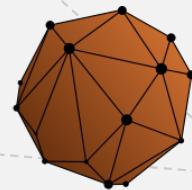


# Post Processing in ParaView

## An overview

*Gabriel Mar Pinto Wagner*  
gmpwagner@gmail.com  
p42786@alunos.uminho.pt



Computational  
Rheology  
@IPC

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ParaView's overview

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6

## Saving progress

Images, animations, states

# 1

# Introduction

- What is ParaView?
- History
- Basics of visualization
- Why is it important for OpenFoam users?



CRheo@IPC

# What is ParaView?



- An open-source application for visualizing two and three dimensional data sets.
  - It is designed to handle complex scientific and engineering data.
    - Offers a flexible and intuitive graphical user interface.
  - Widely used by many academic, government and commercial institutions.
    - Downloaded roughly 100.000 times every year.
    - Developed and maintained by Kitware Inc.

# History

2000 – ParaView project started as a collaborative effort between Kitware Inc. and Los Alamos National Laboratory.

## 2000 - 2002

2002 – The first public release, ParaView 0.6, was announced in October 2002.

2005 – In September ParaView 3.0 started being developed focused on a more user-friendly interface.

## 2005 - 2007

2007 – ParaView 3.0 was released in May 2007.

2013 – ParaView 4.0 was released in June 2013, which introduced more cohesive GUI controls and better multiblock interaction.

## 2013 - 2016

2016 – ParaView 5.0 was released in January 2016, which provided a major update to the rendering system.

From that on, ParaView development continued until today, focused on implementing new features, graphical optimizations.

## 2016 > now

2023 – Latest release: ParaView 5.11.2



# Basics of visualization

3 basic steps to visualize your data

Reading > Filtering > Rendering

Firstly, data must be read in Paraview.

Next, you may apply any number of filters that process the data to generate extract or derive features from the data.

Finally, a viewable image is rendered from the data.

# Why is it important for OpenFOAM users?

**Data Visualization:** Allows the visualization of complex simulations in OpenFOAM, making it easier to understand and explore data results.

**Advanced Analysis:** It offers a wide range of filters and tools to perform in-depth analysis, extract insights and validate simulations.

**Customization:** Scripting capabilities allow users to create custom workflows, automate tasks and integrate with OpenFOAM simulations.

**Efficiency:** It accelerates the post-processing workflow, saving time and resources.



# 2

## User interface

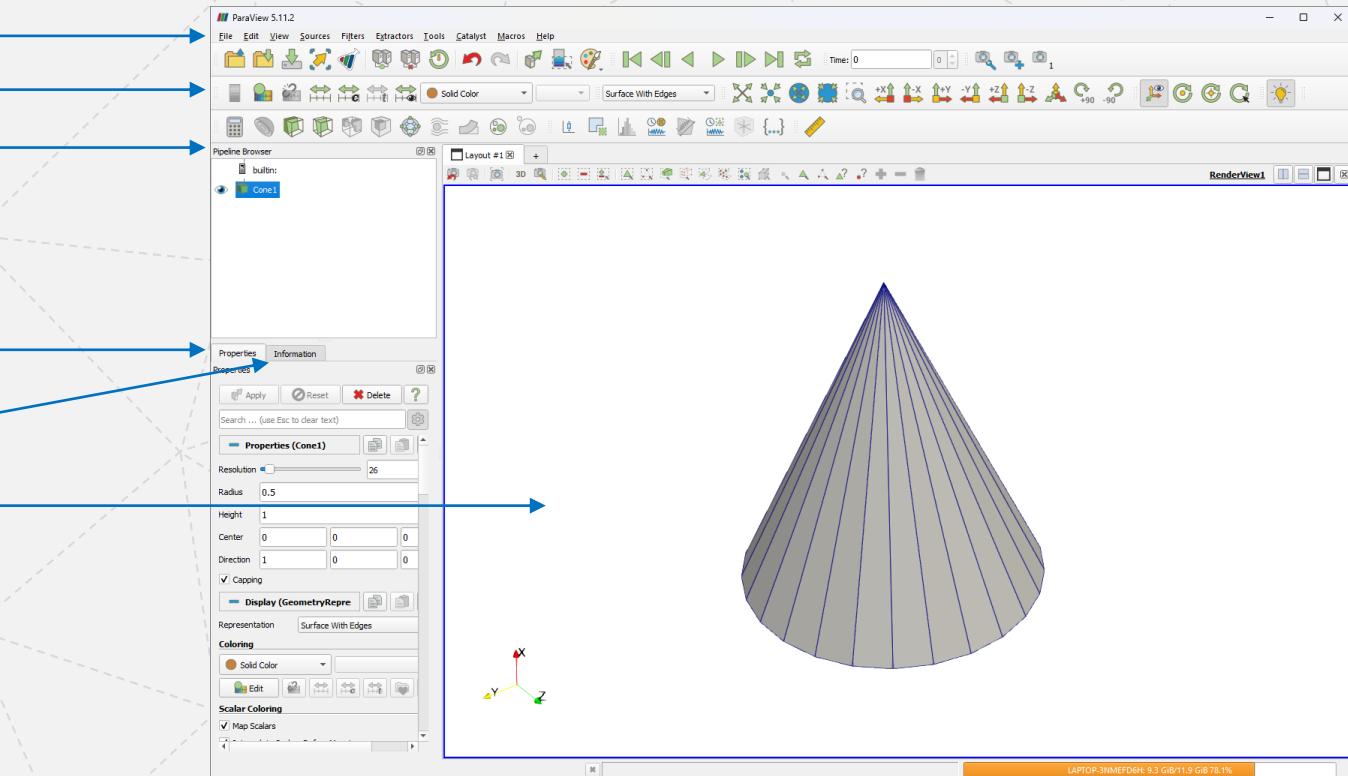
- Overview
- Menu bar
- Toolbars
- Pipeline browser
- Properties panel
- Canvas



# Overview

Menu bar  
Toolbars  
Pipeline Browser

Properties panel  
Information panel  
Canvas

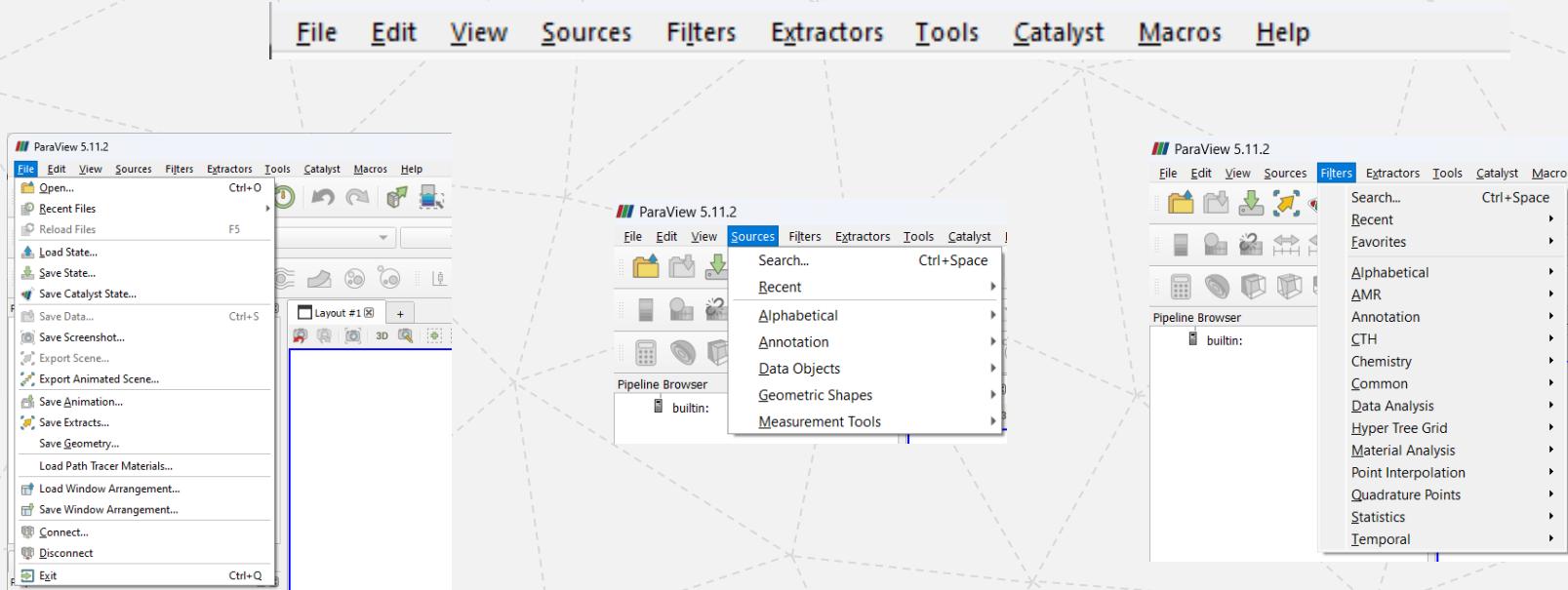


Post Processing in ParaView

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# Menu bar

The menu bar allows you to access the majority of tools and features, dividing it into sections.



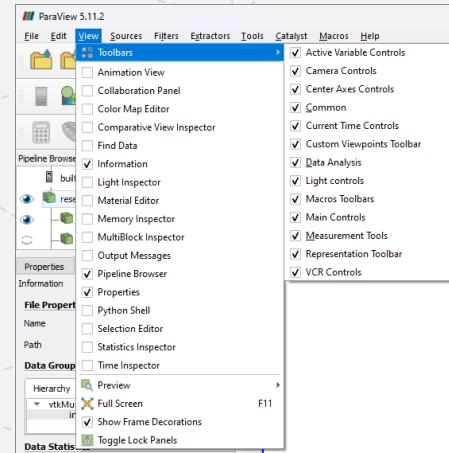
# Toolbars

The toolbars provide shortcuts to some features and tools.

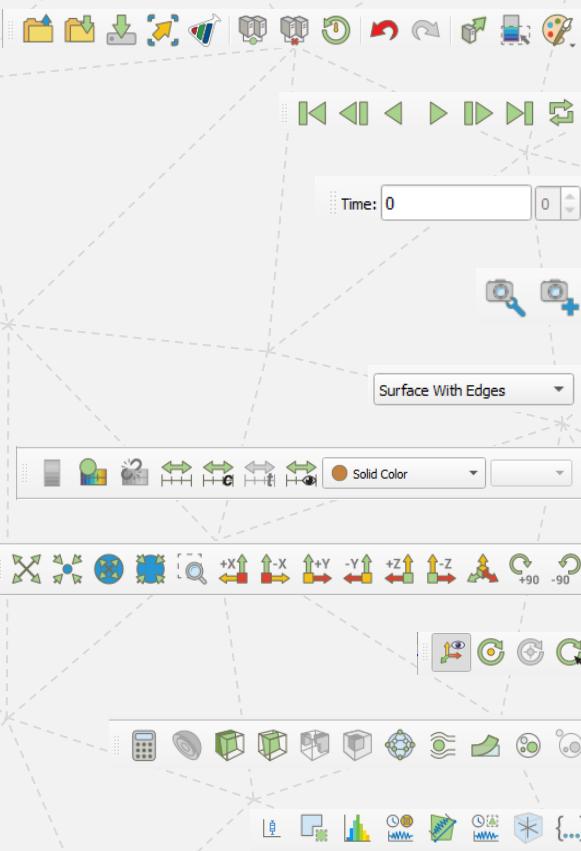


Toolbars are customized by hiding/showing what you desire.

## Menu bar View - Toolbars



# Toolbars



Main Controls

VCR Controls

Current Time Controls

Custom Viewpoints Toolbar

Representation Toolbar

Active Variable Controls

Camera controls

Center Axes Controls

Common Filters

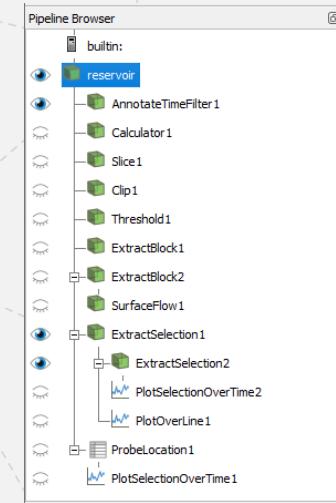
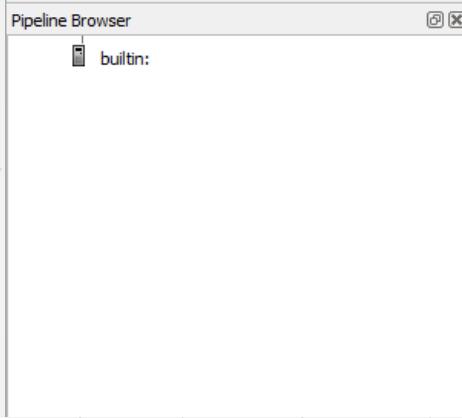
Data Analysis Toolbar

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# Pipeline browser

The pipeline browser shows the pipeline structure, providing the objects being post processed and its correspondent applied filters.

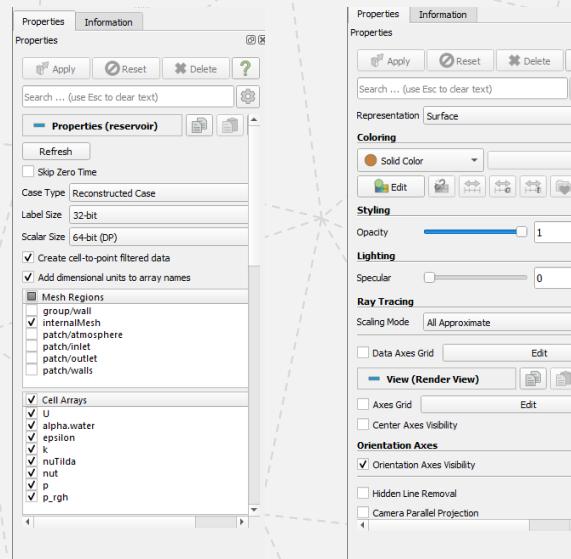


The icon refers to the objects/filters being shown in the canvas

The icon refers to the objects/filters being hidden in the canvas

# Properties panel

The properties panel allows you to view and modify some parameters of the selected pipeline object/filter.

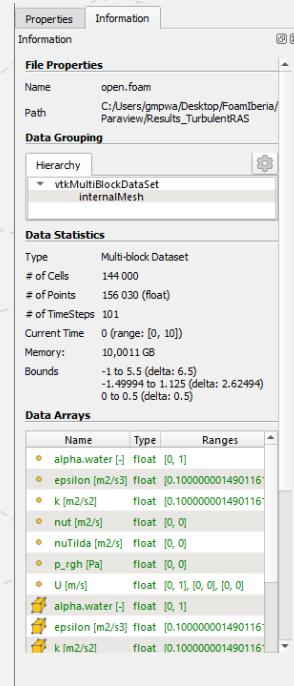


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# Information panel

The information panel allows you to visualize parameters information of the selected pipeline object/filter.

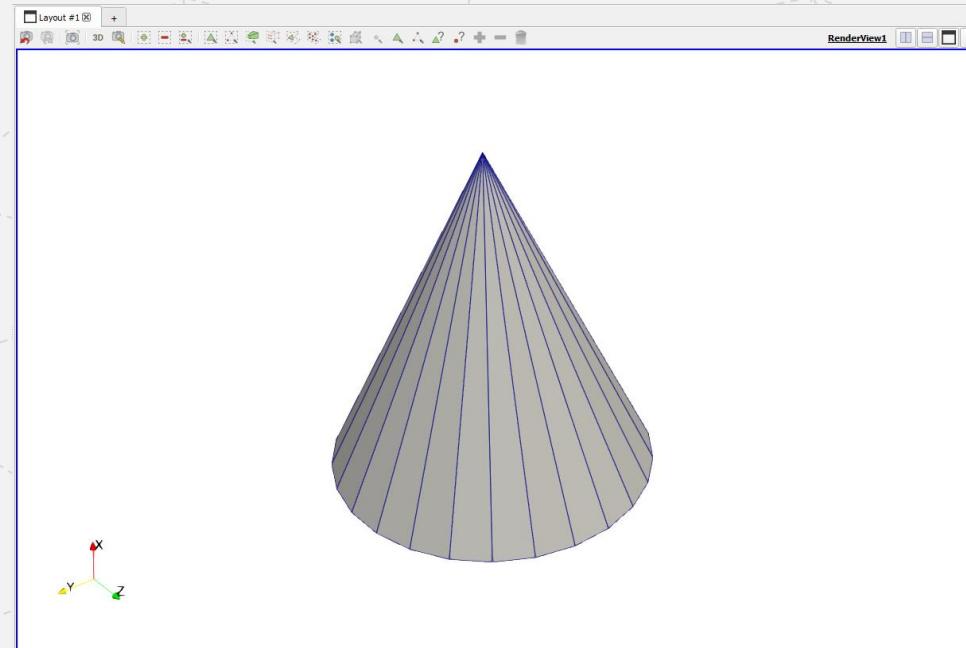
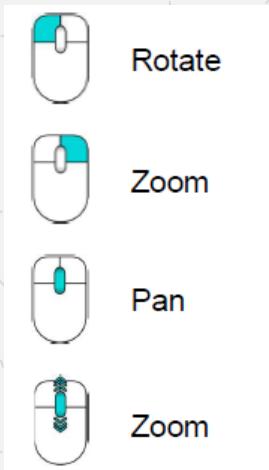


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# Canvas

The canvas allows you to visualize results.



Post Processing in ParaView

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# 3

## Basic Usage

- Creating sources
- Applying filters

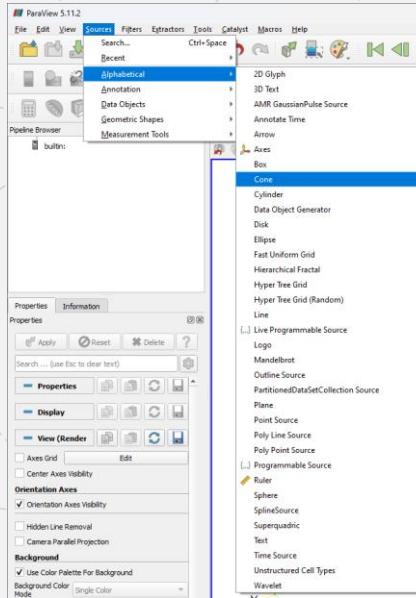


# Creating sources

Sources refers to specific modules or objects that generate or provide data for visualization and analysis.

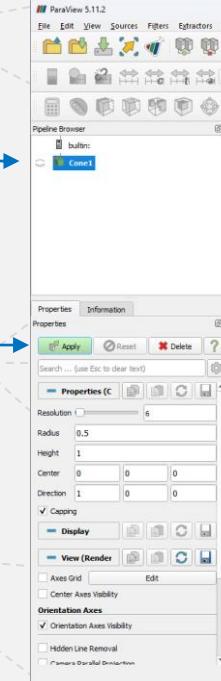
Every available source can be seen in the menu bar *Sources > Alphabetical*

They are very handy to explore Paraview's features.



Object “Cone1”  
will be created

Click

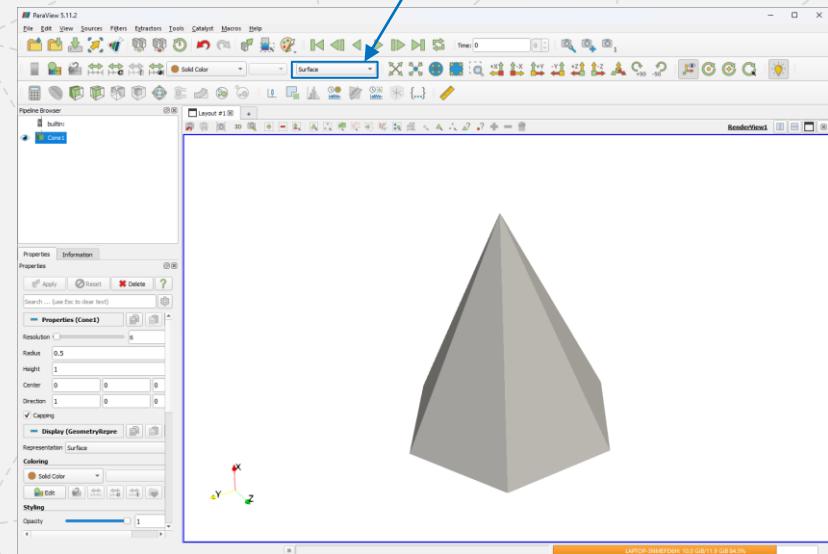


Post Processing in Paraview

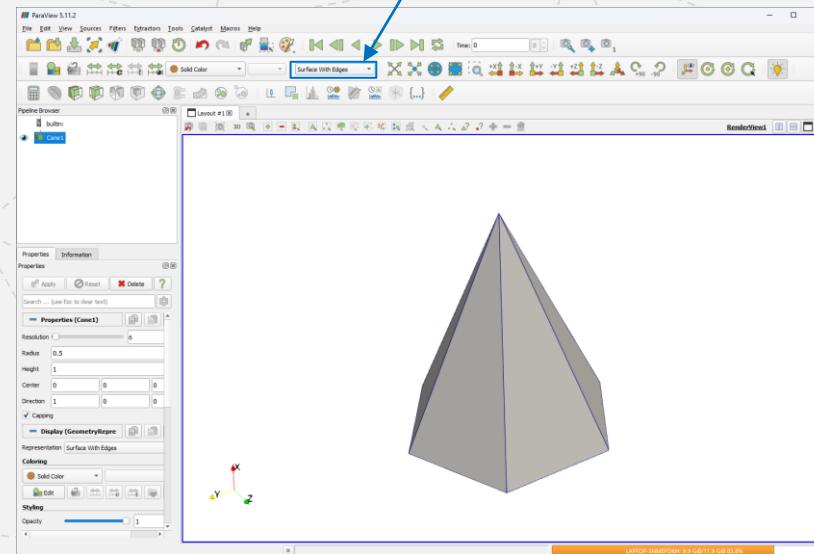
Gabriel Wagner et al.

# Creating sources

Surface representation



Surface with Edges representation

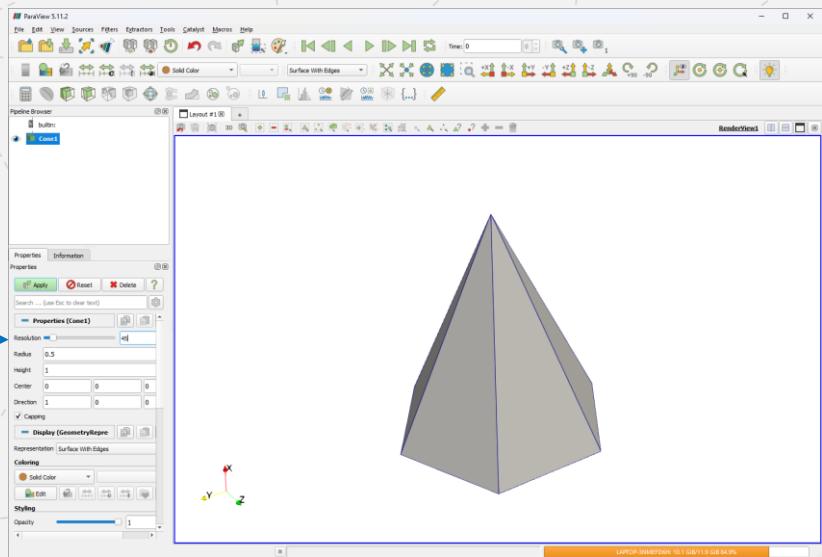


Post Processing in ParaView

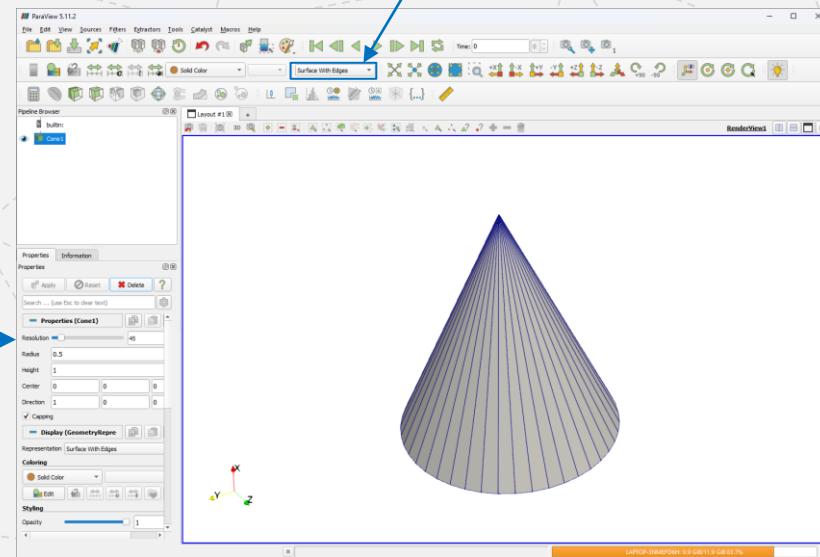
Gabriel Wagner et al.

# Creating sources

Change “Resolution” to 45 and click 



Surface with Edges representation



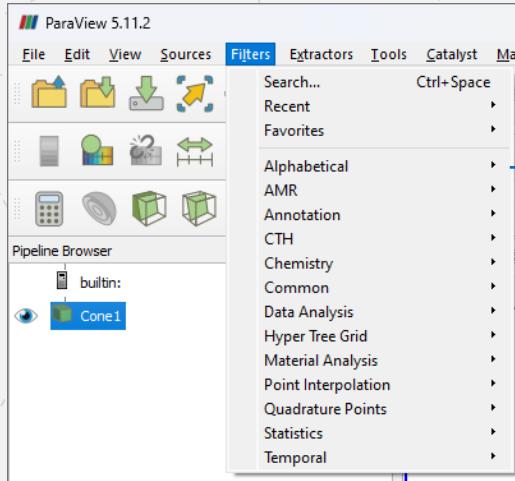
Post Processing in ParaView

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# Applying filters

Filters are a set of operations or processing tools that allow you to manipulate, analyse and visualize your data.

