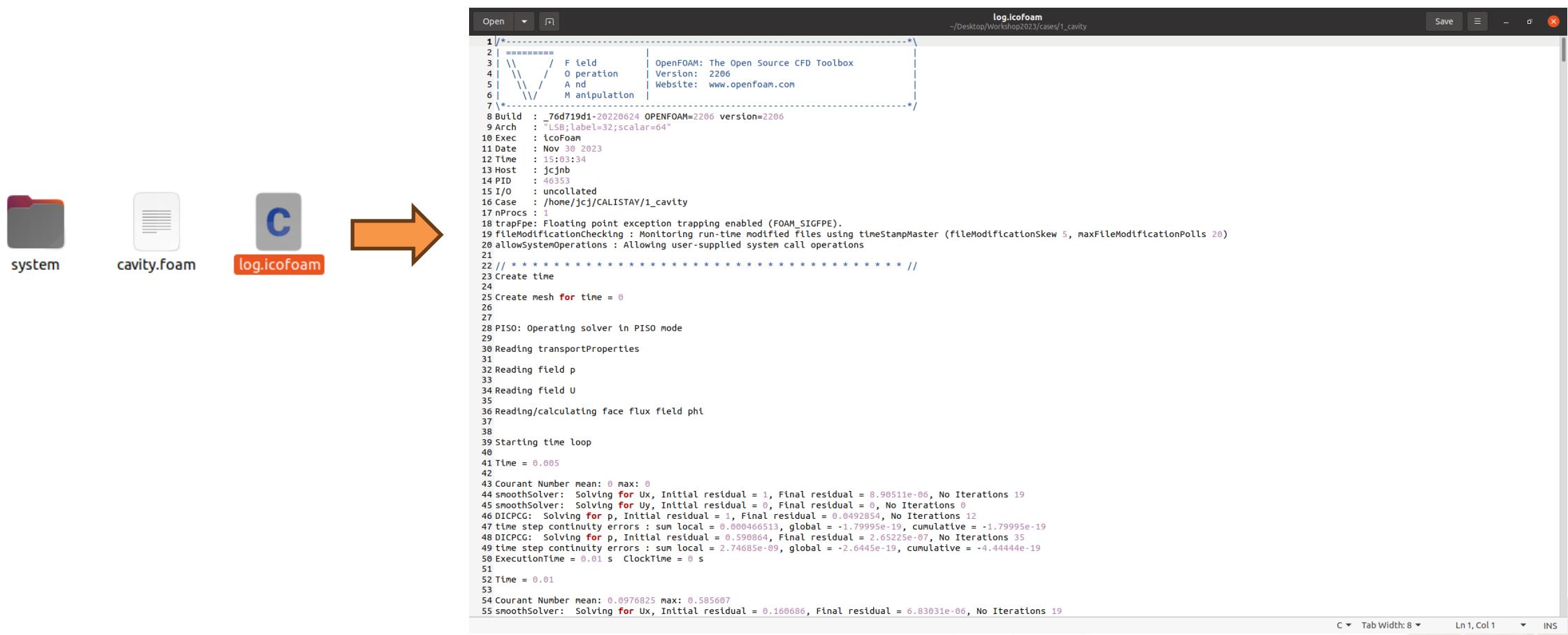
Saving Screenshot

1. Press capture screenshot icon
2. Specify the name and file saving location
3. Assign image resolution
4. Assign background



Plotting Residuals Using Gnuplot

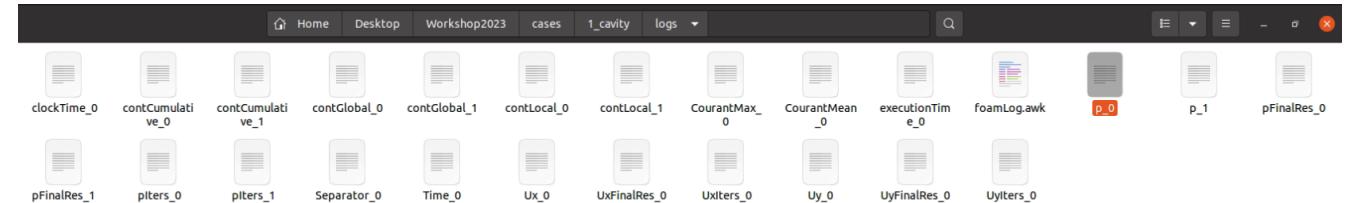
- We use the script `foamLog` (distributed with your OpenFOAM® installation), to extract the information inside the file `log.icoFoam`. This information is saved in an editable/plottable format in the directory `logs`.



```
Open | +| Save | ... | X
log.icofoam ~/Desktop/Workshop2023/cases/1_cavity
1 /*-----*
2 =====
3 \ \ / F i e l d | OpenFOAM: The Open Source CFD Toolbox
4 \ \ / O peration | Version: 2206
5 \ \ / A nd | Website: www.openfoam.com
6 \ \ / M anipulation | */
7 /*-----*/
8 Build : _76d719d1-20220624 OPENFOAM=2206 version=2206
9 Arch : "LSB;label=32;scalar=64"
10 Exec : icoFoam
11 Date : Nov 30 2023
12 Time : 15:03:34
13 Host : jcjh
14 PID : 46353
15 I/O : uncollocated
16 Case : /home/jcj/CALISTAY/1_cavity
17 nProcs : 1
18 trapFpe: Floating point exception trapping enabled (FOAM_SIGFPE).
19 fileModificationChecking : Monitoring run-time modified files using timeStampMaster (fileModificationSkew 5, maxFileModificationPolls 20)
20 allowSystemOperations : Allowing user-supplied system call operations
21
22 // * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
23 Create time
24
25 Create mesh for time = 0
26
27
28 PISO: Operating solver in PISO mode
29
30 Reading transportProperties
31
32 Reading field p
33
34 Reading field U
35
36 Reading/calculating face flux field phi
37
38
39 Starting time loop
40
41 Time = 0.005
42
43 Courant Number mean: 0 max: 0
44 smoothSolver: Solving for Ux, Initial residual = 1, Final residual = 8.90511e-06, No Iterations 19
45 smoothSolver: Solving for Uy, Initial residual = 0, Final residual = 0, No Iterations 0
46 DICPCG: Solving for p, Initial residual = 1, Final residual = 0.0492854, No Iterations 12
47 time step continuity errors : sum local = 0.000466513, global = -1.79995e-19, cumulative = -1.79995e-19
48 DICPCG: Solving for p, Initial residual = 0.590864, Final residual = 2.65225e-07, No Iterations 35
49 time step continuity errors : sum local = 2.74685e-09, global = -2.6445e-19, cumulative = -4.44444e-19
50 ExecutionTime = 0.01 s ClockTime = 0 s
51
52 Time = 0.01
53
54 Courant Number mean: 0.0976825 max: 0.585607
55 smoothSolver: Solving for Ux, Initial residual = 0.160686, Final residual = 6.83031e-06, No Iterations 19
```

