

Demo and Exercise

Create some colorful pictures ...

Exercise

- Learn basic usage of Paraview
- Plot streamlines
- Plot glyphs that resemble velocity vectors
- Plot pressure iso-surface (contour plot)
- Play and save flow motion

Obtaining Visualization Data

- The easiest option to visualize data is to copy the files to your local machine and use a locally installed Paraview
- You find compressed files for download in the zipped subdirectory:
- `$KURS/zipped/hpcfdx2/individual/*.zip`: some individual timesteps each about 65 MB
- `$KURS/zipped/hpcfdx2/vtk_files.zip`: all timesteps (3 GB)

Copy VTK files

- Copy the exercise data to your workspace:

```
cp -r $KURS/exercises/hpcfdx2 $MYWS
```
- In `$MYWS/hpcfdx2/vtk_files/` you should then find various VTK files with unstructured mesh data and a video information file describing the temporal ordering of those files:
 - `simulation_t*****.vtu`
 - `simulation.pvd`

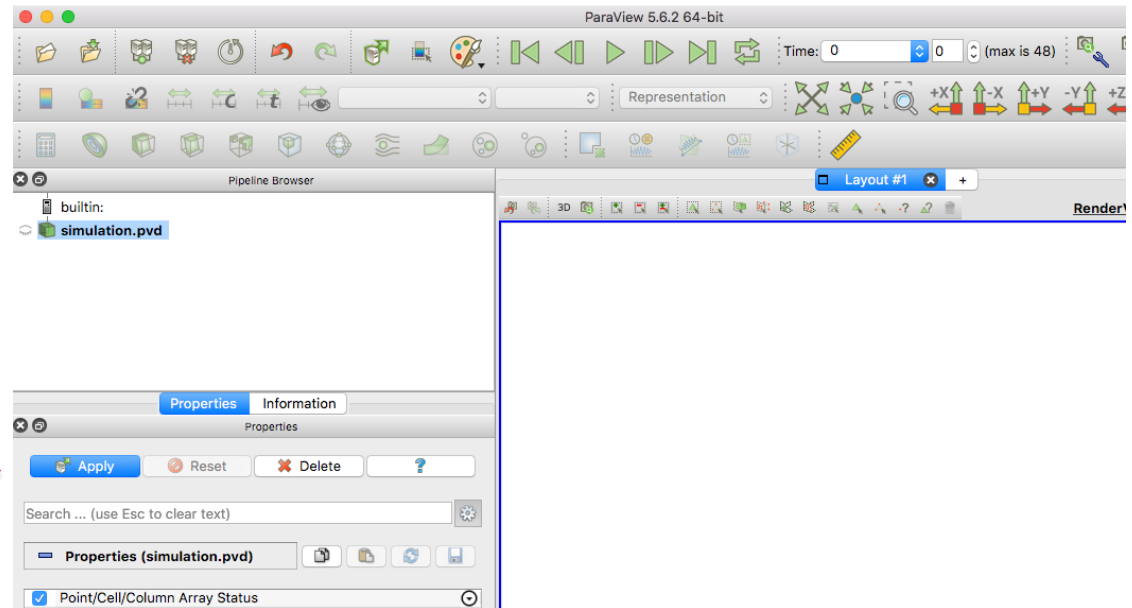
Start the Visualization on Barnard

- Follow instructions on <https://geb.inf.tu-dresden.de/hpcfd/pages/Visualisierung.html>