Every available filter can be seen in the menu bar *Filters > Alphabetical*



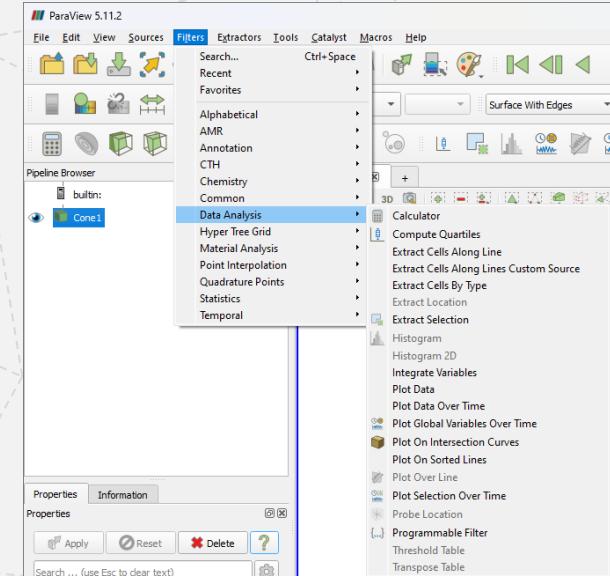
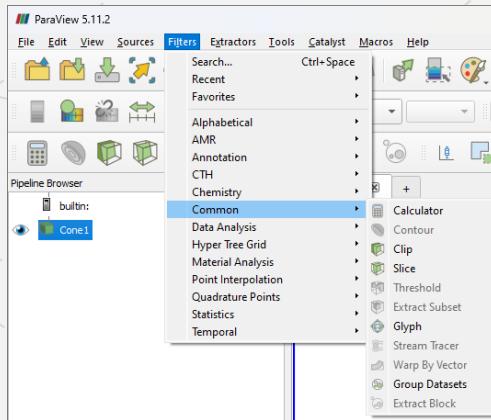
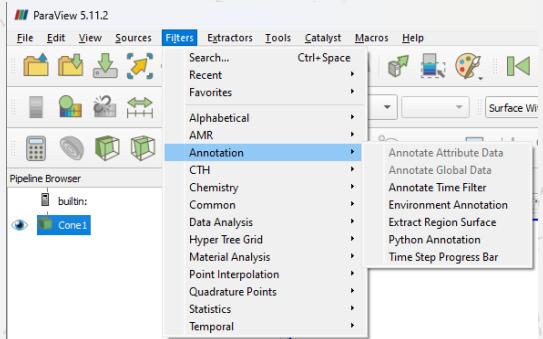
AMR Connectivity	Descriptive Statistics	Interpolate to Quadrature Points	Remove Ghost Information
AMR Contour	Elevation	Intersect Fragments	Rename Arrays
AMR Clip	Environment Annotation	K Means	Resample All
AMR Fragment Integration	Equalizer Filter	Level Scales(Developping AMR)	Resample To Image
AMR Fragments Filter	Evenly Spaced Streamlines 2D	Linear Cell Extrusion	Resample To Line
Adaptive Resample To Image	Extract AMR Blocks	Linear Extrusion	Resample With Dataset
Add Field Arrays	Extract Block	Loop Subdivision	Reverse Sense
Aggregate Dataset	Extract CTH Parts	Mask Points	Ribbon
Angular Periodic Filter	Extract Cells Along Line	Material Interface Filter	Rotational Extrusion
Animate Modes	Extract Cells Along Lines Custom Source	Median	SPH Dataset Interpolator
Annotate Attribute Data	Extract Cells By Region	Merge Blocks	SPH Line Interpolator
Annotate Global Data	Extract Cells By Type	Merge Time	SPH Plane Interpolator
Annotate Image	Extract Component	Mesh Editor Components	SPH Volume Interpolator
Append Arc Length	Extract Edges	Mesh Quality	Scatter Plot
Append Attributes	Extract Enriched Points	Molecule To Lines	Sphere
Append Datasets	Extract Generic Dataset Surface	Multicorelate Statistics	Slice
Append Geometry	Extract Ghost Cells	Normal Glyphs	Slice Along PolyLine
Append Location Attributes	Extract Location	OME TIFF Channel Calculator	Slice Generic Dataset
Append Molecule	Extract Particles Over Time	Outline	Slice With Plane
Append Reduce	Extract Region Surface	Outline Corners	Smooth
Block Scalars	Extract Selection	Outline Curvilinear Dataset	StreamLine
Bounding Ruler	Extract Subset	Overlapping Cells Detector	Stream Tracer
Calculator	Extract Subset With Seed	Parallel Mesh	Subdivide
Cell Centers	Extract Surface	Partitioner	Surface Rewire
Call Data to Point Data	Extract Time Steps	PartitionBalancer	Surface Vectors
Cell Size	FFT Of Selection Over Time	Pesistence	Synchronize Time
Clean	Feature Edges	Perlin Noise	Table FET
Clean Cells to Grid	Finite Element Field Distributor	Plot Data	Table To Points
Clean to Grid	Finite Time	Plot Data Over Time	Table To Structured Grid
Clip	Gaussian Resampling	Plot Global Variables Over Time	Temporal Array Operator
Clip Closed Surface	Generate Global Ids	Plot On Intersection Curves	Temporal Cache
Clip Generic Dataset	Generate Ids	Plot On Sorted Lines	Temporal Interpolator
Compute Connected Surface Properties	Generate Quadrature Points	Plot Over Line	Temporal Particles To Pathlines
Compute Derivatives	Generate Quadrature Scheme Dictionary	Plot Over Lines From Custom Source	Temporal Spline
Compute Molecule Bonds	Generate Surface Normals	Plot Selection Over Time	Temporal Step-to-Step
Compute Quantiles	Generate Surface Tangents	Point Data to Cell Data	Temporal Statistics
Connectivity	Generate Time Steps	Point Dataset Interpolator	Tensor Glyph
Contingency Statistics	Ghost Cell Generator	Point Line Interpolator	Tessellate
Contour	Glyph	Point Mesh Interpolator	Tetrahedraize
Contour Generic Dataset	Glyph With Custom Source	Point Volume Interpolator	Texture Map to Cylinder
Convert AMR dataset to Multi-block	Gradient	Principal Component Analysis	Texture Map to Plane
Convert Into Molecule	Group Datasets	Probe Location	Texture Map to Sphere
Convert Polyhedral Cells	Group Time Steps	Process Id Scalars	Threshold
Convert To MultiBlock	Histogram	Programmable Annotation	Threshold Table
Convert To PartitionedDataSetCollection	Histogram 2D	Programmable Filter	Time Step Progress Bar
Convert To Point Cloud	Hyper Tree Grid - Axis Reflection	Python Annotation	Transform
Convert To Point Cloud	Hyper Tree Grid - Cell Centers	Python Calculator	Transpose Table
Count Cell Faces	Hyper Tree Grid - Depth Limiter	Quadric Clustering	Triangle Strips
Count Cell Vertices	Hyper Tree Grid Ghost Cells Generator	Random Attributes	Triangulate
Curvature	HyperTreeGrid To Dual Grid	Random Vector	Tube
D3	HyperTreeGrid To UnstructuredGrid	Remap Data To Point Set	Validate Cells
DataToNumeric	Image Data To AMR	Resample Grid Connectivity	Vortex Cores
Decimate	Image Data To Uniform Grid	Redistribute Dataset	Warp by Scalar
Decimate Polyline	Image Data To Point Set	Reflect	Warp by Vector
Deflect Normals	Integrate Variables		
Delaunay 2D			
Delaunay 3D			

Post Processing in ParaView

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# Applying filters

Likewise for the sources, in the menu bar *Filters* every available filter in the *Alphabetical* section is also presented in its type section.



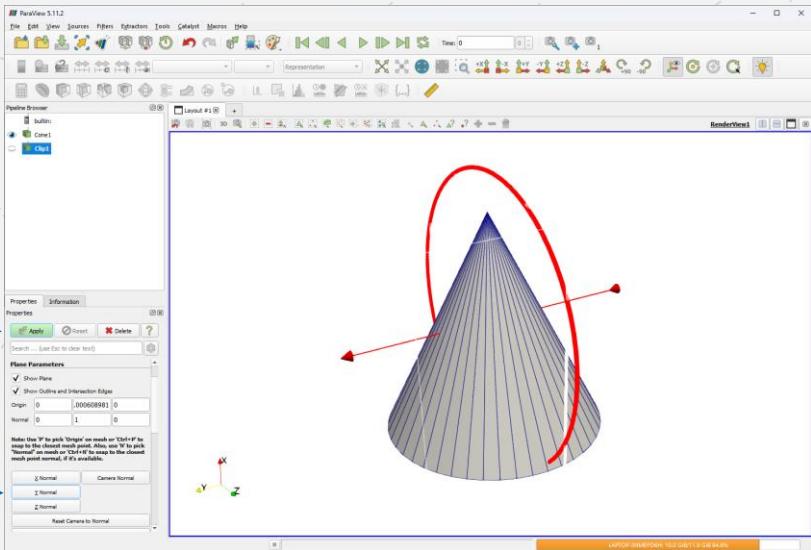
Post Processing in ParaView

Gabriel Wagner et al.

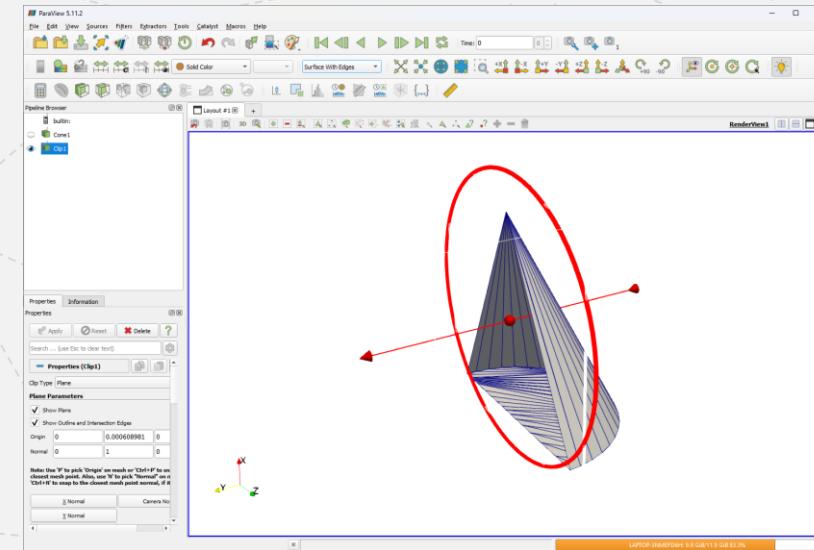
# Applying filters

Select the “Clip” filter from the menu bar *Filters > Common > Clip*

Click



Define Y normal



Post Processing in Paraview

Gabriel Wagner et al.

# 4

## Importing data

- Loading OpenFOAM simulation data
- From terminal
- Directly from Paraview
- Mesh visualization



# Loading OpenFOAM simulation data

Paraview reads an OpenFOAM case results through a “.foam” file extension.

This file can be created in the terminal by the following command:

\$CASE

Inside an OpenFOAM case folder

> touch open.foam

Can be replaced for anything you like since you keep “.foam” extension  
(e.g. blabla.foam)

```

bino@LAPTOP-3NMEFD6H:/mnt/c/Users/gmpwa/Desktop/FoamIberia/Paraview/Results_TurbulentRAS$ ls
0 0.5 1.1 1.5 1.6 1.7 2.1 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7.0 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9.0 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9
bino@LAPTOP-3NMEFD6H:/mnt/c/Users/gmpwa/Desktop/FoamIberia/Paraview/Results_TurbulentRAS$ touch open.foam
bino@LAPTOP-3NMEFD6H:/mnt/c/Users/gmpwa/Desktop/FoamIberia/Paraview/Results_TurbulentRAS$ ls
0 0.5 1.1 1.5 1.6 1.7 2.1 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7.0 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9.0 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9
Constant
System
bino@LAPTOP-3NMEFD6H:/mnt/c/Users/gmpwa/Desktop/FoamIberia/Paraview/Results_TurbulentRAS$ ls
0 0.5 1.1 1.5 1.6 1.7 2.1 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7.0 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9.0 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9
Constant
open.foam
System

```

The terminal window shows the user's path: bino@LAPTOP-3NMEFD6H:/mnt/c/Users/gmpwa/Desktop/FoamIberia/Paraview/Results\_TurbulentRAS\$. The user runs the command "ls" to list files, which shows numerous numerical files from 0 to 9.9 and three directory entries: "Constant", "System", and "open.foam". Arrows point from the text above to these elements: one arrow points to the "ls" command output, another to the "open.foam" file, and a third to the "Case folder" label.

Case folder

Line command  
(touch open.foam)

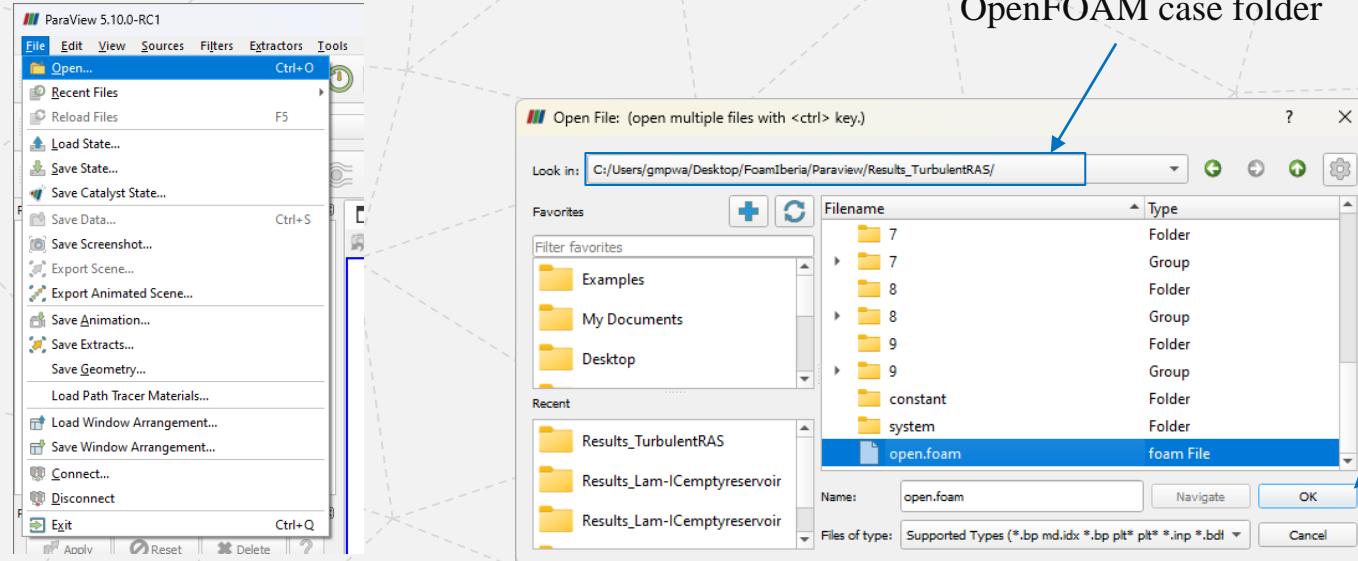
Created file

# Loading OpenFOAM simulation data

## From Paraview

In the toolbar: File > Open...

- Select the “.foam” file extension inside an OpenFOAM case



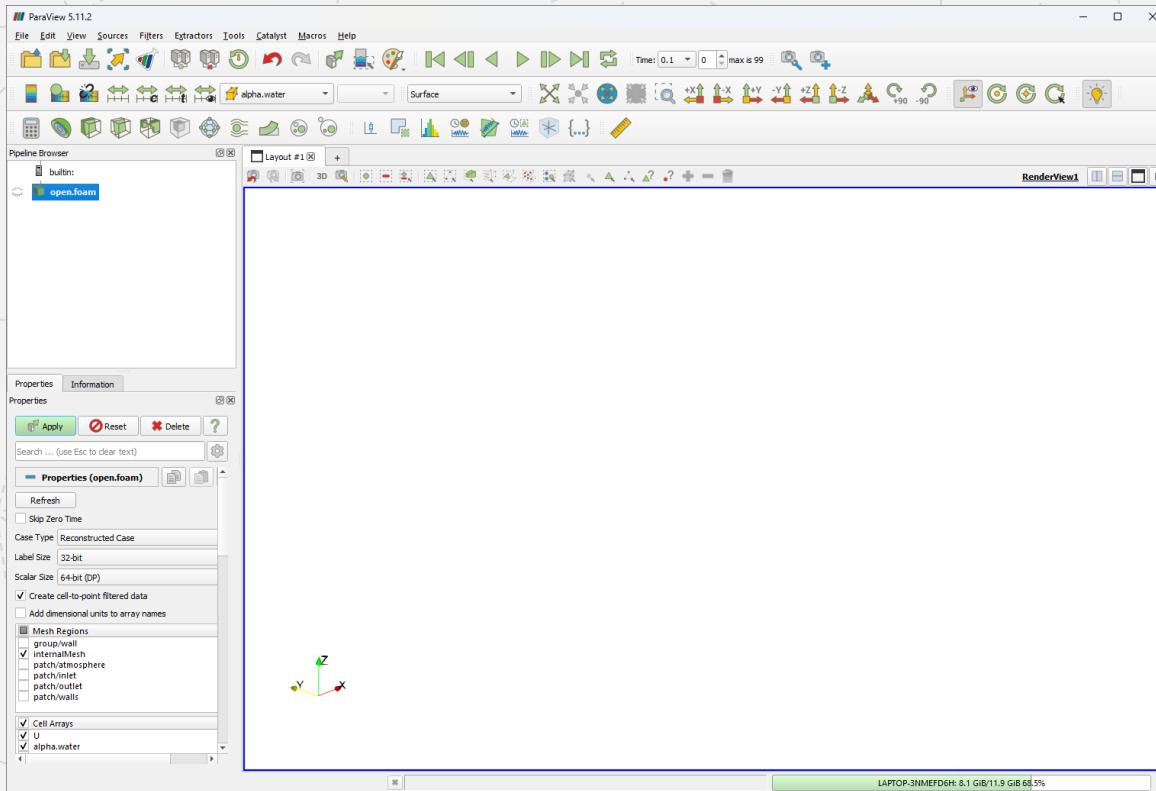
# Loading OpenFOAM simulation data

## From Paraview

“open.foam” is the created object in the pipeline browser

Click  to load data

Uncheck “Skip Zero Time” to enable initial time step visualization



Post Processing in Paraview

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# Loading OpenFOAM simulation data

## From terminal

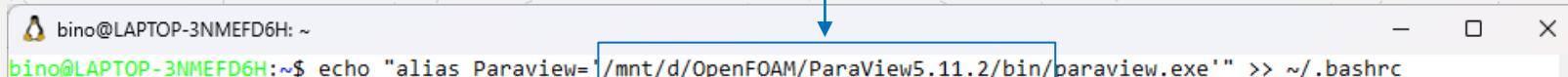
Create an alias called “Paraview” to execute Paraview application.

Use the following command from your terminal:

```
> echo "alias Paraview='\$PATHtoAPPLICATION/paraview.exe'" >> ~/.bashrc
```

Folder where paraview.exe is located

e.g. Folder where Paraview application is located in my computer



```
bino@LAPTOP-3NMEFD6H: ~
bino@LAPTOP-3NMEFD6H:~$ echo "alias Paraview='/mnt/d/OpenFOAM/ParaView5.11.2/bin/paraview.exe'" >> ~/.bashrc
```

Line command

Load .bashrc modifications with “> source ~/.bashrc” command:

```
bino@LAPTOP-3NMEFD6H:~$ source ~/.bashrc
```

Line command

# Loading OpenFOAM simulation data

# From terminal

Use the created alias pointing to Paraview executable file, followed by the “.foam” file you want to open.

This should be done by the following command:

\$CASE

> Paraview open.foam

## Inside the OpenFOAM case folder

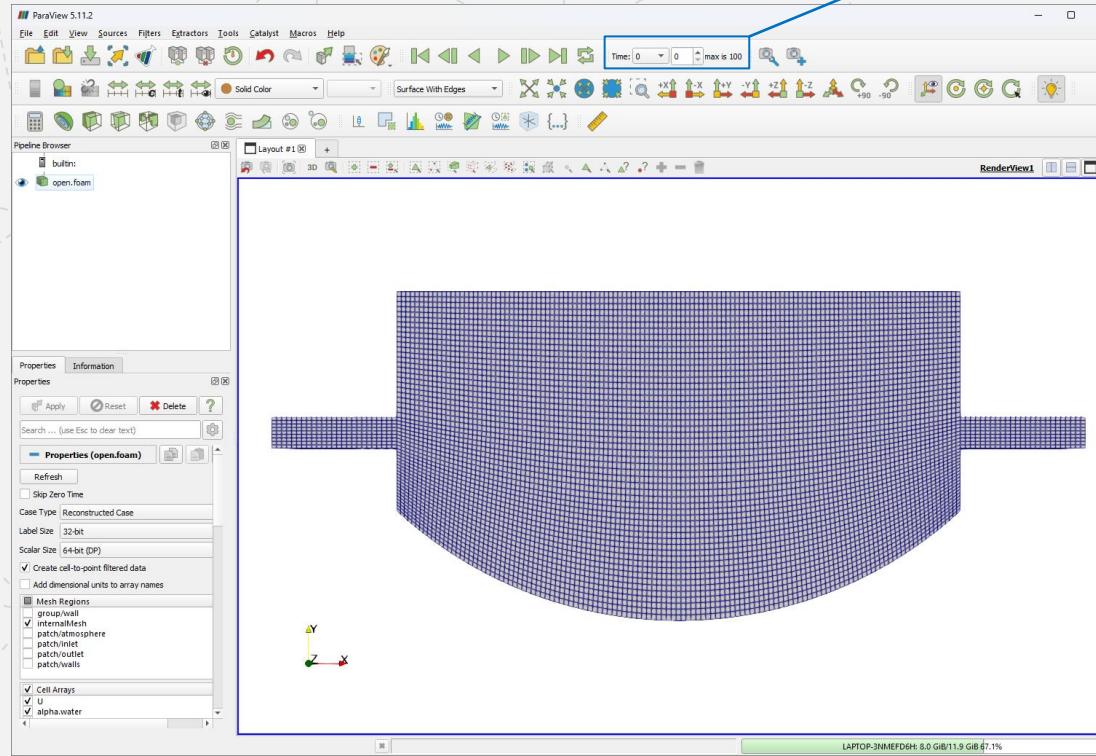
```
bino@LAPTOP-3NMEFD6H:/mnt/c/Users/gmpwa/Desktop/FoamIberia/Paraview/Results_TurbulentRAS$ ls
0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7.0 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9.0 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9
bino@LAPTOP-3NMEFD6H:/mnt/c/Users/gmpwa/Desktop/FoamIberia/Paraview/Results_TurbulentRAS$ touch open.foam
bino@LAPTOP-3NMEFD6H:/mnt/c/Users/gmpwa/Desktop/FoamIberia/Paraview/Results_TurbulentRAS$ ls
0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7.0 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9.0 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9
bino@LAPTOP-3NMEFD6H:/mnt/c/Users/gmpwa/Desktop/FoamIberia/Paraview/Results_TurbulentRAS$ Paraview open.foam
```

Case folder

## Line command

(Paraview openfoam)

# Loading OpenFOAM simulation data



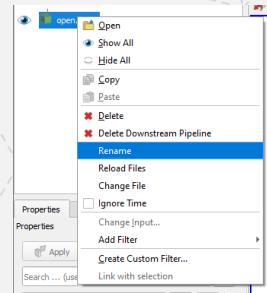
Post Processing in ParaView

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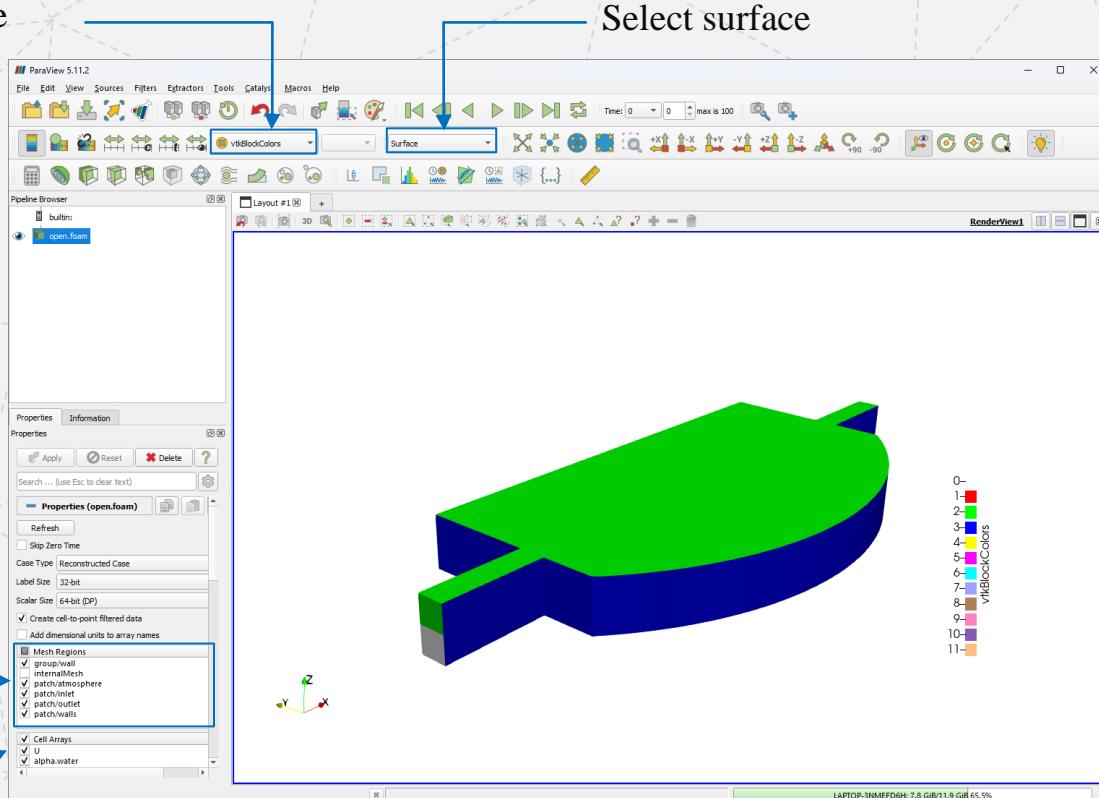
# Loading OpenFOAM simulation data

Select vtkBlockColors to visualize patches in different colors

Right click on the object and rename it to “reservoir”



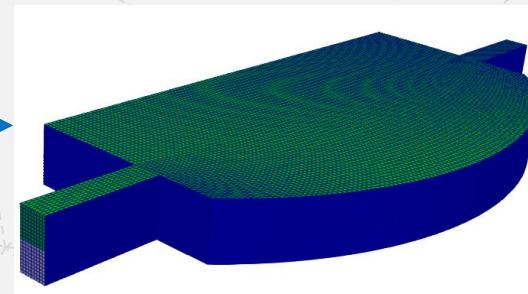
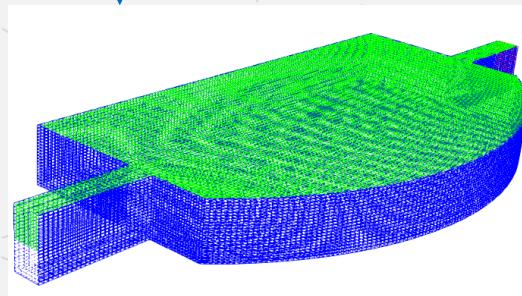
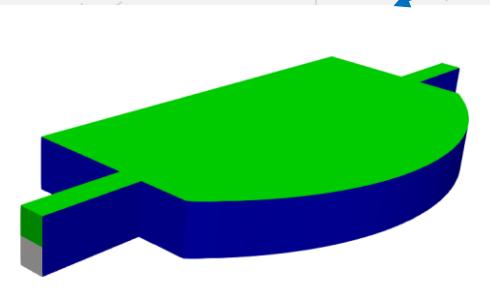
Uncheck internal mesh and check all other options



Post Processing in ParaView

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# Loading OpenFOAM simulation data



Post Processing in ParaView

Gabriel Wagner et al.