Plotting Residuals Using Gnuplot

- After entering `foamLog logs` folder is created:



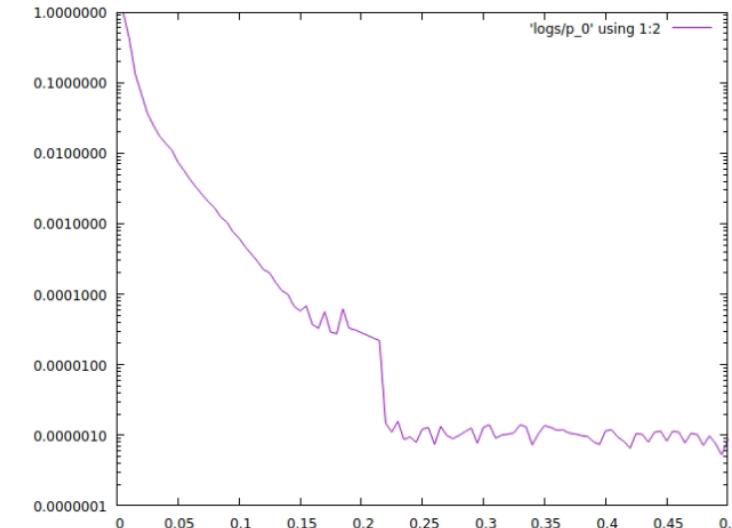
- We use `gnuplot` to plot the information extracted from the `log.icoFoam` file.

1. `gnuplot> set logscale y`

Set log scale in the y axis

2. `gnuplot> plot 'logs/p_0' using 1:2 with lines`

Plot the file `p_0` located in the directory `logs`, use columns 1 and 2 in the file `p_0`, use lines to output the plot.



Plotting Residuals Using Gnuplot

3. gnuplot> plot 'logs/p_0' using 1:2 with lines, 'logs/pFinalRes_0' using 1:2 with lines

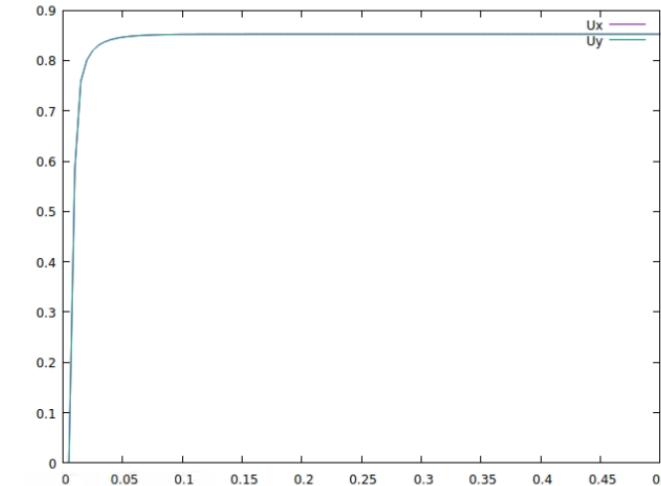
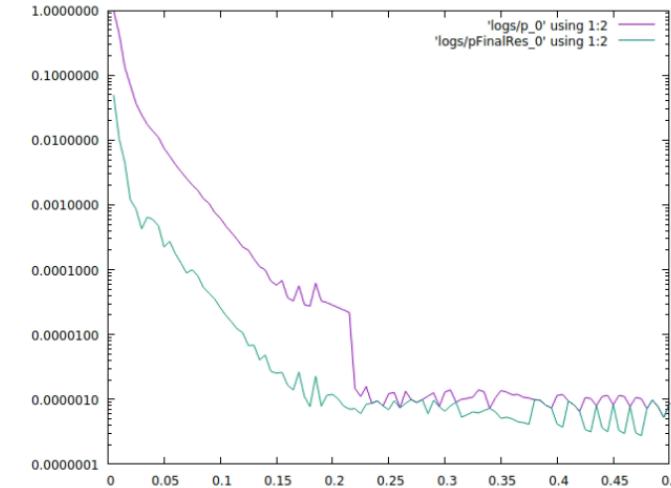
Here we are plotting to different files. You can concatenate files using comma (,)

4. gnuplot> reset

To reset the scales

5. gnuplot> plot 'logs/CourantMax_0' u 1:2 w l

To plot file CourantMax_0. The letter u is equivalent to using. The letters w l are equivalent to with lines





TÜBİTAK

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25TH YEAR
1773 - 2023

Thank you