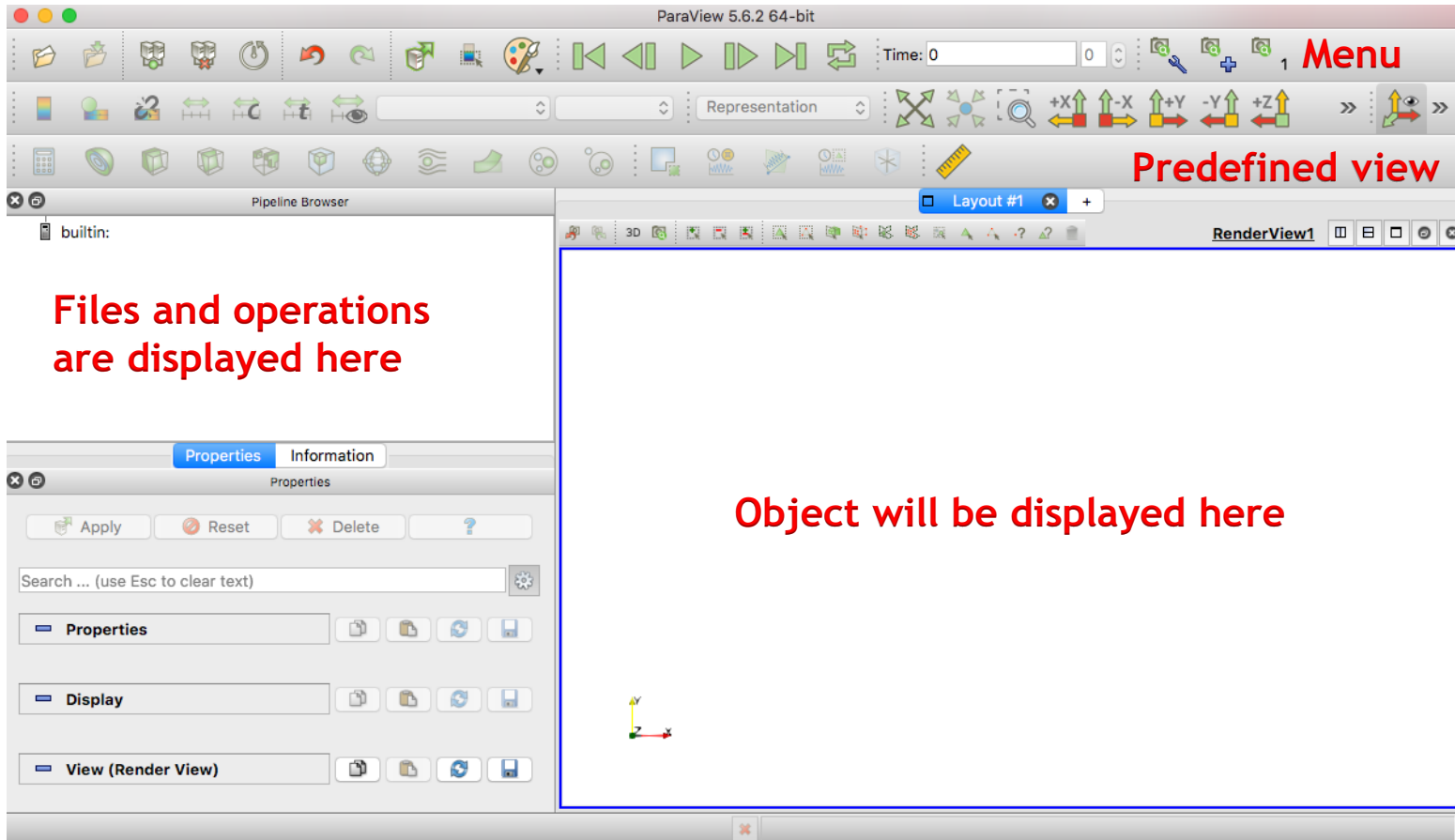
Tutorial

- Open the visualization file in the opened Paraview and click “Apply”:

Click “Apply”



Paraview Overview



Load VTK files within Paraview

1. Click "Open"

2. Select "simulation.pvd" and click "OK"

3. Click "Apply"

Display velocity

The image shows the ParaView 5.6.2 64-bit interface. The top toolbar contains various icons for file operations, simulation control, and visualization. The main toolbar shows the 'velocity' quantity selected, with 'X' as the component and 'Surface' as the display type. A color map legend on the right indicates velocity values from -0.5 to 2.0e+00. The Properties panel on the left shows the 'simulation.pvd' file and a list of variables including density, energy, mach_number, and momentum. A red box highlights the mouse controls: 'Left mouse button: Rotate', 'Right mouse button: Zoom', and 'Shift + right mouse button: Move'. Red arrows point to the 'Colour map' icon, the 'velocity' dropdown, the 'X' dropdown, and the 'Predefine view' icon.

Colour map

Quantity to be displayed

Predefine view

Left mouse button: Rotate
Right mouse button: Zoom
Shift + right mouse button: Move

Create streamline

1. Select "Stream tracer"

2. Select "High Resolution Line Source" and set point 1 and point 2

3. Click "Apply"

Seed Type: High Resolution Line Source

Line Parameters

Length: 2.74531

Show Line

Point1	3.72552	1.49021	0.00125
Point2	6.27448	2.50979	0.00125

Note: Use 'F' to place alternating points on mesh or 'Cmd+F' to place points on the closest mesh point. Use '1/Cmd+1' for point 1 and '2/C' for point 2.