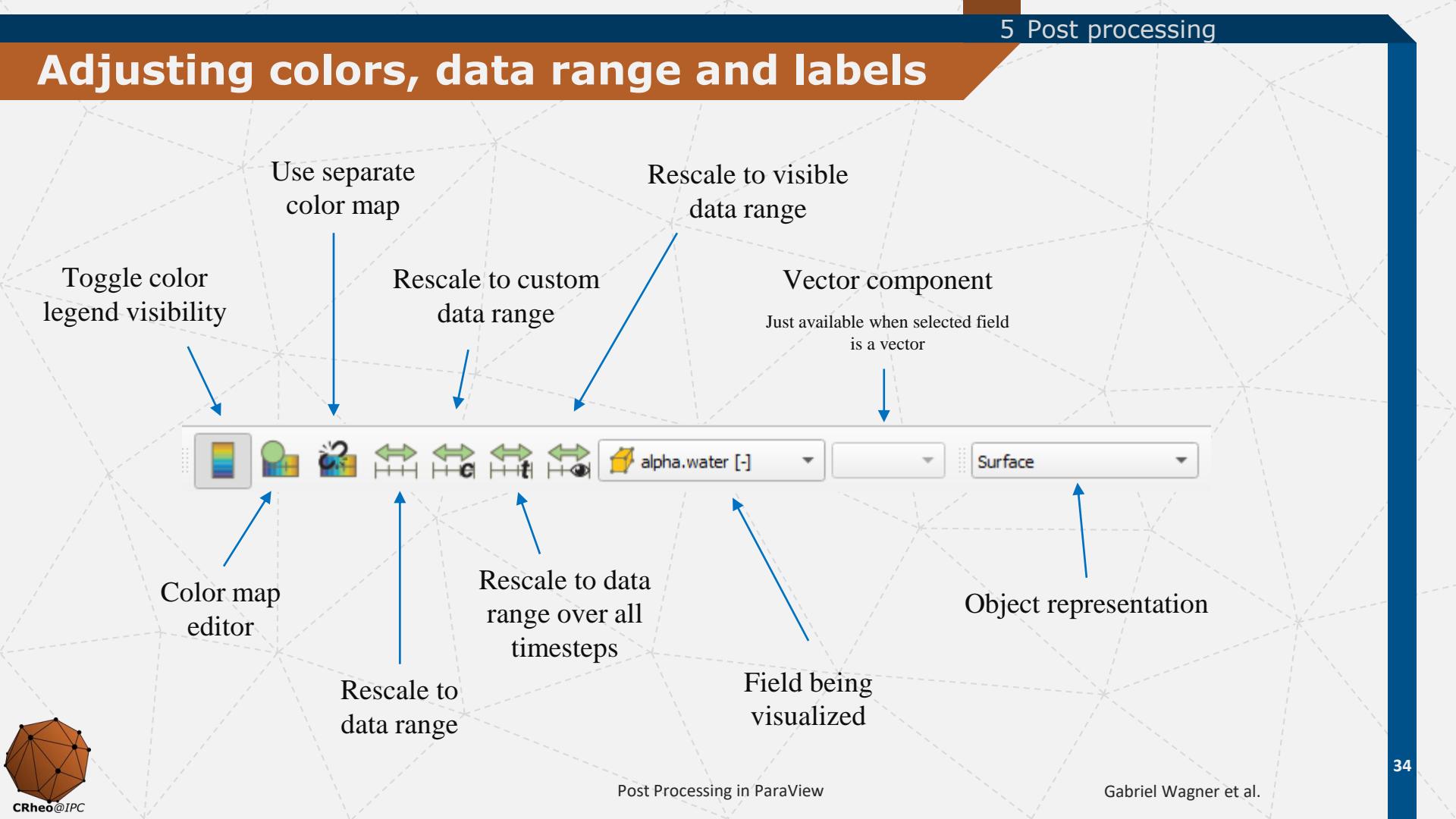
# 5

## Post processing

- Displaying scalar and vector fields
- Adjusting colors, data range and labels
- Applying Common Filters
- Select cells and show values
- Plot over line
- Probe location
- Plot selection over time

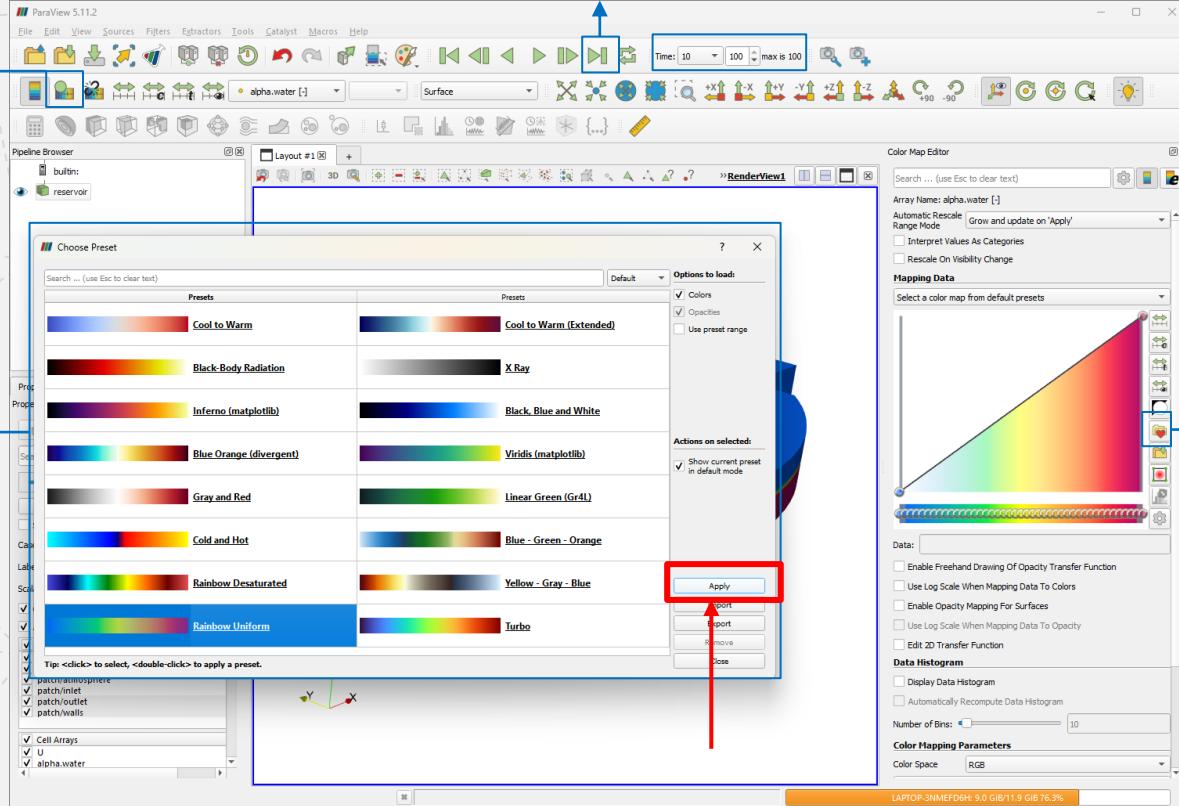


# Adjusting colors, data range and labels



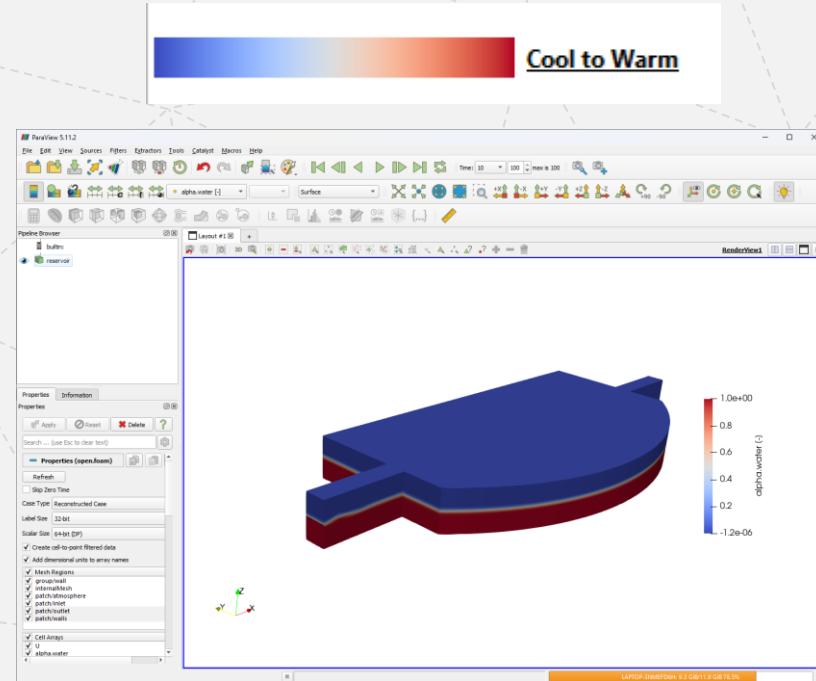
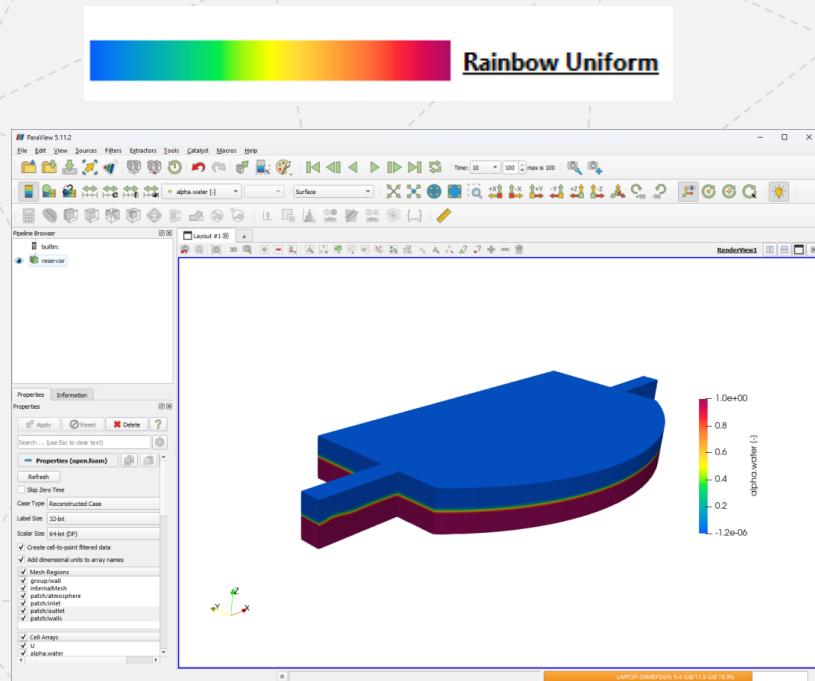
# Adjusting colors, data range and labels

1 – click on Edit color map



# Adjusting colors, data range and labels

Using different color maps

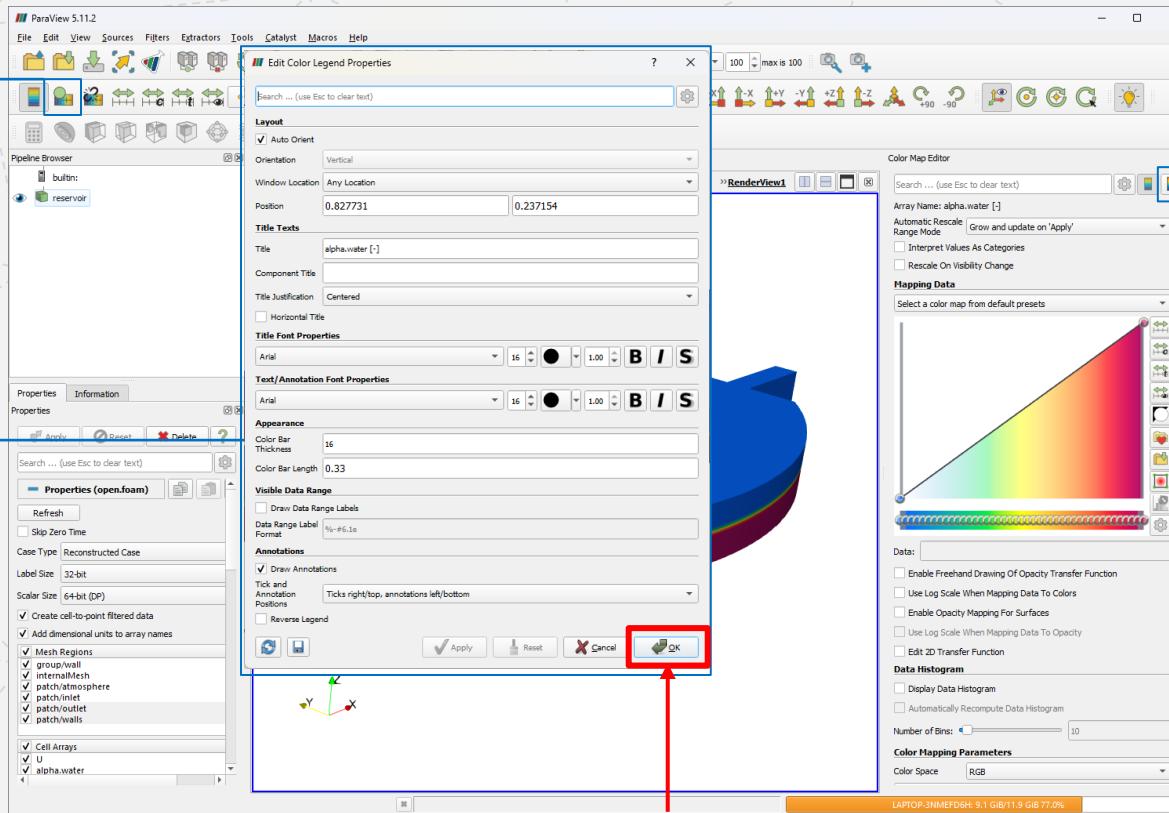


Post Processing in ParaView

Gabriel Wagner et al.

# Adjusting colors, data range and labels

1 – click on Edit color map

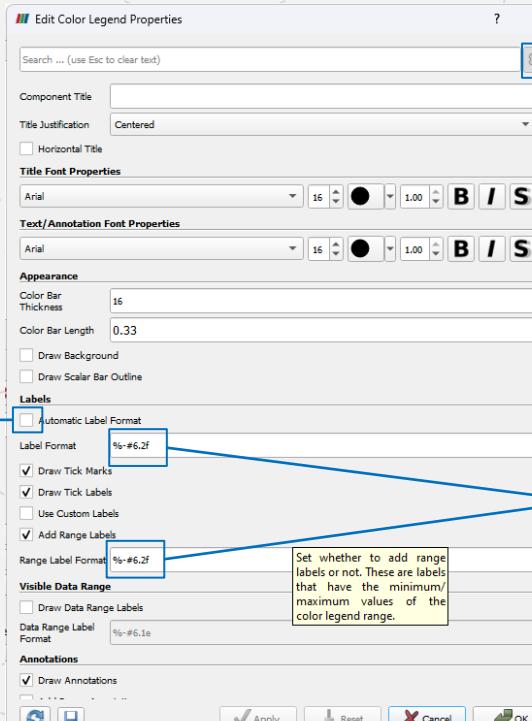


3 – define color legend properties and click Ok

2 – click on Edit color legend properties

# Adjusting colors, data range and labels

Option to edit Data Range label format

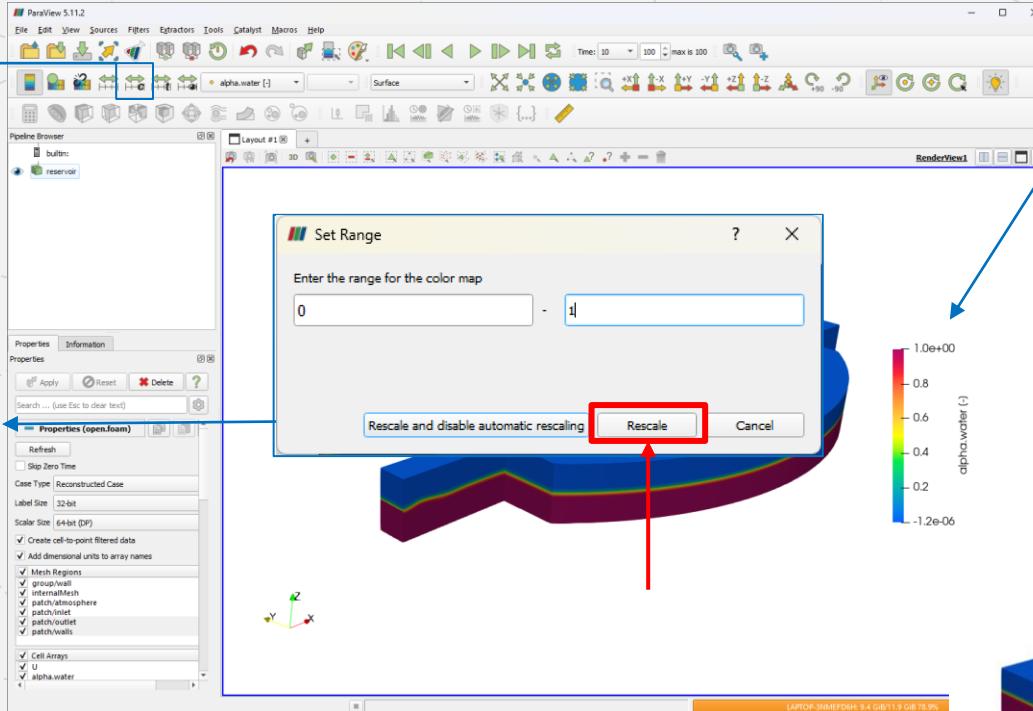


Post Processing in ParaView

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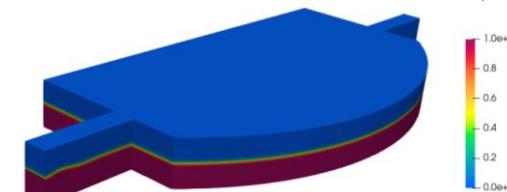
# Adjusting colors, data range and labels

1 – click on Rescale to custom data range



Previous data range

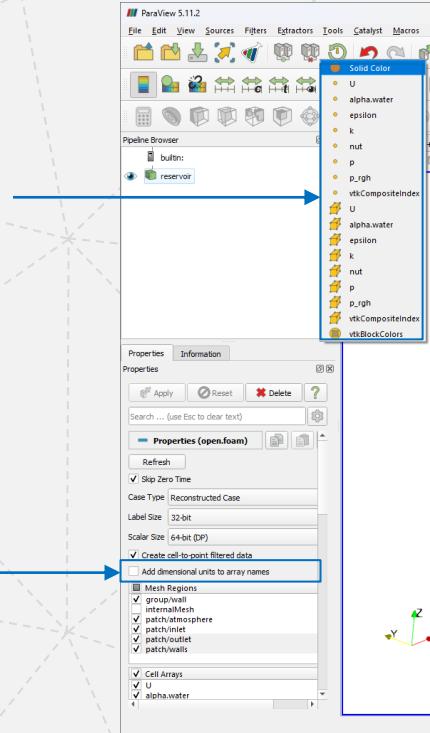
3 – New data range



Post Processing in ParaView

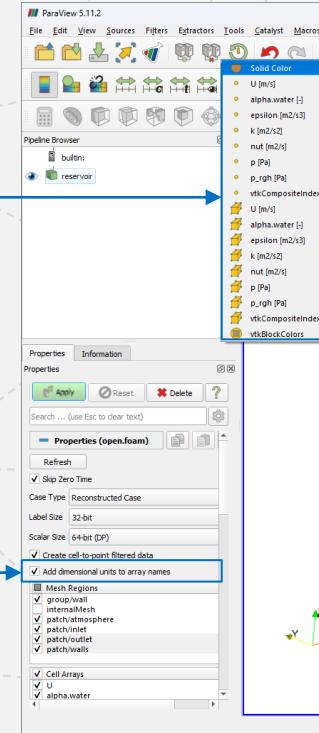
# Displaying scalar and vector fields

Fields without units



Keep it unchecked

Fields with units



Check and click

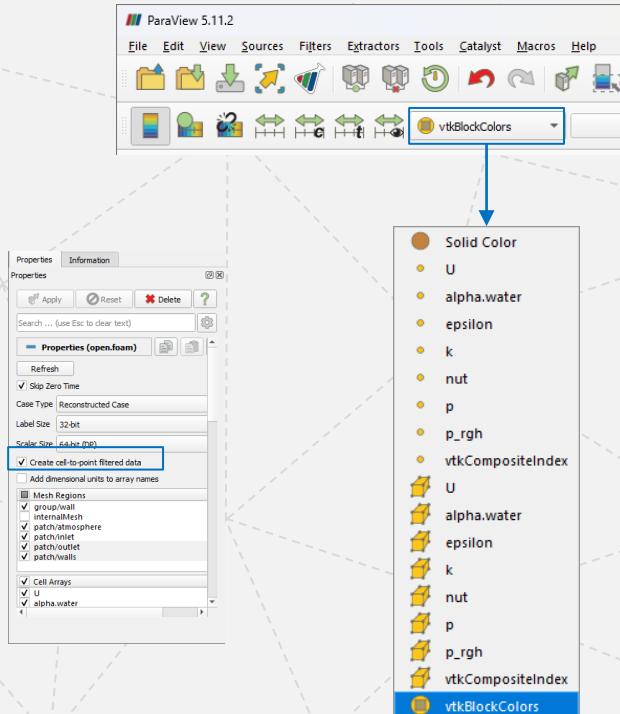


Post Processing in ParaView

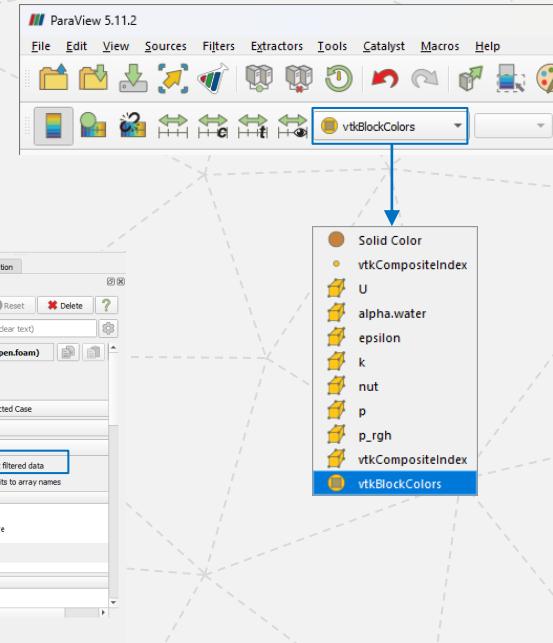
# Displaying scalar and vector fields

By keeping the “Create cell-to-point filtered data” checked, fields with interpolated data between cells are available

• Point Data - interpolated



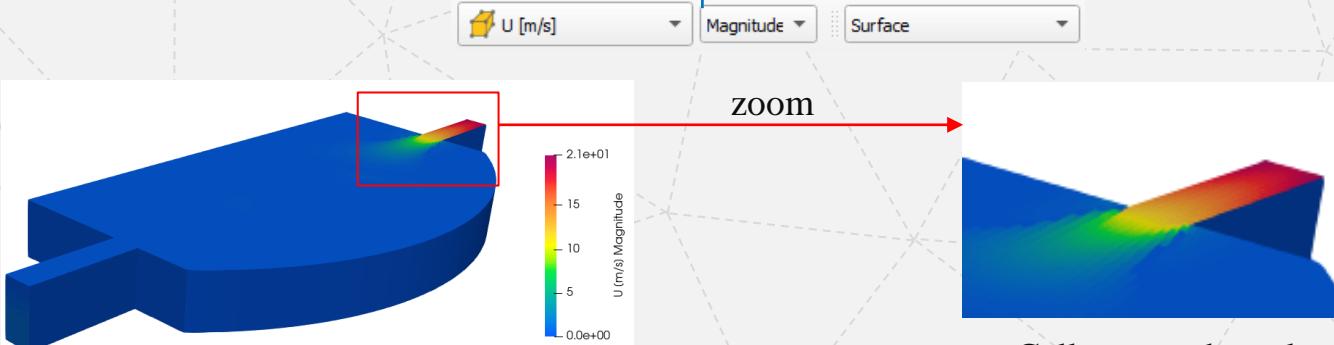
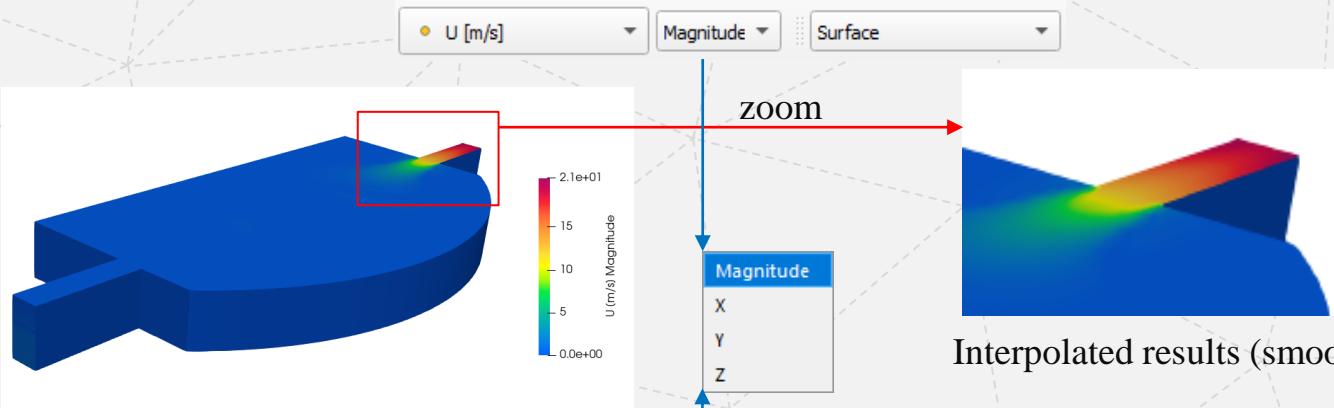
Cell Data



Post Processing in ParaView

Gabriel Wagner et al.

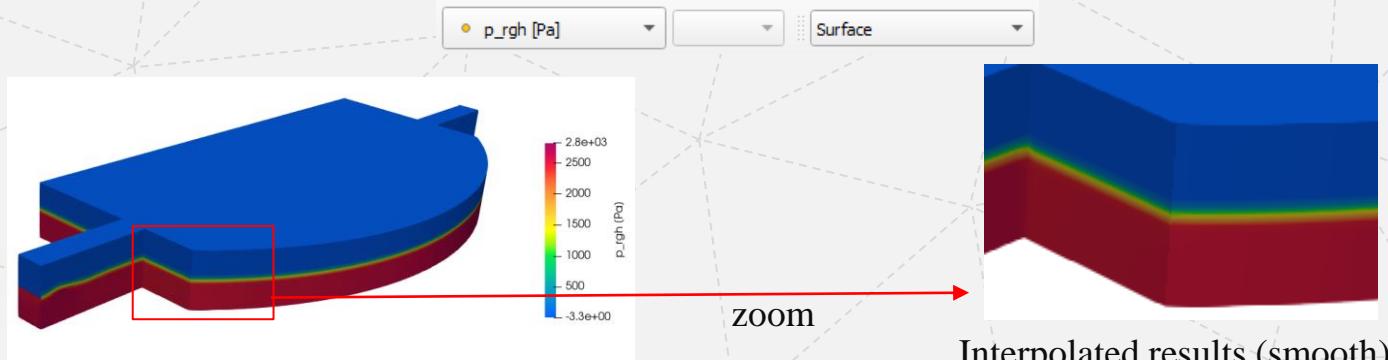
# Displaying scalar and vector fields



Post Processing in ParaView

Gabriel Wagner et al.

# Displaying scalar and vector fields



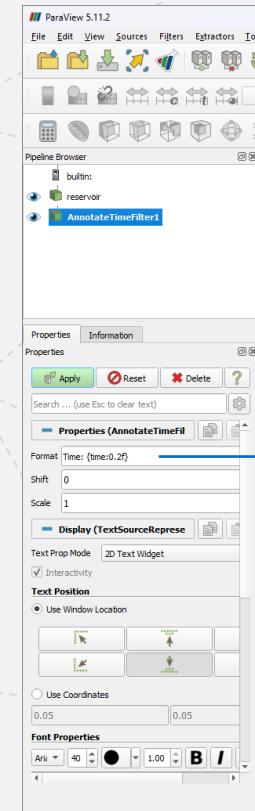
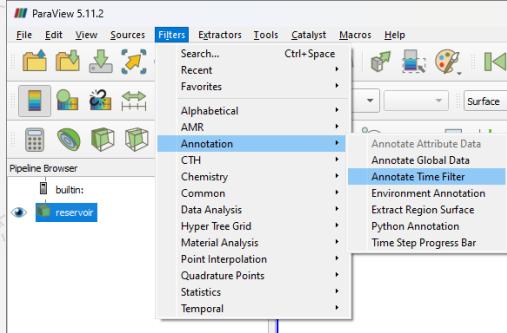
Post Processing in ParaView

Gabriel Wagner et al.

# Applying filters

- Select the reservoir object in the pipeline browser
- Select the Annotate Time Filter in the menu bar

*Filters > Annotation > Annotate Time Filter*



# Annotate time filter

Define format as  
“Time: {time:0.2f}”

0.2 means it will contain 2 decimal numbers

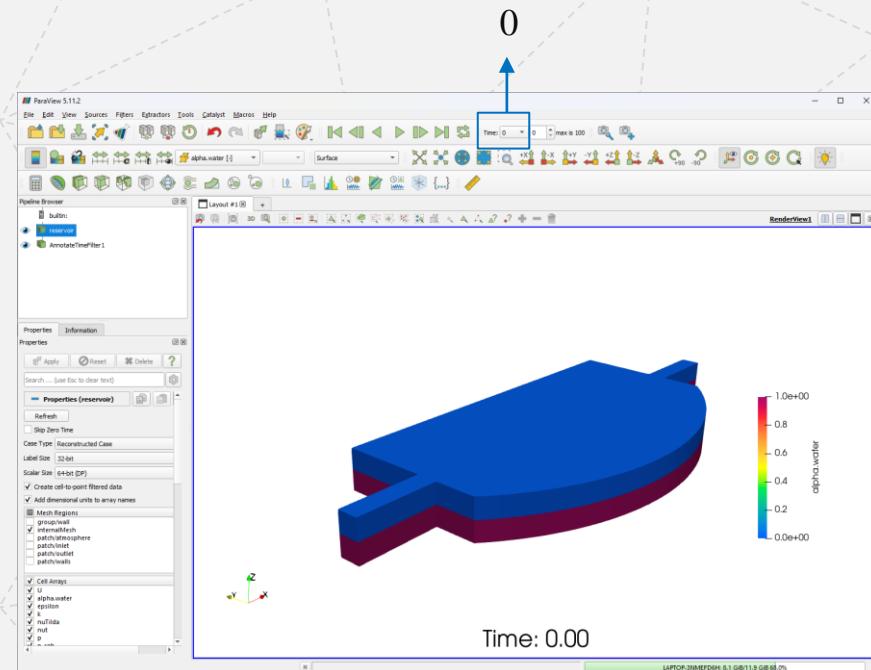
Location in Canvas

Define font properties

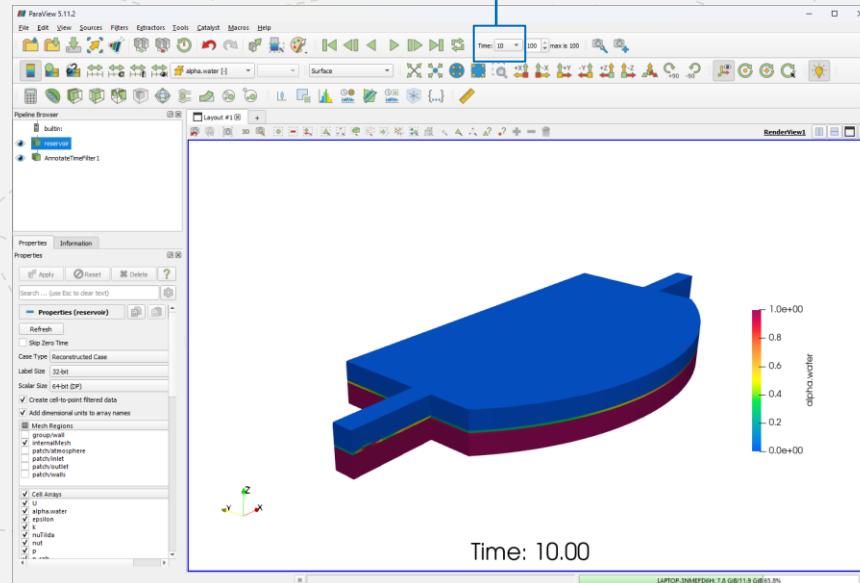
# Applying filters

## Annotate time filter

Time will be displayed in the canvas according to the instant of time being visualized



Post Processing in ParaView

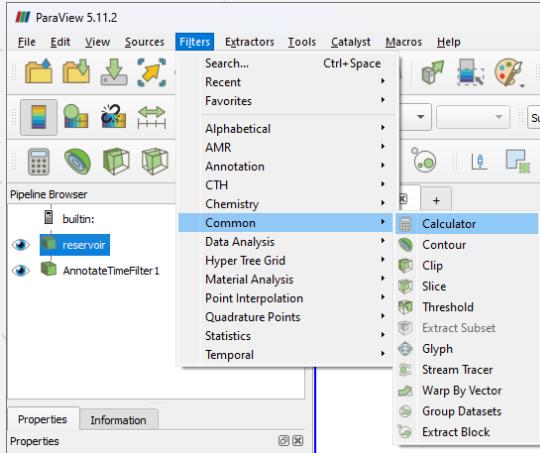


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# Applying filters

- Select the reservoir object in the pipeline browser
- Select the Calculator filter in the menu bar

*Filters > Common > Calculator*



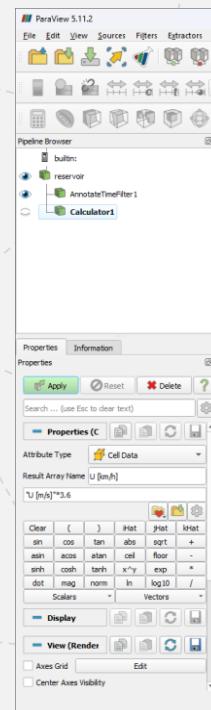
Or select the object and click in the calculator filter above Pipeline Browser



Post Processing in ParaView

# Calculator

Creates an variable field according to an expression



Define if it is point data or cell data

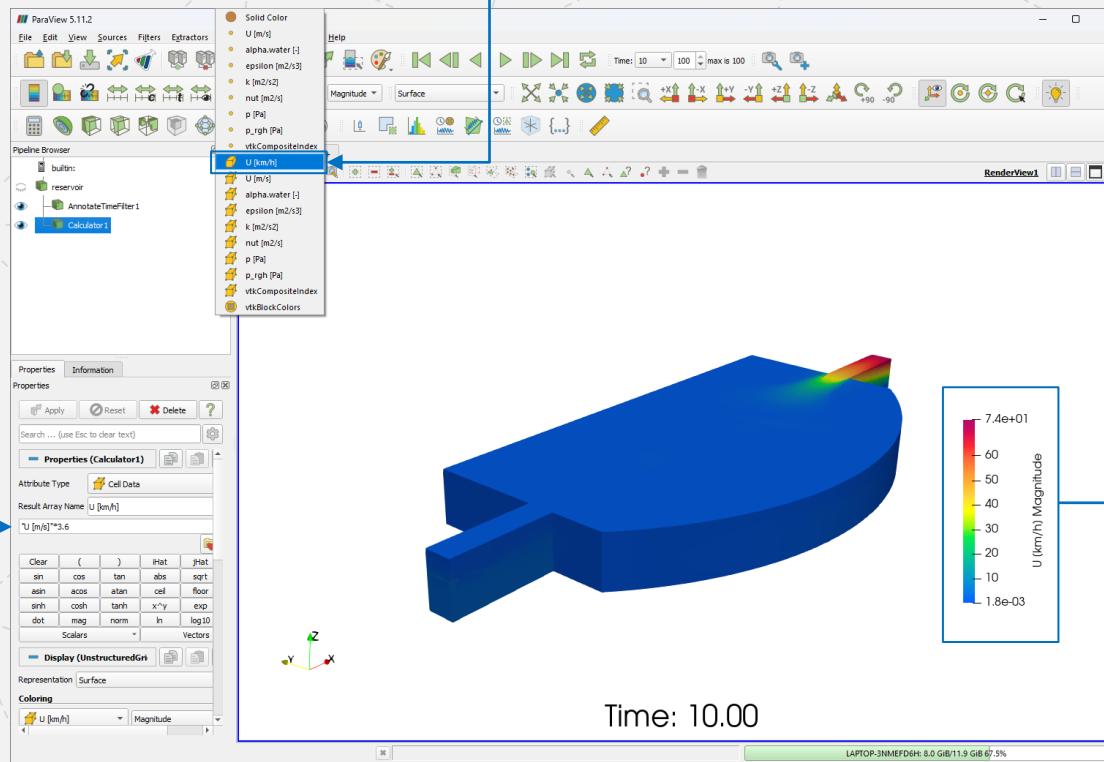
Name – U [km/h]

Equation

# Applying filters

# Calculator

Created variable – U [km/h]



"U[m/s]"\*3.6

Data range  
in km/h



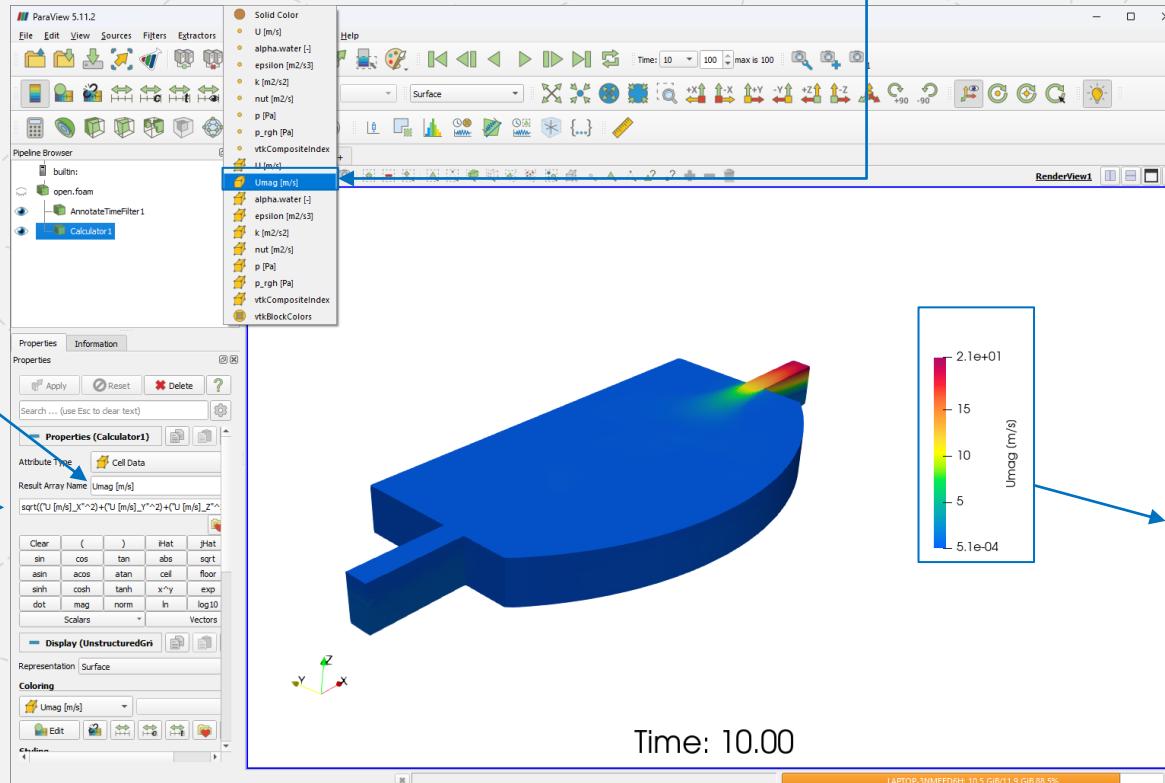
# Applying filters

## Calculator

Created variable calculating the magnitude of velocity – Umag [m/s]

Umag [m/s]

$\text{sqrt}((\text{U [m/s]}_{\text{X}})^2 + (\text{U [m/s]}_{\text{Y}})^2 + (\text{U [m/s]}_{\text{Z}})^2)$

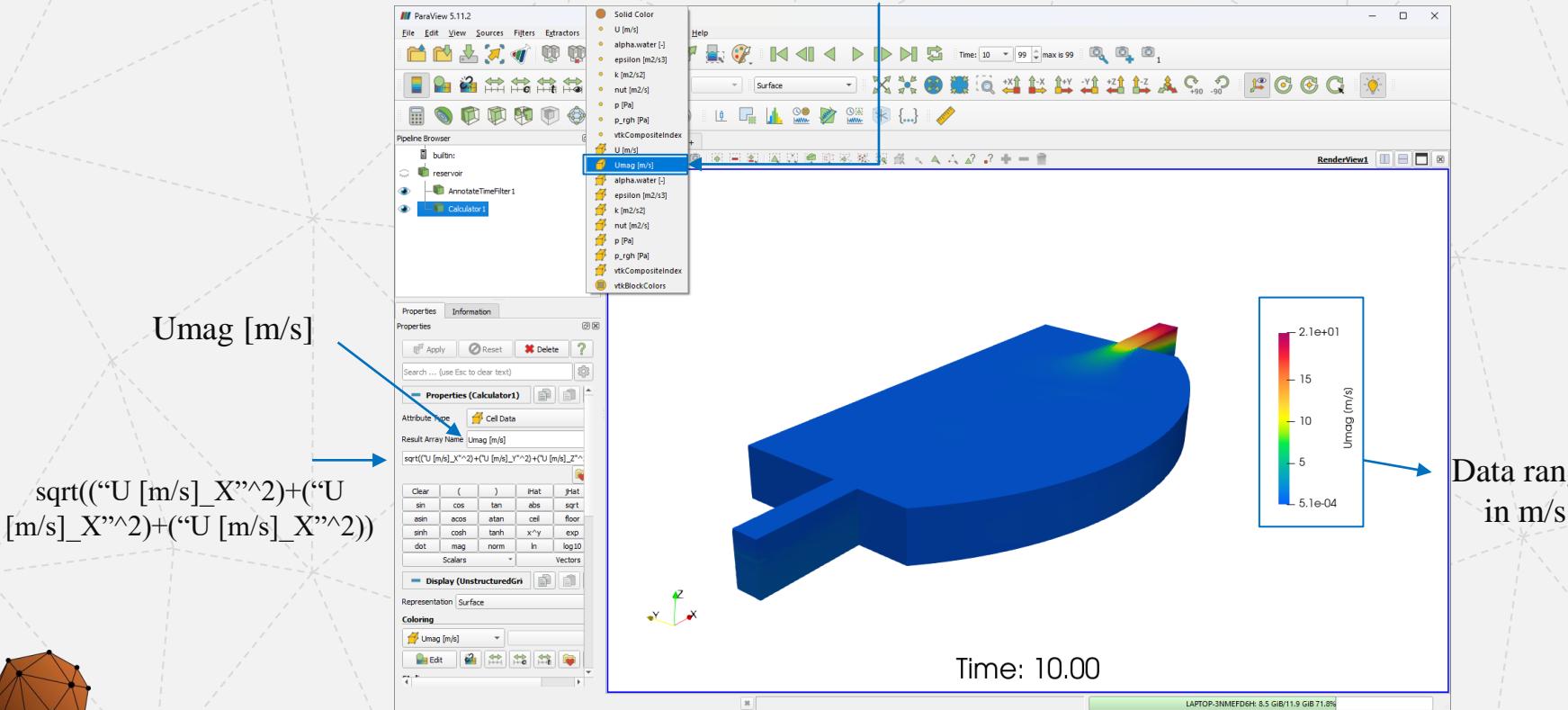


Data range  
in m/s

# Applying filters

## Calculator

Created variable calculating the magnitude of velocity – Umag [m/s] – it is the same as field U [m/s] magnitude

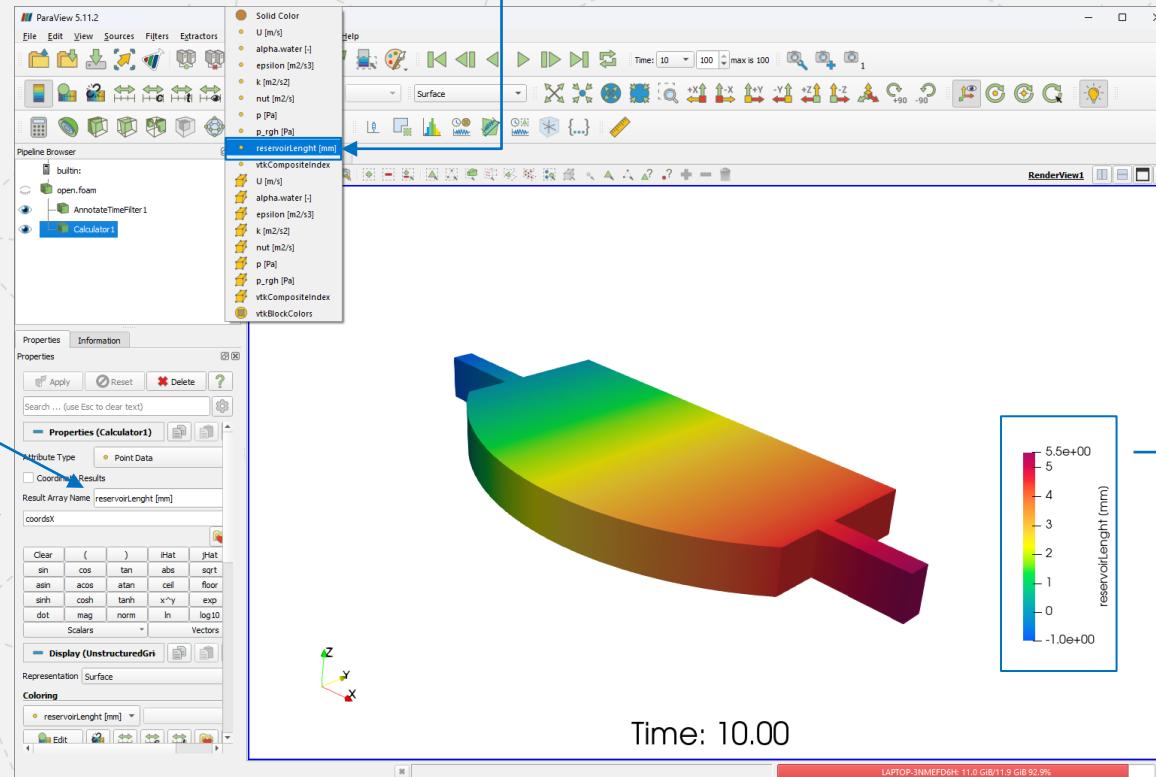


# Applying filters

# Calculator

reservoirLength  
[mm]

coordsX



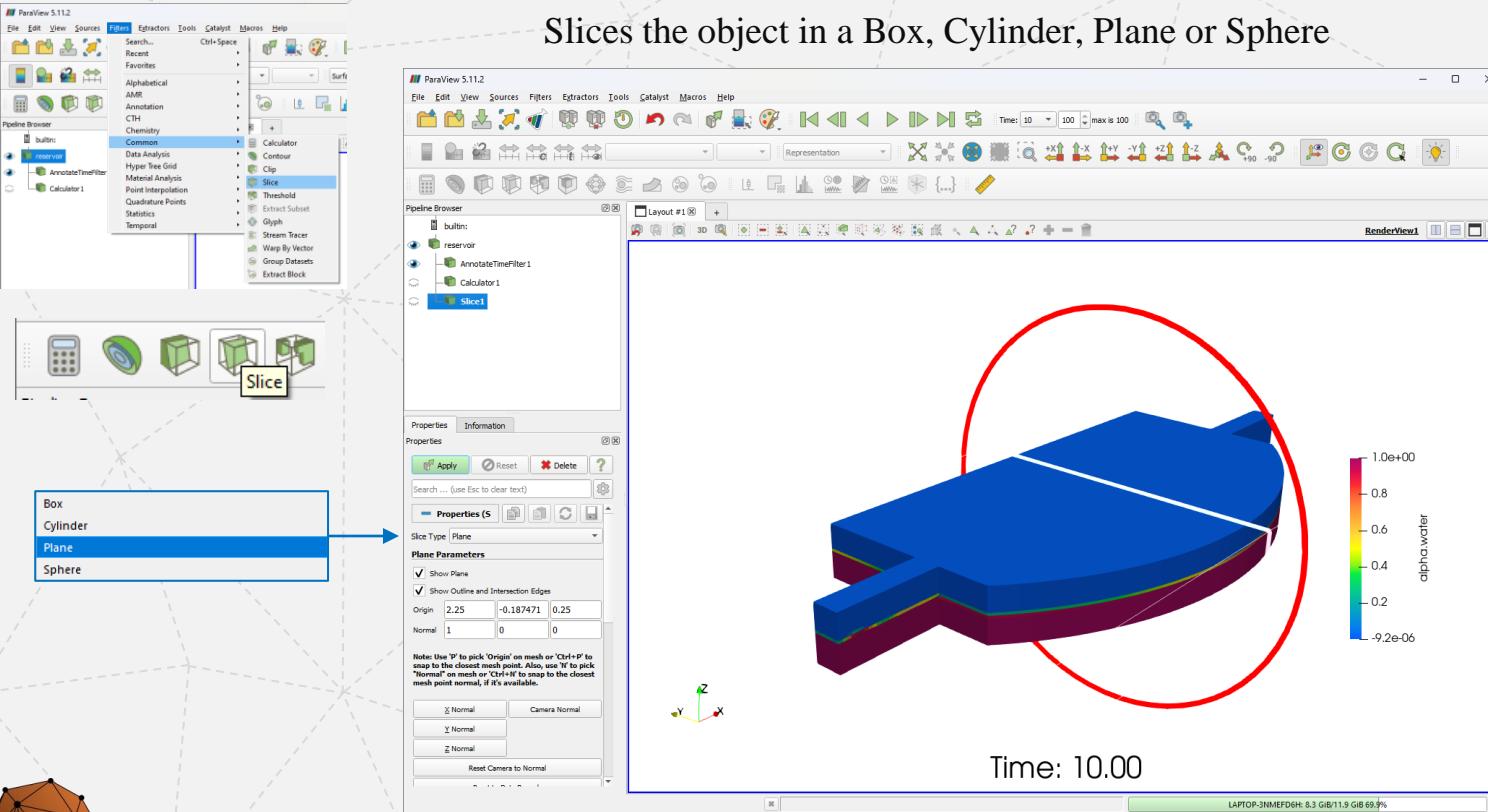
Time: 10.00

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# Applying filters

## Slice

Slices the object in a Box, Cylinder, Plane or Sphere



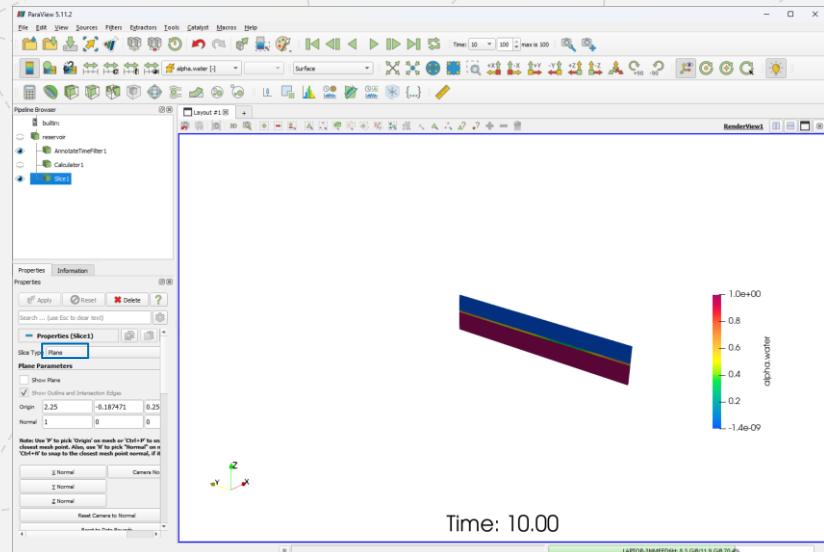
Post Processing in ParaView

Gabriel Wagner et al.

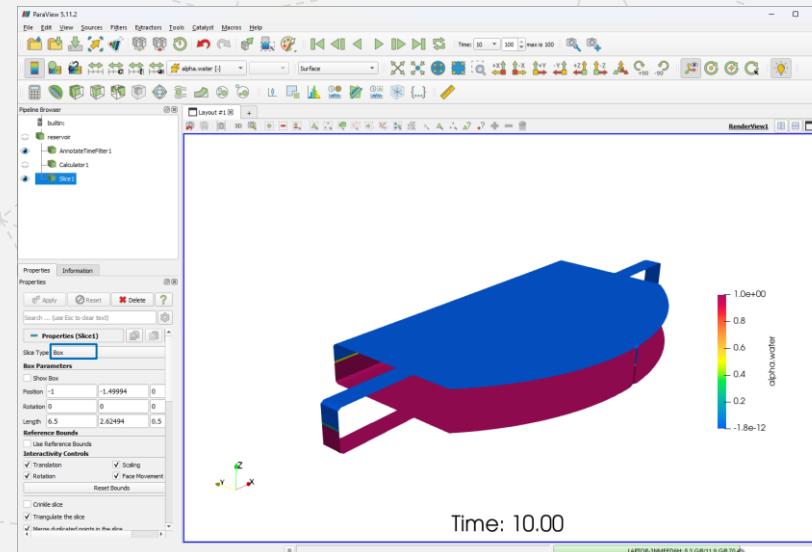
# Applying filters

**Slice**

**Slice - Plane**



**Slice - Box**

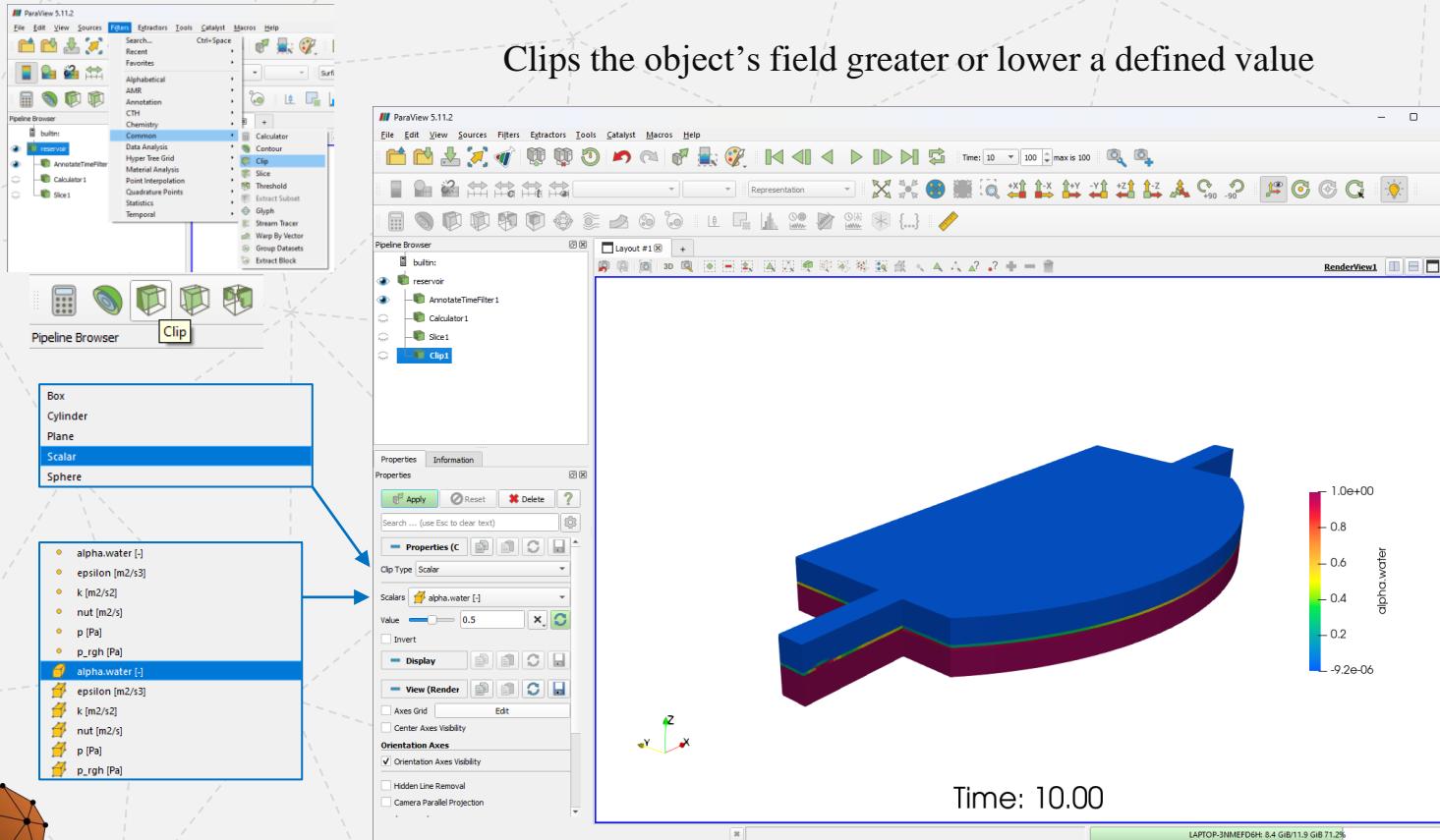


Post Processing in ParaView

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# Applying filters

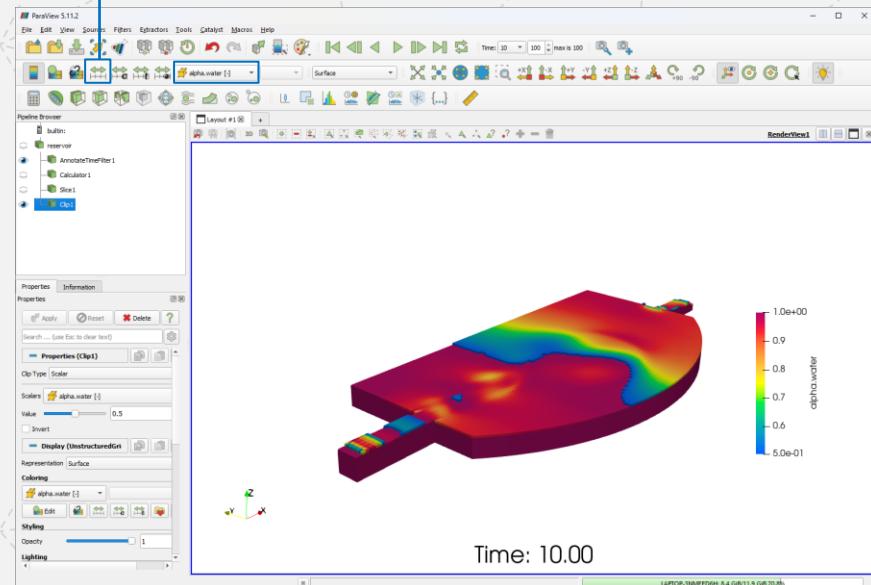
# Clip



# Applying filters

Click Rescale to Data Range

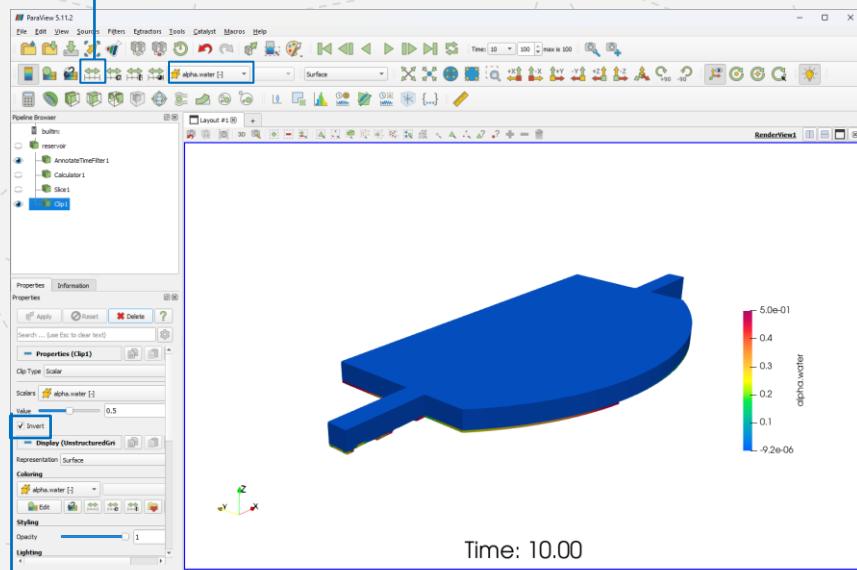
Clip – alpha.water greater than 0.5



Clip

Click Rescale to Data Range

Clip – alpha.water smaller than 0.5



Check “Invert”

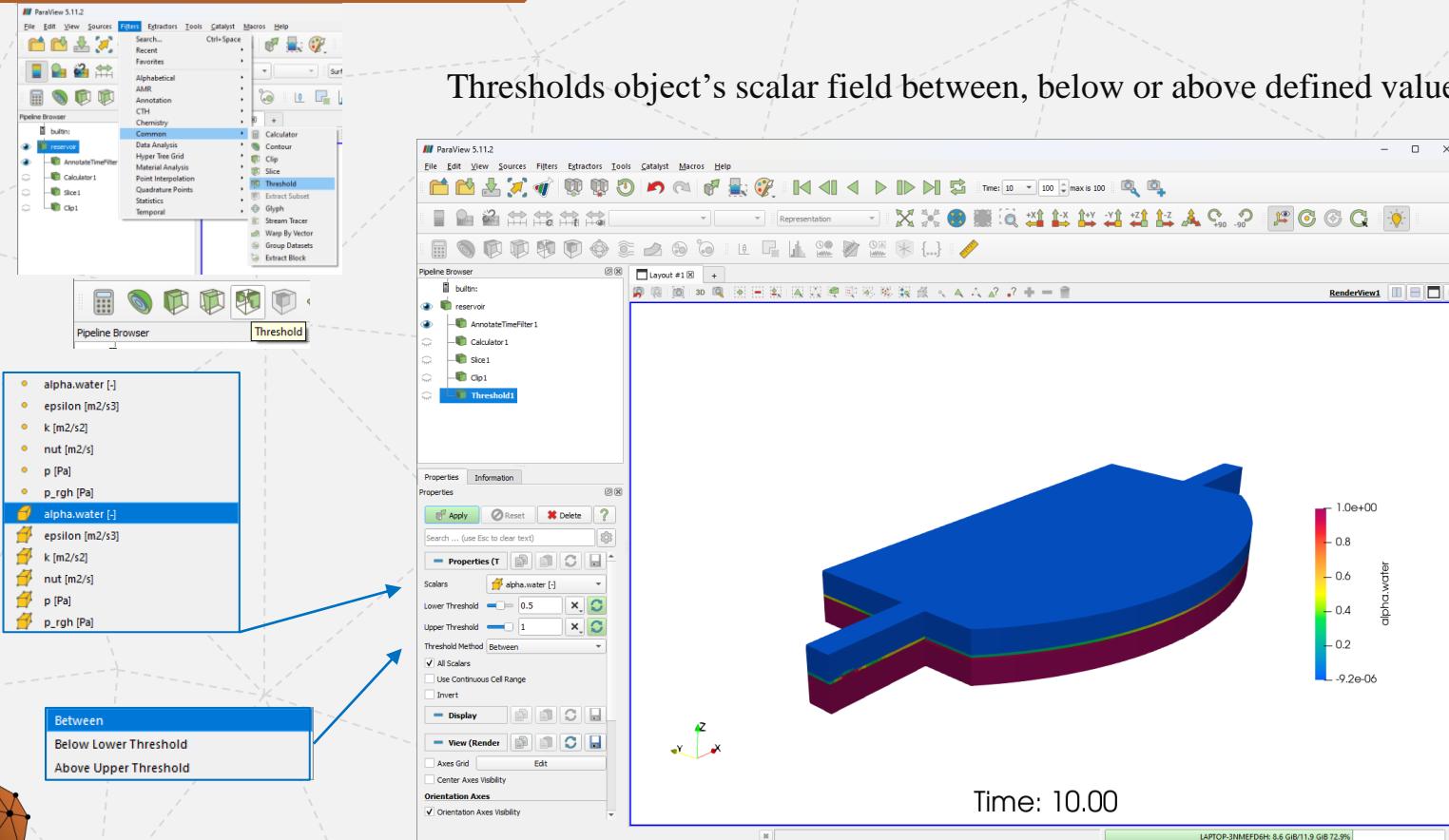
Post Processing in ParaView

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# Applying filters

## Threshold

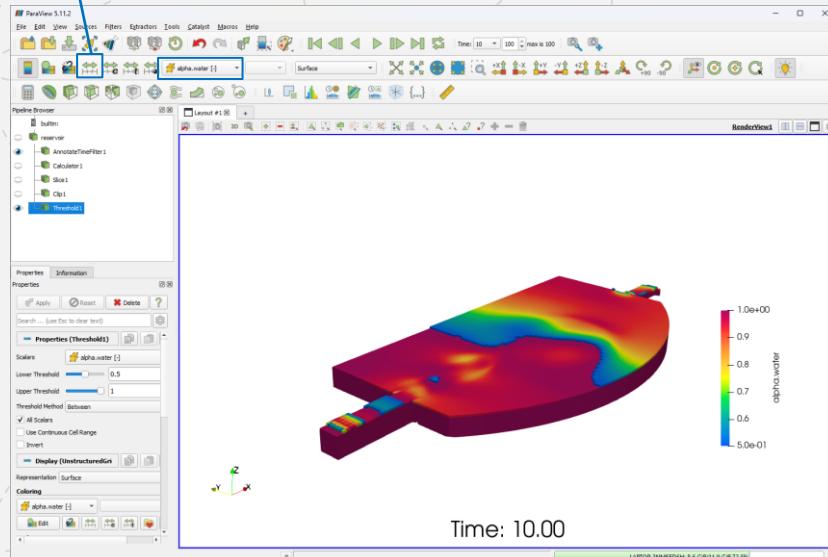
Thresholds object's scalar field between, below or above defined value



# Applying filters

Click Rescale to Data Range

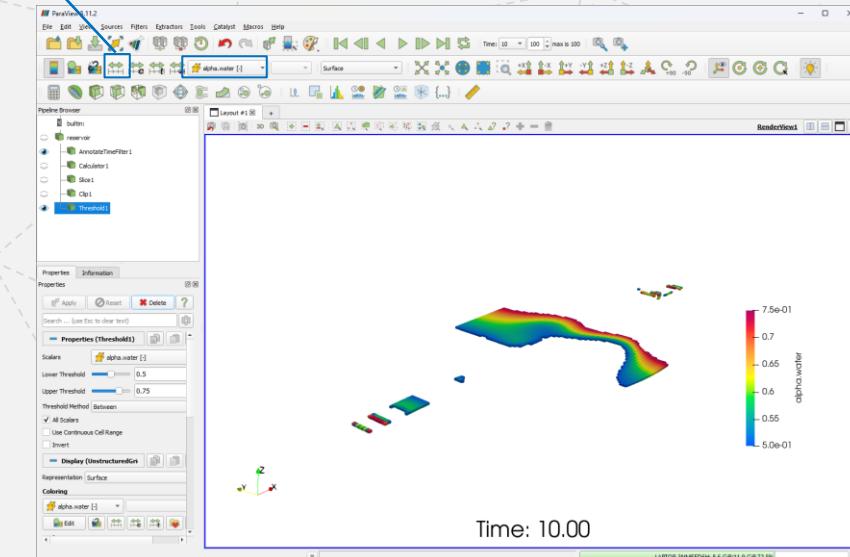
Threshold – alpha.water between 0.5 and 1



This is similar to clip > 0.5, since alpha.water values varies from 0 to 1

Click Rescale to Data Range

Threshold – alpha.water between 0.5 and 0.75



Post Processing in ParaView

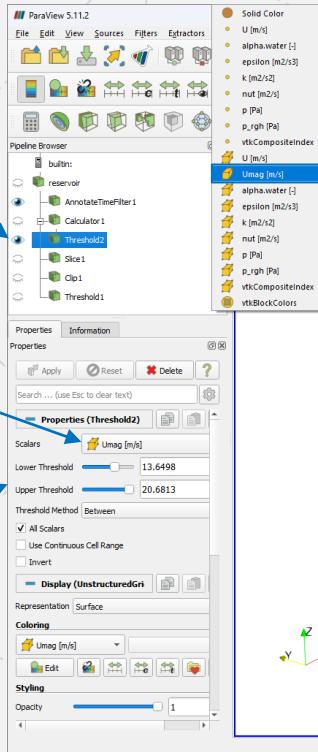
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# Applying filters

## Threshold

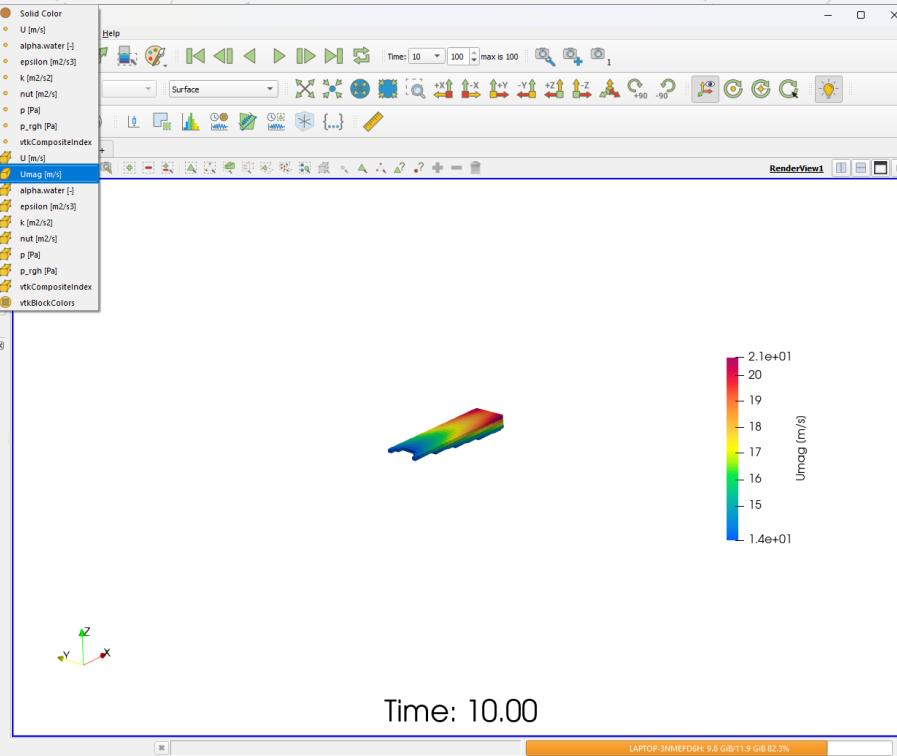
- Select the “calculator1” filter in the pipeline browser
- Select the Threshold filter in the menu bar

Define threshold to scalar Umag [m/s]



Define threshold range

Threshold to calculated Umag scalar field



Post Processing in Paraview

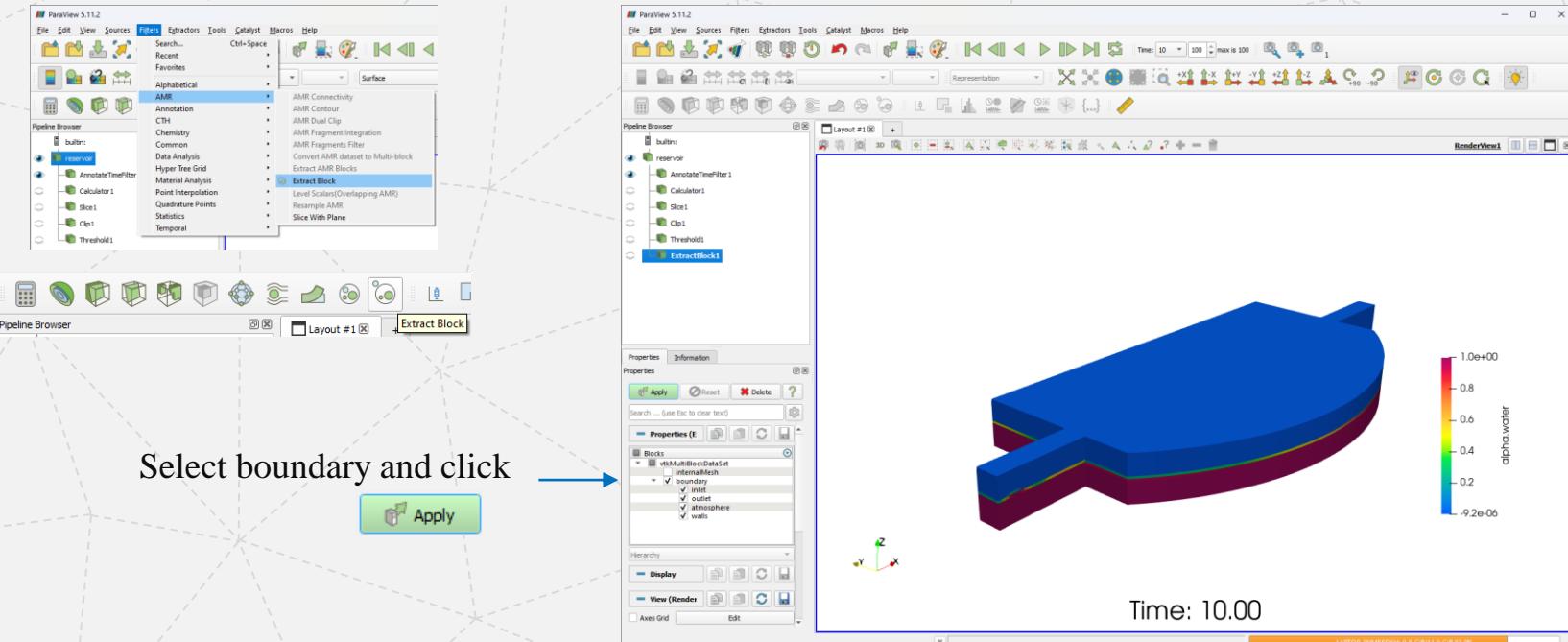
Gabriel Wagner et al.

# Applying filters

## Extract block

Extracting blocks allows you to obtain different objects from the same object.

It is particularly helpfull to analyse surface, and if you want to apply filter to the internal mesh and visualize surfaces.

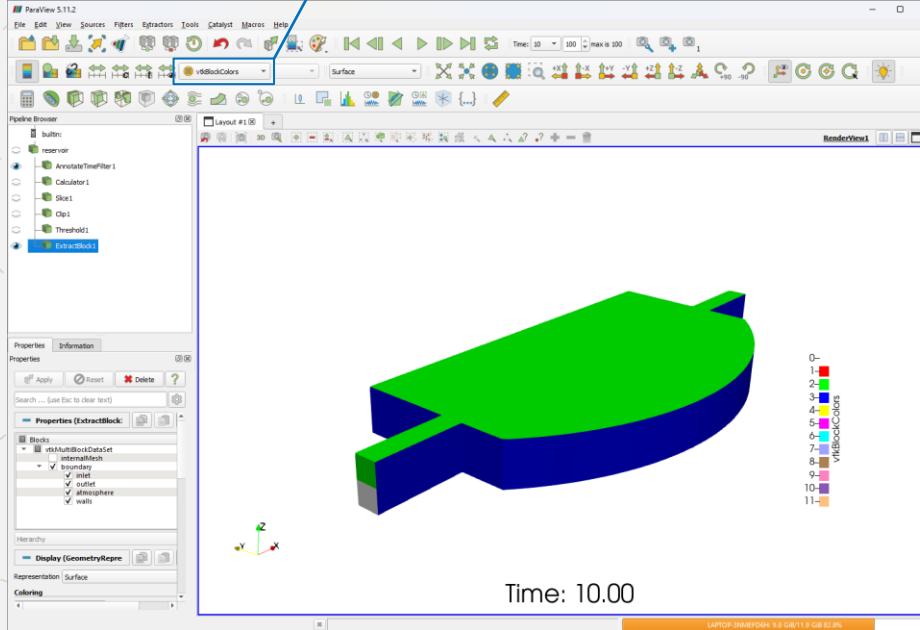


# Applying filters

## Extract block

By that, you have created ExtractBlock1 by extracting all the surfaces of your object.

Select coloring *vtkBlockColors* to visualize.



Post Processing in ParaView

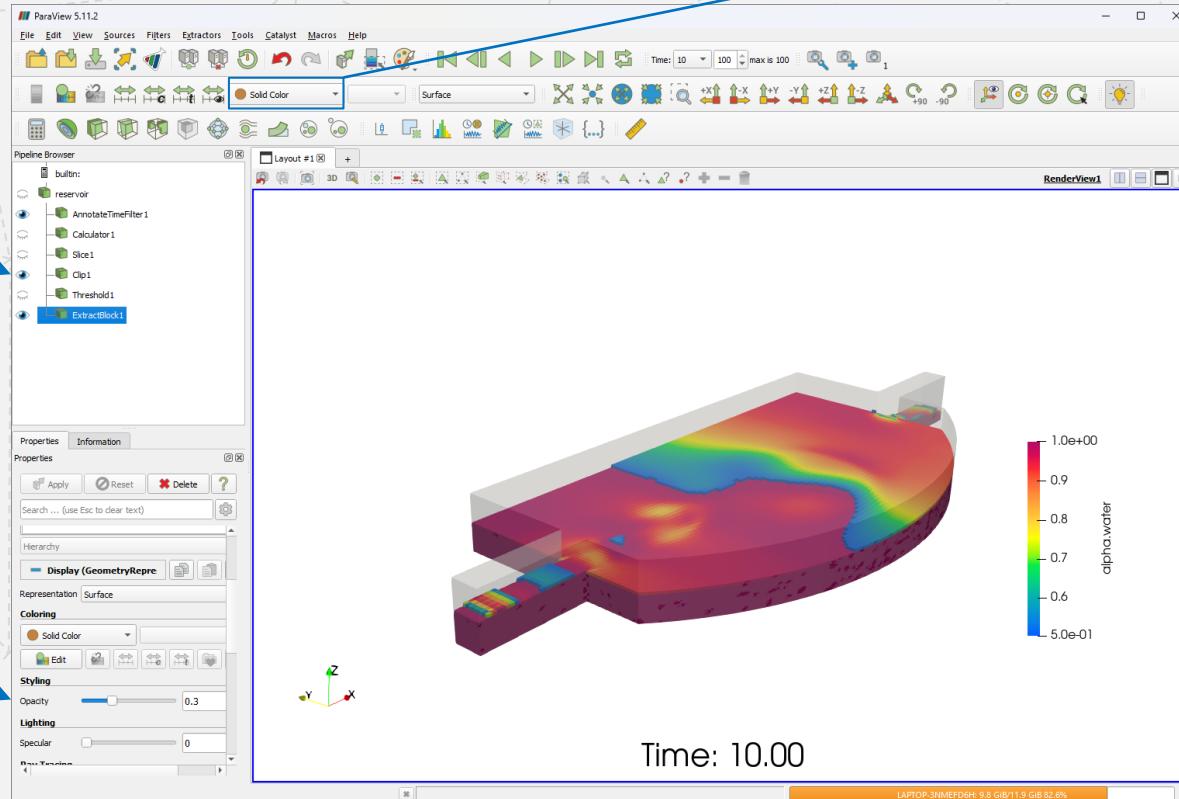
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# Applying filters

## Extract block

Enable Clip1 visualization

Select ExtractBlock1 coloring to *Solid Color*

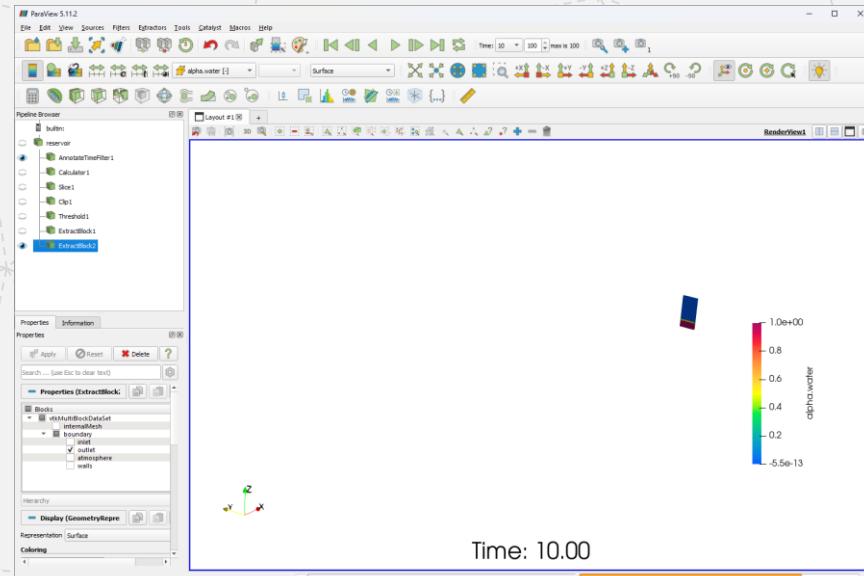
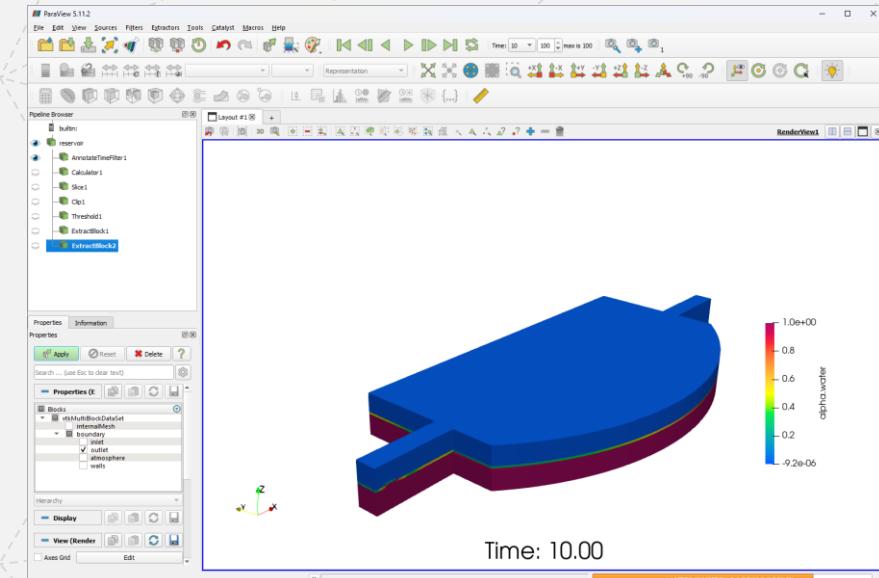


Set ExtractBlock1 opacity to 0.3

# Applying filters

# Extract block

Create new extract block just with the Outlet patch to analize it.



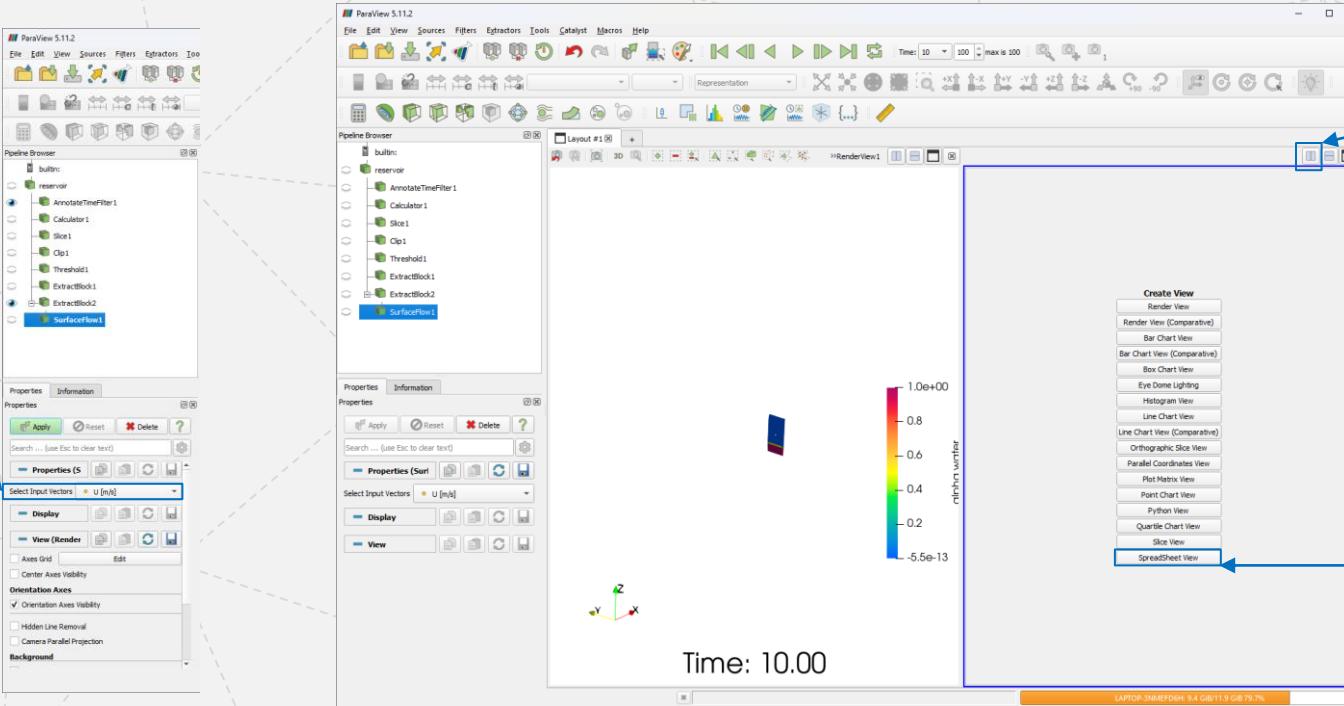
Post Processing in ParaView

Gabriel Wagner et al.

# Applying filters

## Extract block – surface flow

Use the *Surface Flow* filter in the ExtractBlock2 and open it in a SpreadSheet view

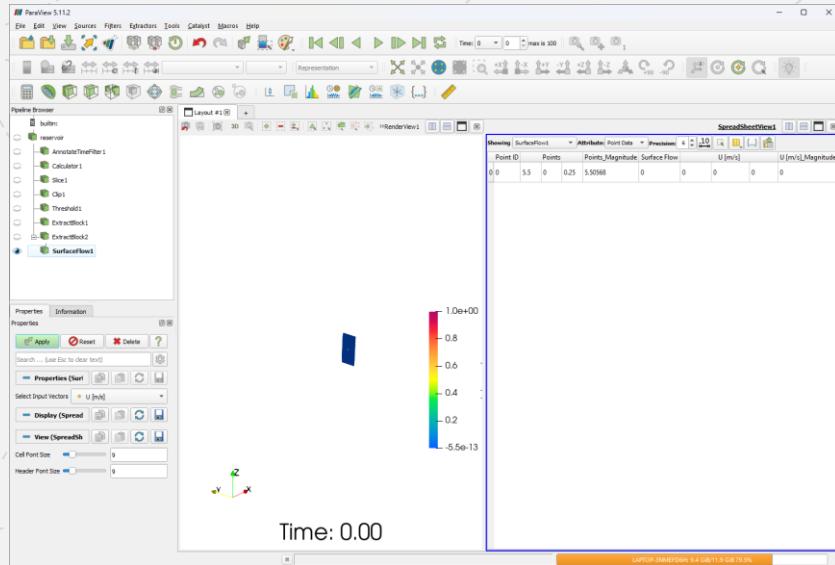


1 – split view in horizontal

2 – select  
SpreadSheet  
View

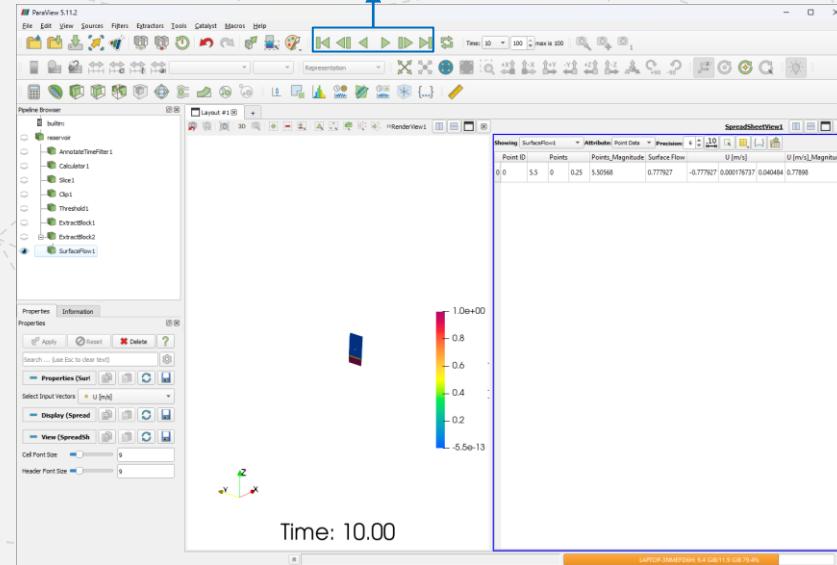
# Applying filters

With that, you can obtain Surface flow and velocity data for the current instant of time.



# Extract block – surface flow

Move forward or backward in time to visualize data for all instants of time



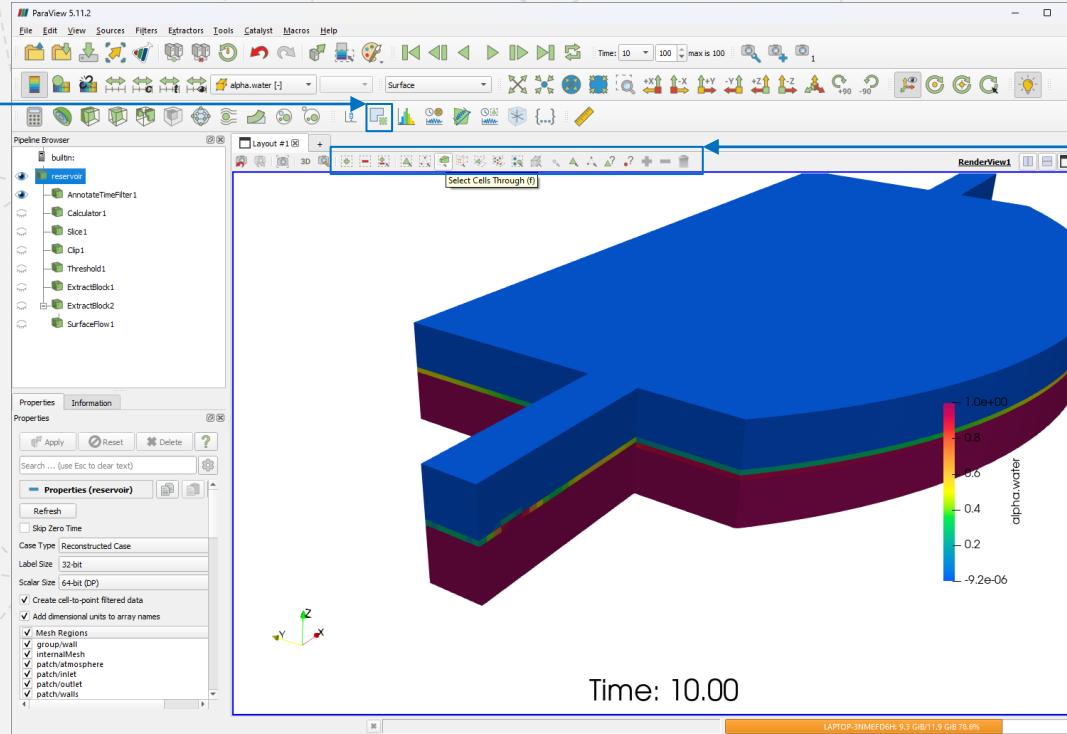
# Applying filters

## Extract selection

*Extract Selection* allow you to extract regions and analyse them independently. Use selection methods to identify the desired region, and apply the *Extract Selection* filter.

Extract Selection  
filter

Selection methods



# Applying filters

## Extract selection

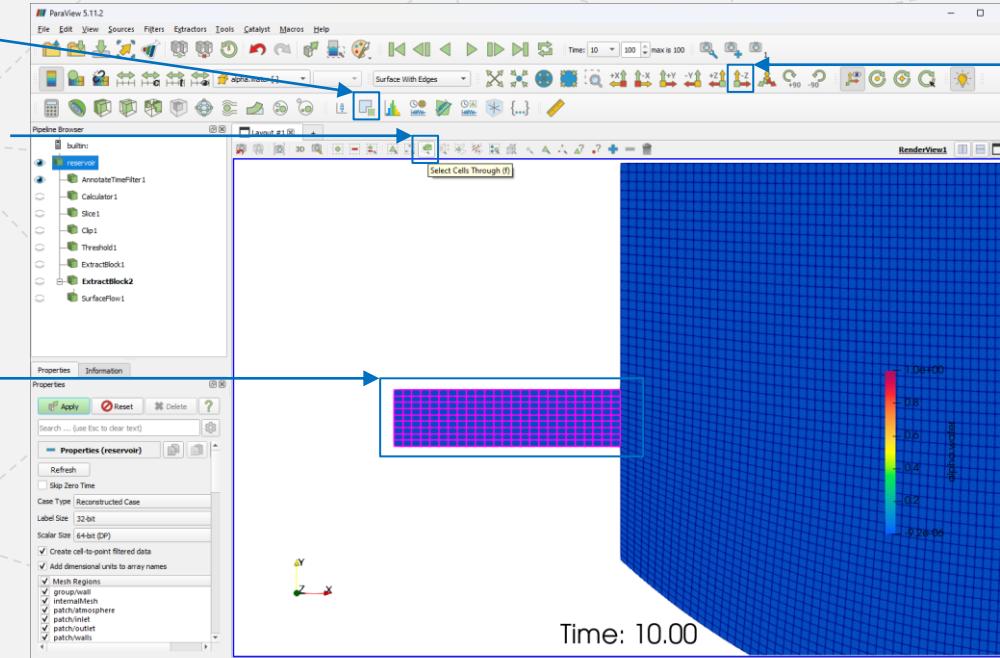
*Extract Selection* allow you to extract regions and analyse them independently. Use selection methods to identify the desired region, and apply the *Extract Selection* filter.

4 - Extract Selection

2 - Use “Select Cells Through”

3 - Select this region

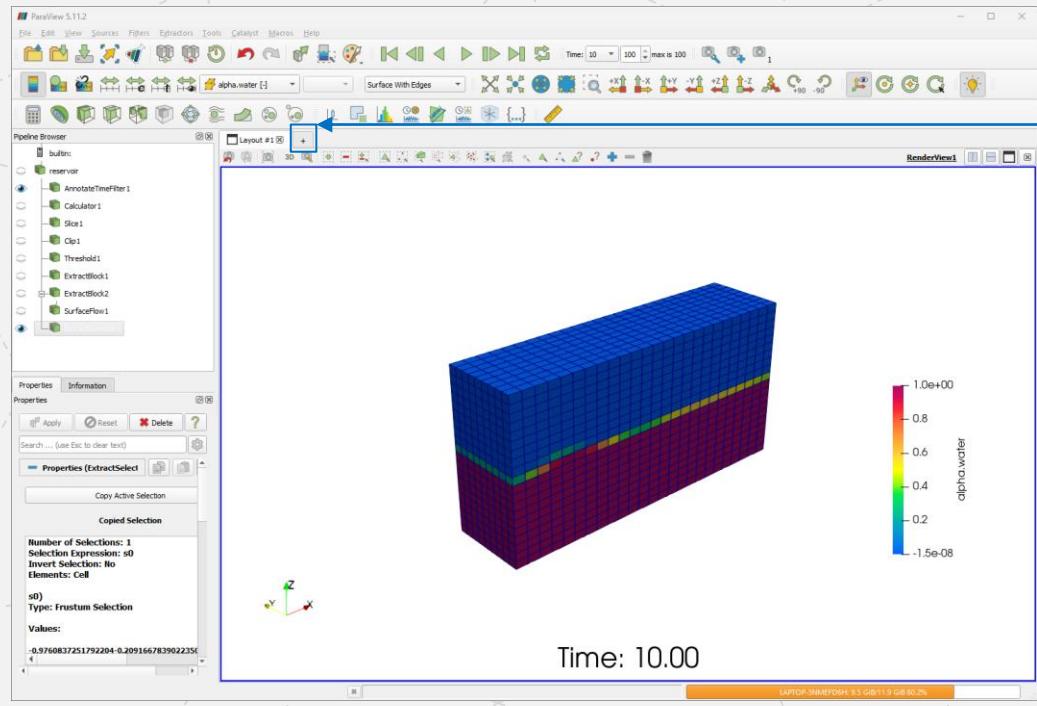
1 - Change view



Post Processing in Paraview

Gabriel Wagner et al.

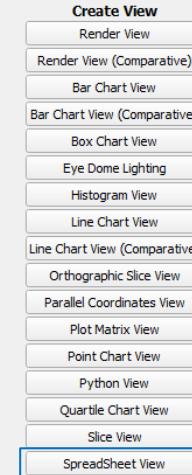
# Applying filters



Post Processing in ParView

# Extract selection

Open a new tab and select SpreadSheet View



Gabriel Wagner et al.

# Applying filters

## Extract selection

Information of all the cells in the extracted selection is displayed for the current instant of time.

Move forward or backward in time to visualize data for all instants of time

The screenshot shows the ParaView interface with the following components:

- Pipeline Browser:** On the left, it lists the data sources and filters used in the pipeline. The "ExtractSelection1" filter is highlighted with a blue arrow pointing to it from the text "ExtractSelection1".
- Spreadsheet View:** On the right, it displays a table of cell data. The table has columns for Block Name, Cell ID, Type, and various physical properties like epsilon, nut, p, rho, U, and Magnitude. The table shows 18 rows of data for internal meshes 0 through 17.
- Properties Panel:** At the bottom left, it shows the properties for the selected "ExtractSelection1" filter, including the number of selections (1), the selection expression (s0), and the type (Frustum Selection).

Block Name	Cell ID	Type	epsilon [m <sup>2</sup> /s]	nut [m <sup>2</sup> /s]	p [Pa]	p_rho [Pa]	U [m/s]	U [m/s].Magnitude	
internalMesh 0	135000	Hexahedron	0.77965	0.0839346	2681.93	2804.55	1, 00505	-0.08... -0.08... 1.01203	
internalMesh 1	135001	Hexahedron	0.579298	0.0588562	2567.63	2690.25	1, 06169	-0.05... -0.06... 1.06599	
internalMesh 2	135002	Hexahedron	0.447834	0.0799888	2502.15	2624.77	1, 08541	-0.03... -0.04... 1.08692	
internalMesh 3	135003	Hexahedron	0.355388	0.0497136	2492.62	2615.24	1, 07381	-0.02... -0.02... 1.07439	
internalMesh 4	135004	Hexahedron	0.287586	0.0431703	2492.63	2615.25	1, 05001	-0.01... -0.01... 1.05021	
internalMesh 5	135005	Hexahedron	0.23647	0.078897	2488.14	2610.77	1, 02763	-0.00... -0.01... 1.0277	
internalMesh 6	135006	Hexahedron	0.197286	0.033789	2481.44	2604.06	1, 0096...	-0.00... -0.00... 1.00966	
internalMesh 7	135007	Hexahedron	0.166897	0.0300354	2474.8	2597.43	0, 995644	0, 0017...	-0.00... 0.995677
internalMesh 8	135008	Hexahedron	0.143072	0.027104	2468.31	2590.93	0, 984836	0, 0022...	-0.00... 0.984864
internalMesh 9	135009	Hexahedron	0.124163	0.024597	2462	2584.63	0, 975944	0, 002...	-0.00... 0.975964
internalMesh 10	135010	Hexahedron	0.108948	0.0280616	2456.47	2579.09	0, 97545	0, 0021...	-0.00... 0.967558
internalMesh 11	135011	Hexahedron	0.0965312	0.0208498	2452.29	2574.92	0, 95863	0, 0019...	-0.00... 0.959637
internalMesh 12	135012	Hexahedron	0.0862581	0.0193429	2449.61	2572.23	0, 948901	0, 0016...	-0.00... 0.948904
internalMesh 13	135013	Hexahedron	0.0776571	0.0183046	2448.16	2570.78	0, 938686	0, 0014...	-0.00... 0.938688
internalMesh 14	135014	Hexahedron	0.0703872	0.0168906	2447.49	2570.12	0, 928656	0, 0013...	-0.00... 0.928657
internalMesh 15	135015	Hexahedron	0.0641981	0.0158853	2447.11	2569.73	0, 919519	0, 001...	-0.00... 0.91952
internalMesh 16	135016	Hexahedron	0.0589801	0.0149989	2446.58	2569.21	0, 911785	0, 001...	-0.00... 0.911786
internalMesh 17	135017	Hexahedron	0.0543427	0.0142154	2445.61	2568.23	0, 905634	0, 001...	-0.00... 0.905635
internalMesh 18	135018	Hexahedron	0.0504142	0.0103521	2444.07	2566.7	0, 900951	0, 001...	-0.00... 0.900953

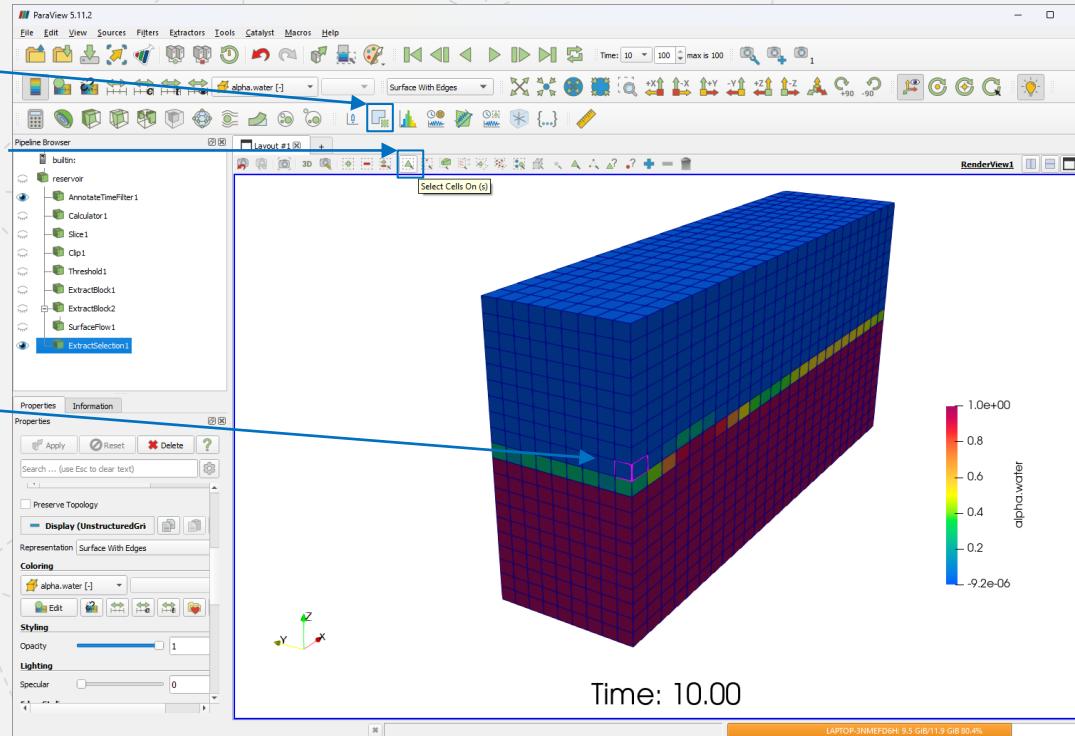
# Select cells and show values

Similarly to *Extract Selection* filter, *Select cells on* allows to analyse data for a given cell (not region).

3 - Extract Selection

1 - Use “Select Cells on”  
to select a cell

3 - Select cell

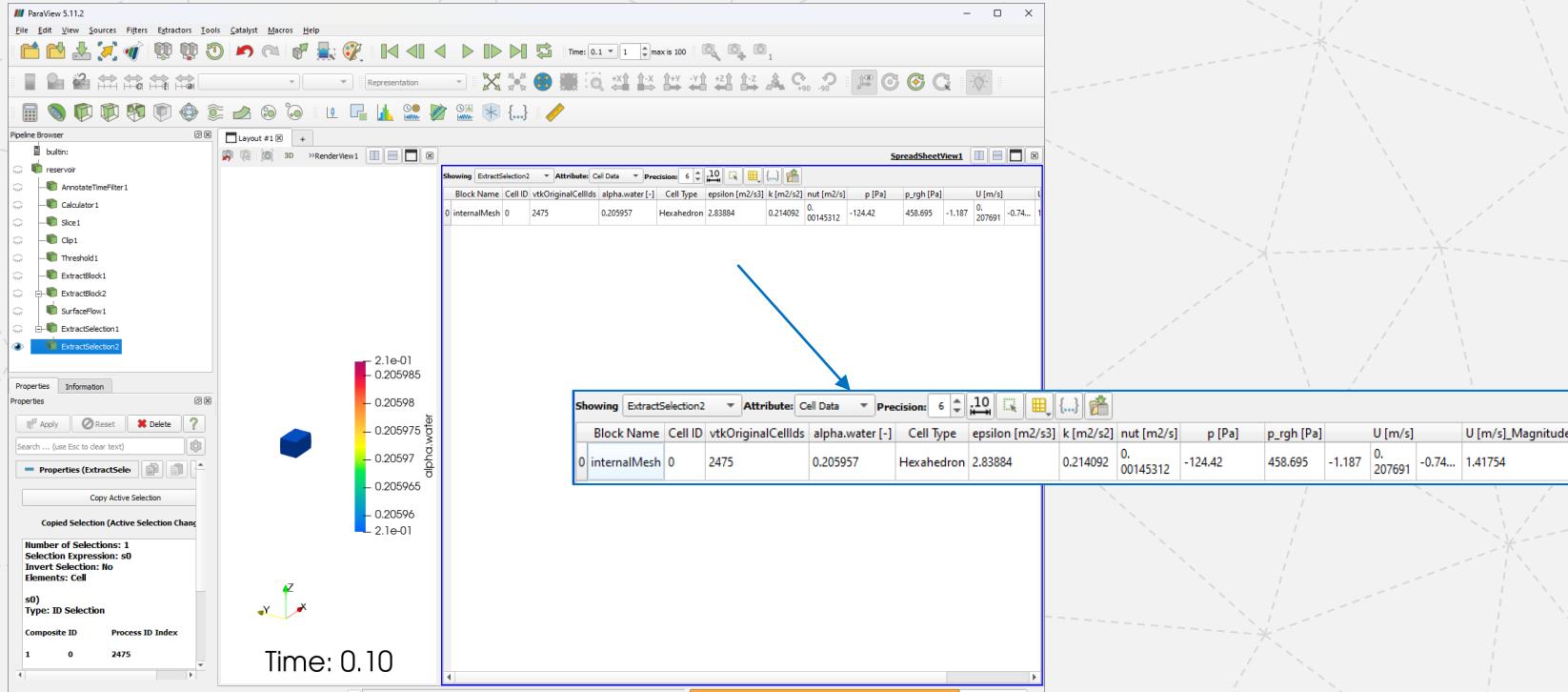


Post Processing in ParaView

Gabriel Wagner et al.

# Select cells and show values

Split horizontal view and select SpreadSheet View. Information of the cell will be displayed.



Post Processing in ParaView

Gabriel Wagner et al.

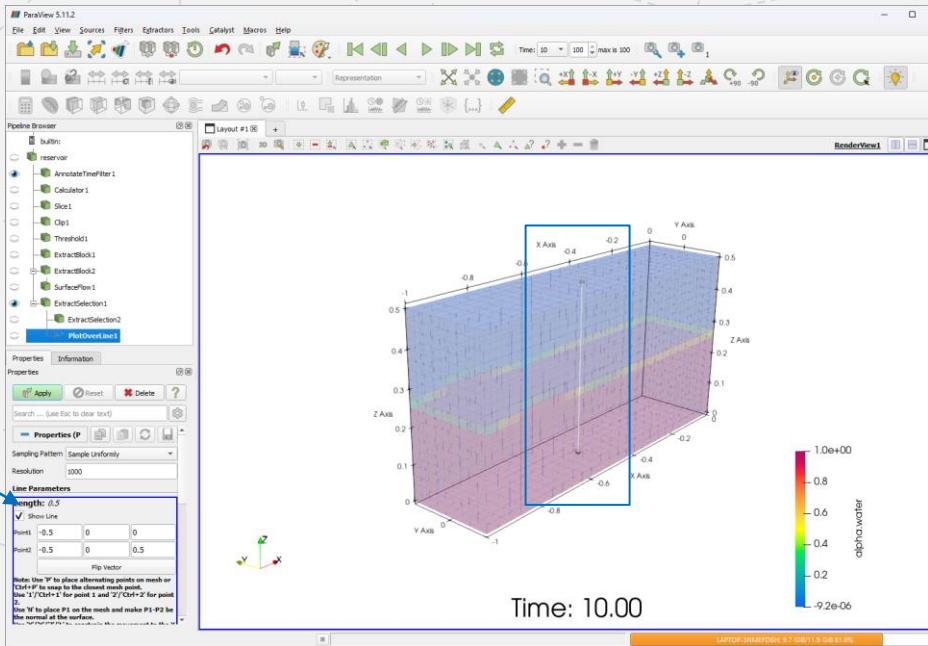
# Plot over line



Select the ExtractSelection1 and apply the *Plot Over Line* filter.

Enter coordinates (-0.5 0 0) and (-0.5 0 0.5) in the properties panel. Change ExtractSelection1 opacity to view the line.

Check the “Axes grid” box in the properties panel of the ExtractSelection1 to view dimensions.



Lines coordinates

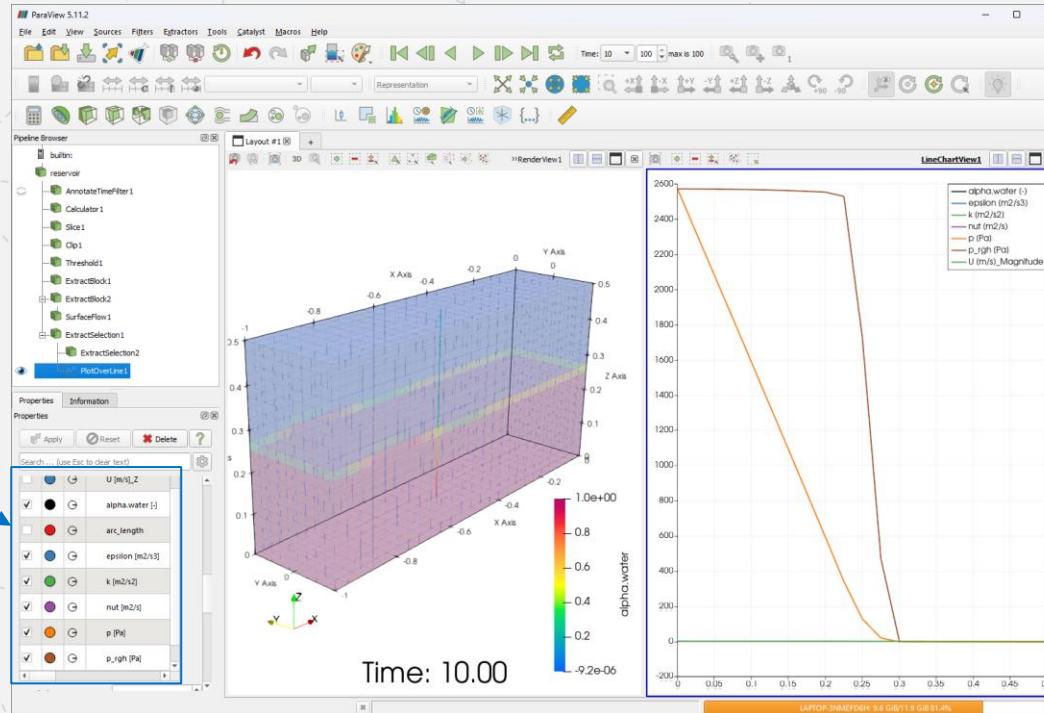


# Plot over line

LineChartView will be displayed in a horizontal split canvas, with fields checked in the properties panel.

Y axis in the Line chart represent data values; X axis represent Line distance

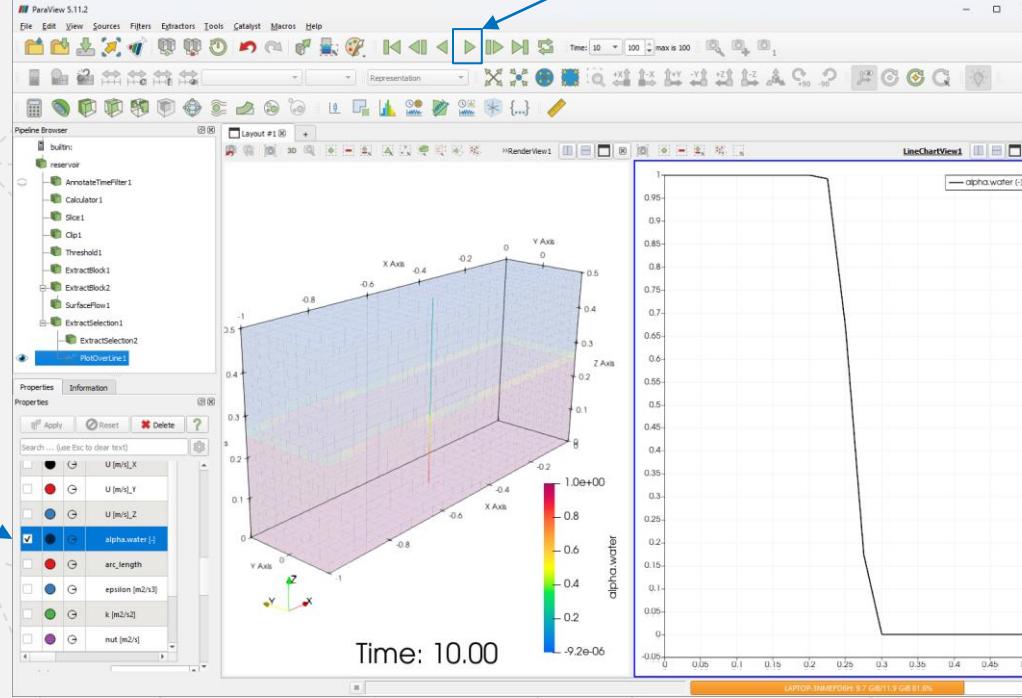
Analysed fields



Post Processing in Paraview

# Plot over line

Keep just “alpha.water [-] field checked and move forward in time to visualize chart evolution.



Alpha.water [-]

Post Processing in ParaView

Gabriel Wagner et al.

# Probe location



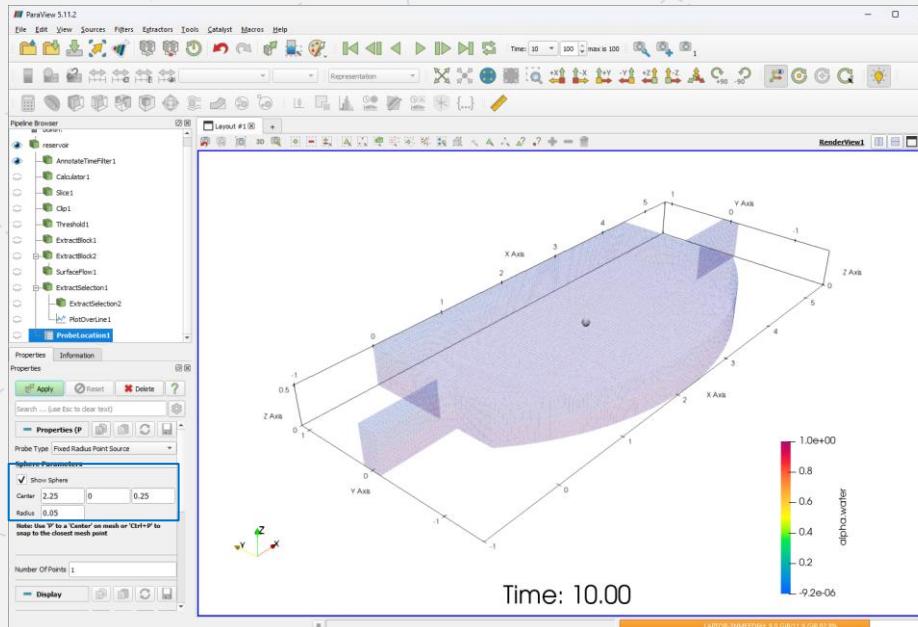
Select the Reservoir and apply the *Probe Location* filter.

Enter center point (2.25 0 0.5) in the properties panel. Change reservoir opacity to view the point location.

Check the “Axes grid” box in the properties panel of the Reservoir to view dimensions.

Center (2.25 0 0.25)

Radius 0.05

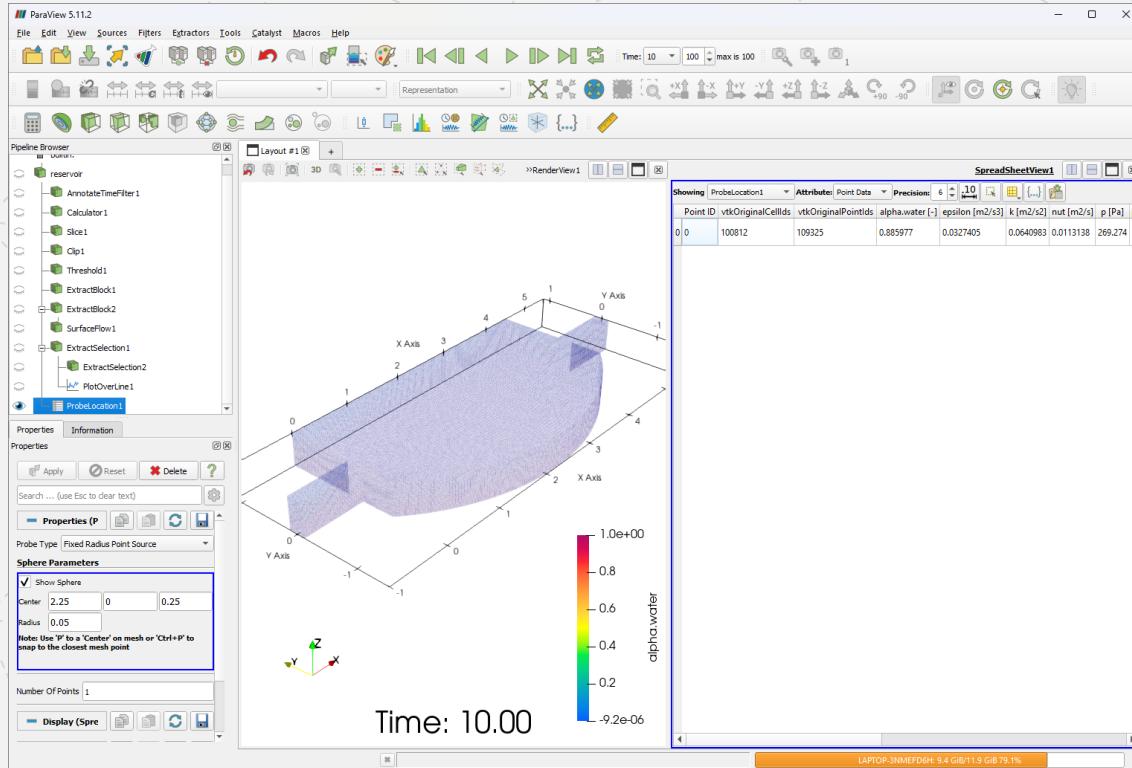


Post Processing in ParaView

Gabriel Wagner et al.

# Probe location

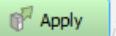
SpreadSheetView will be displayed, with location information for the current instante of time.



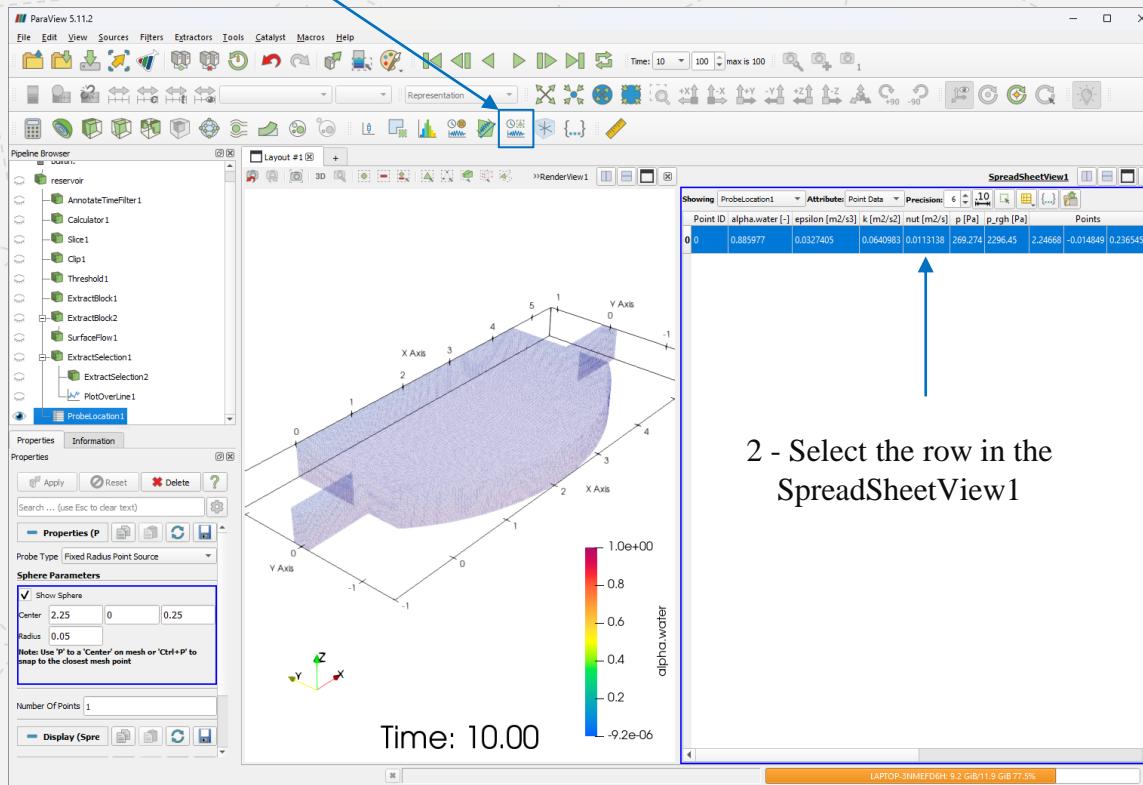
Post Processing in Paraview

Gabriel Wagner et al.

# Plot selection over time

3 - Select *Plot Selection Over Time* filter and click 

1 - Select  
ProbeLocation1

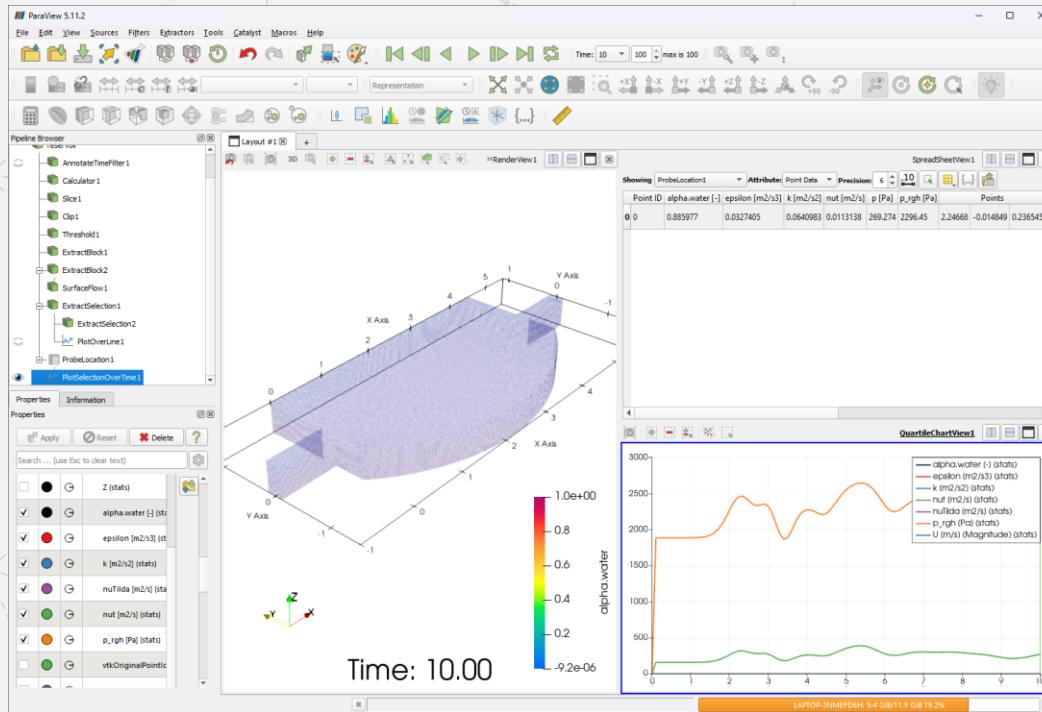


2 - Select the row in the  
SpreadSheetView1

# Plot selection over time

QuartileChartView1 will be displayed in the canvas, with fields checked in the properties panel.

Y axis in the chart represent data values; X axis represent time.



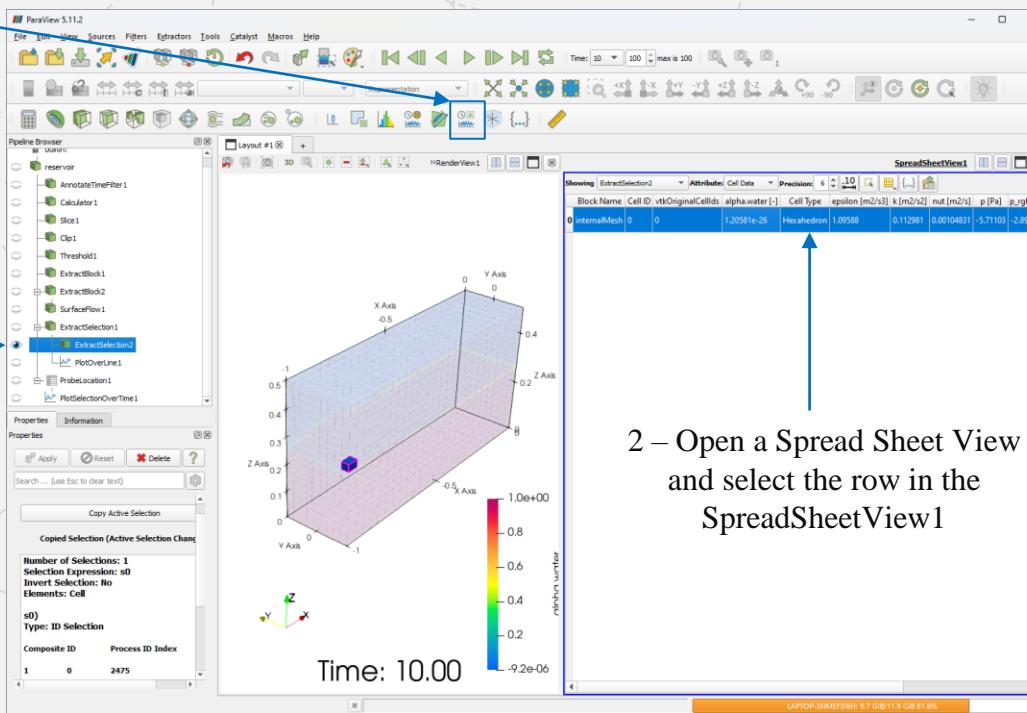
Post Processing in ParaView

# Plot selection over time

The same procedure can be done for a cell instead of a point. For that, open a Spread Sheet View of ExtractSelection2.

3 - Select *Plot Selection Over Time* filter and click 

1 - Select  
ExtractSelection2

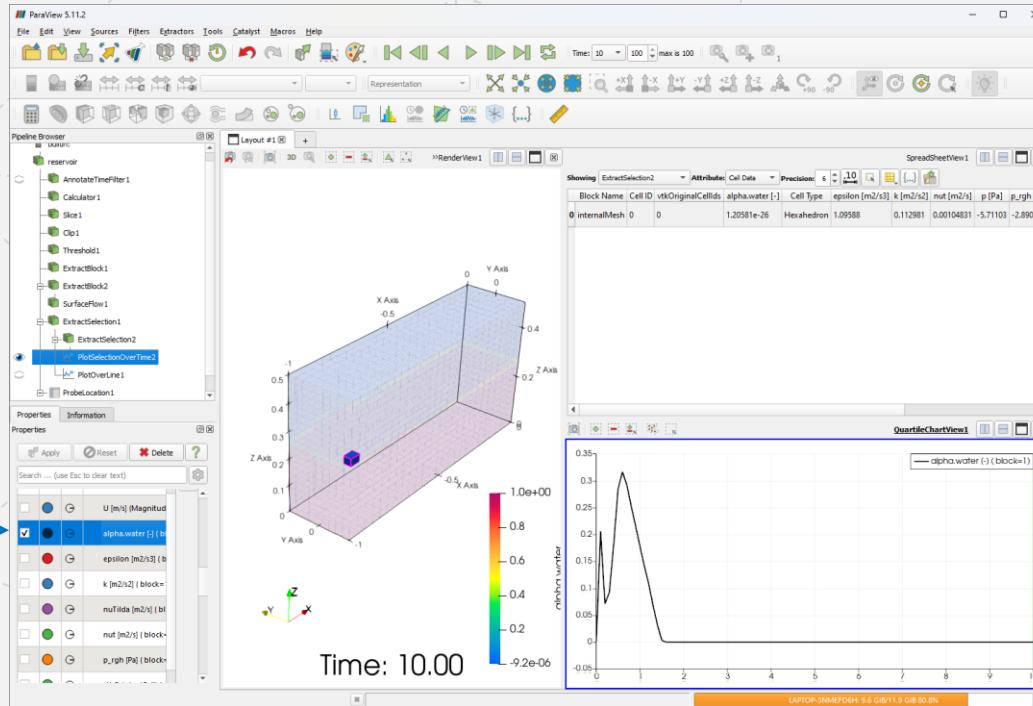


2 – Open a Spread Sheet View  
and select the row in the  
SpreadSheetView1

# Plot selection over time

QuartileChartView1 will be displayed in the canvas, with fields checked in the properties panel.

Y axis in the chart represent data values; X axis represent time.



Post Processing in ParaView

Gabriel Wagner et al.

# 6

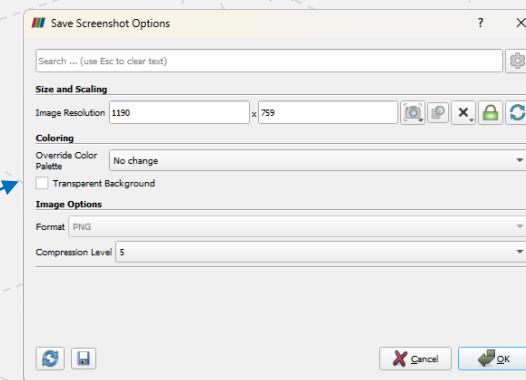
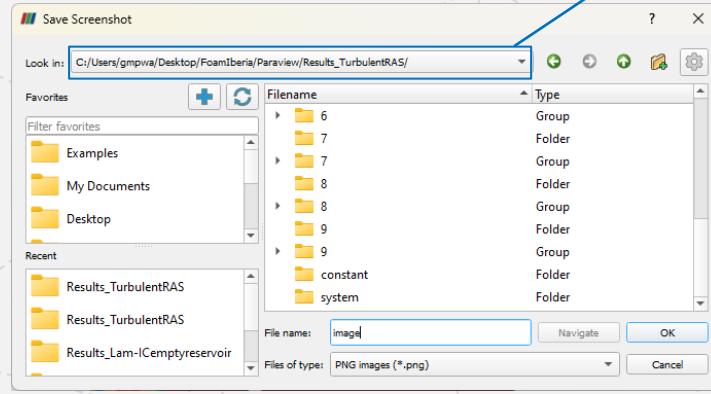
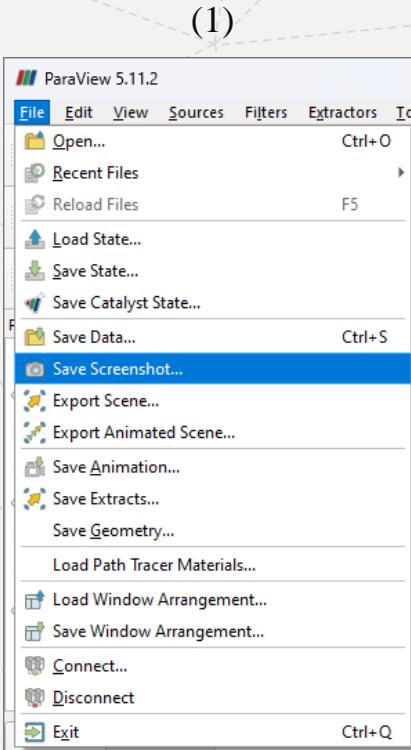
## Saving progress

- Images
- Animations
- States



## 6 Saving progress

# Images

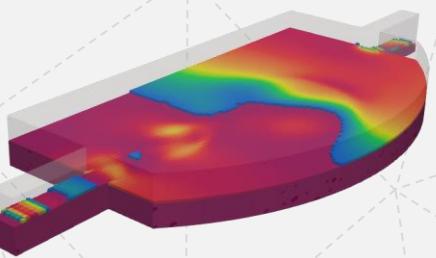


Post Processing in ParaView

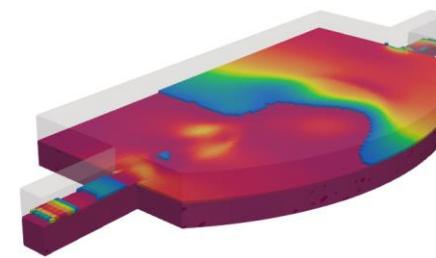
Gabriel Wagner et al.

# Images

Checked “Transparent background”



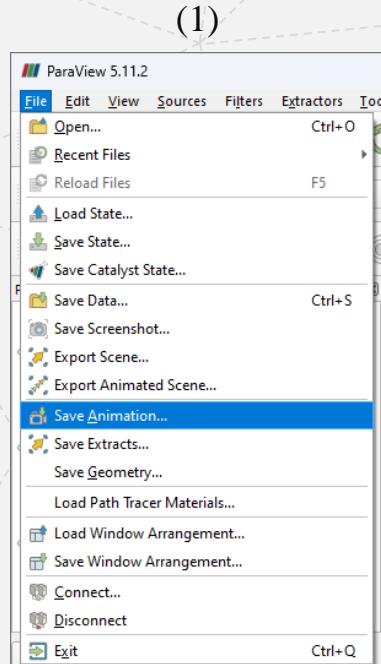
Unchecked “Transparent background”



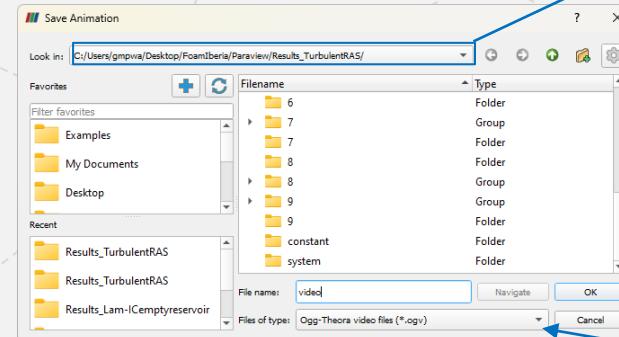
Post Processing in ParaView

Gabriel Wagner et al.

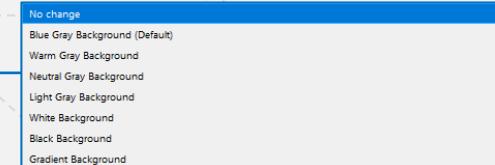
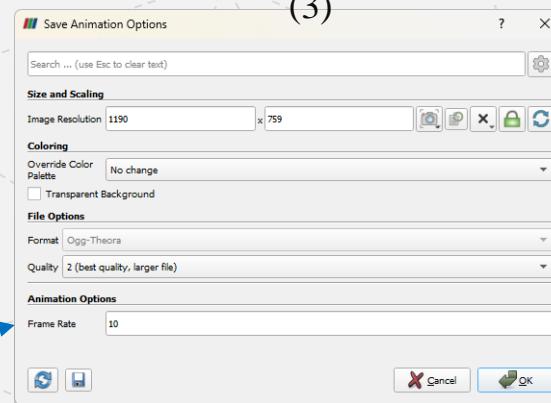
# Animations



10 frames per second as  
timeStep is 0.1



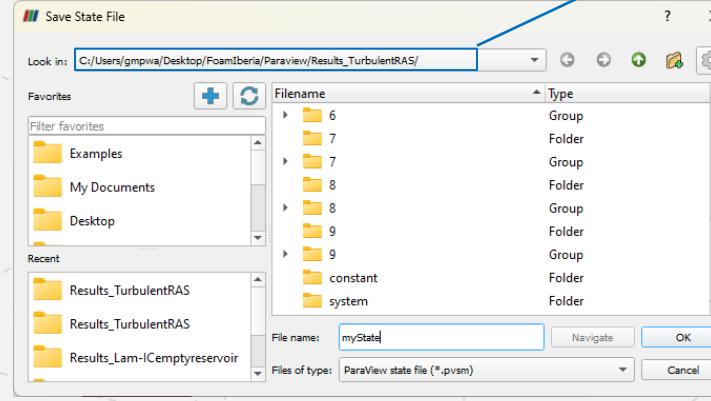
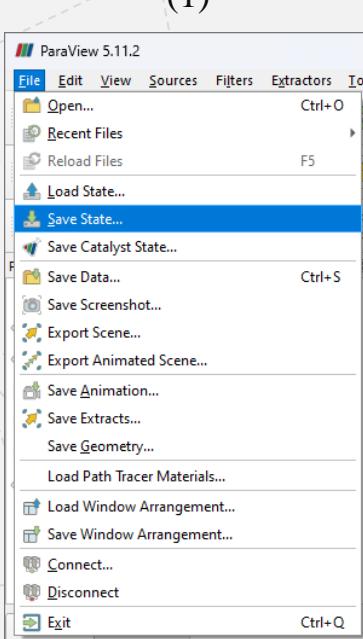
Saving location



Post Processing in Paraview

Gabriel Wagner et al.

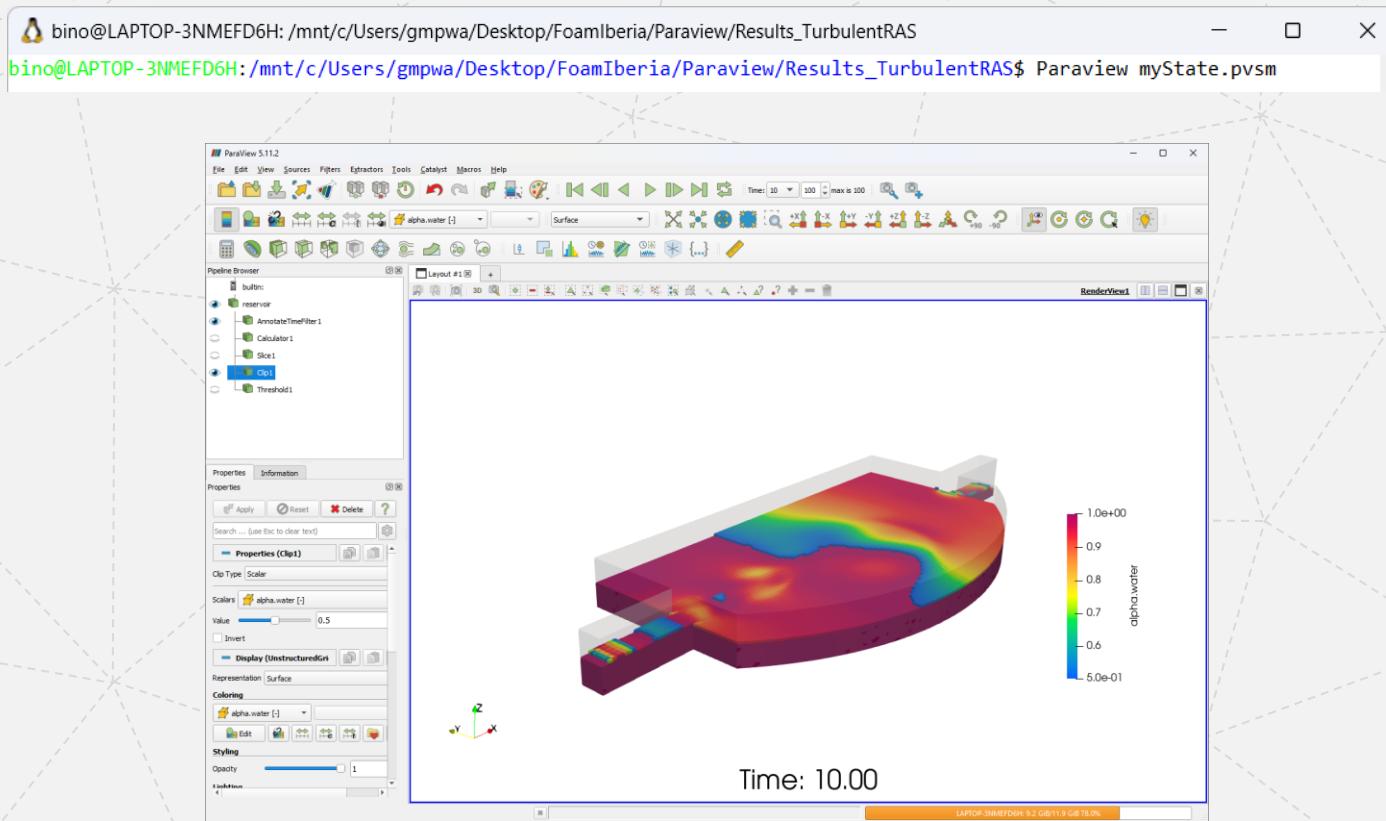
# States



Saving a state allow you to reproduce your visualization settings and view without applying post-processing steps again.

It will save all your progress and it will work as a macro: once you load it, you will open your Paraview visualization the same way you saved it.

# States



Post Processing in ParaView

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# States

The state file (.pvsm format) can be standardized to be fitted for other case studies, allowing to open a new case with the same applied filters.

In the terminal, open the .pvsm file

> nano myState.pvsm

Press **ctrl+W** and search for  
“TurbulentRAS” (it will lead you to the  
line where it is written)

Replace the file location inside the “ ”  
for “.**open.foam**”

Press **ctrl+X** and then “Y” to exit and  
save

```

GNU nano 4.8          myState.pvsm
<Property name="CopyDataToCellZones" id="8941.CopyDataToCellZones" number_of_elements="1">
  <Element index="0" value="0"/>
  <Domain name="bool" id="8941.CopyDataToCellZones.bool"/>
</Property>
<Property name="CreateCellToPoint" id="8941.CreateCellToPoint" number_of_elements="1">
  <Element index="0" value="1"/>
  <Domain name="bool" id="8941.CreateCellToPoint.bool"/>
</Property>
<Property name="DecomposePolyhedra" id="8941.DecomposePolyhedra" number_of_elements="1">
  <Element index="0" value="1"/>
  <Domain name="bool" id="8941.DecomposePolyhedra.bool"/>
</Property>
<Property name="FileName" id="8941.FileName" number_of_elements="1">
  <Element index="0" value="C:\Users\gmpwa\Desktop\FoamIberia\Paraview\Results_TurbulentRAS\open.foam"/>
  <Domain name="files" id="8941.FileName.files"/>
</Property>
<Property name="LagrangianArrayInfo" id="8941.LagrangianArrayInfo"/>
<Property name="LagrangianArrays" id="8941.LagrangianArrays">
  <Domain name="array_list" id="8941.LagrangianArrays.array_list"/>
</Property>
<Property name="ListTimeStepsByControlDict" id="8941.ListTimeStepsByControlDict" number_of_elements="1">
  <Element index="0" value="0"/>
  <Domain name="bool" id="8941.ListTimeStepsByControlDict.bool"/>
</Property>
<Property name="MeshRegions" id="8941.MeshRegions" number_of_elements="12">
  <Element index="0" value="group/wall"/>

```

Get Help    Write Out    Where Is    Cut Text    Justify    Cur Pos    Undo  
 Exit    Read File    Replace    Paste Text    To Spell    Go To Line    Redo    Mark Text  
 Copy Text

```

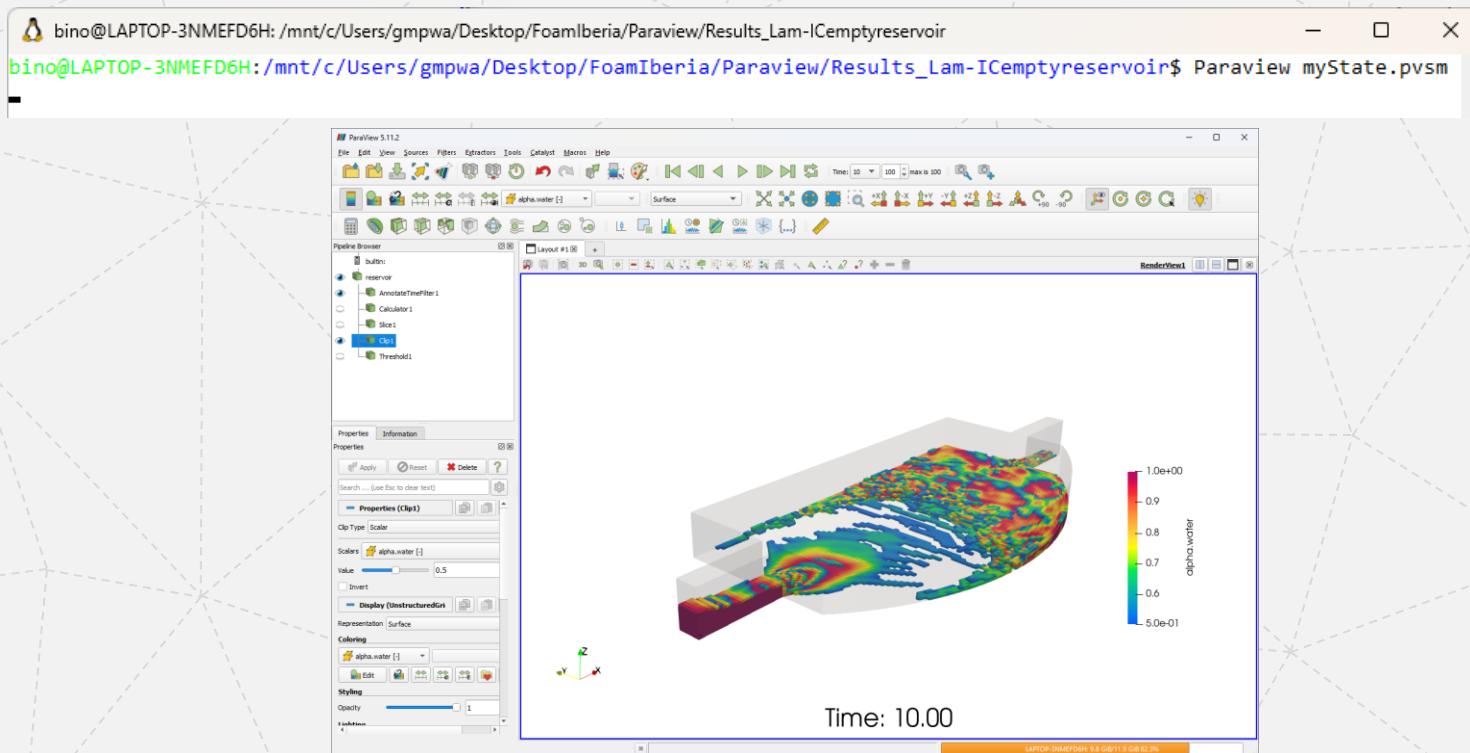
<Property name="FileName" id="8941.FileName" number_of_elements="1">
  <Element index="0" value=".\open.foam"/>
  <Domain name="files" id="8941.FileName.files"/>

```

# States

Copy the myState.pvsm file to the **Results Lam Iemptyreservoir** case folder and open it in Paraview

Note: you need to have an “open.foam” file in the **Results Lam Iemptyreservoir** folder.

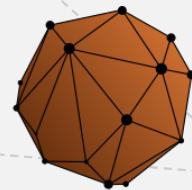




# THANK YOU

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*Gabriel Mar Pinto Wagner*  
gmpwagner@gmail.com  
p42786@alunos.uminho.pt



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