X Axis Y Axis Z Axis

Center on Bounds

Display velocity and streamline together

1. Click the first “eye” to display velocity distribution and streamline at the same time

2. Change opacity to make streamline visible

Task 2: Velocity vector

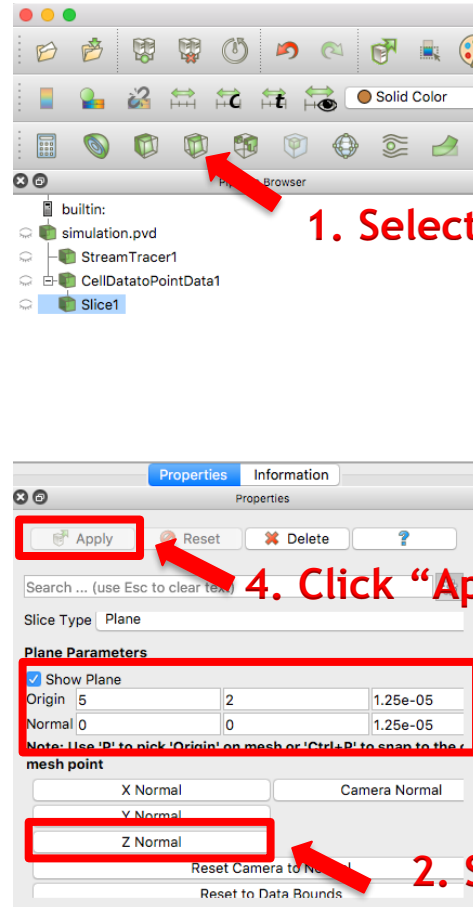
1. Select "Filters" in the menu

2. Select "Alphabetical"

3. Select "Cell Data to Point Data"

The screenshot shows the ParaView application window. The 'Filters' menu is open, and the 'Alphabetical' option is selected. The 'Cell Data to Point Data' option is highlighted with a red box. The background shows a 3D visualization of a velocity vector field with a color scale ranging from -9.7e-01 to 2.0e+00.

Task 2: Velocity vector



1. Select "Slice"

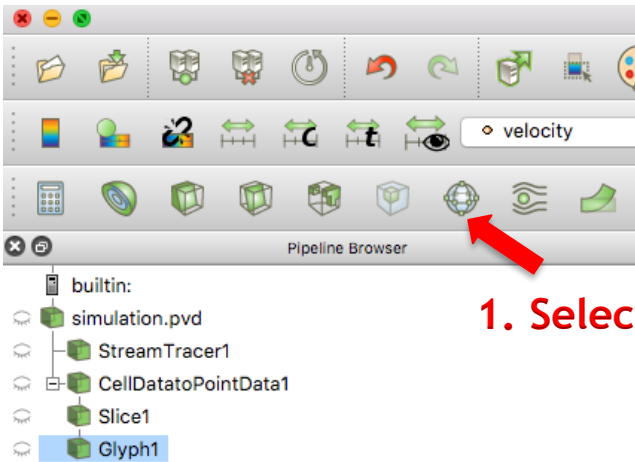
4. Click "Apply"

3. Set "Origin"

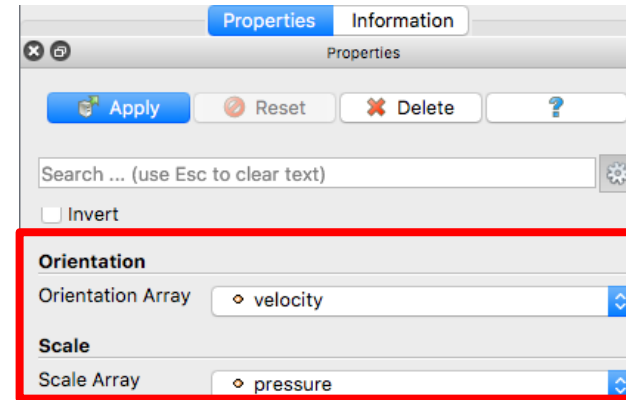
2. Select "Z Normal"

Set origin (5,2,0.0000125)

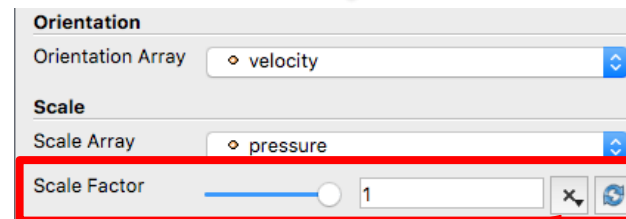
Task 2: Velocity vector



1. Select Glyph



2. Select quantities

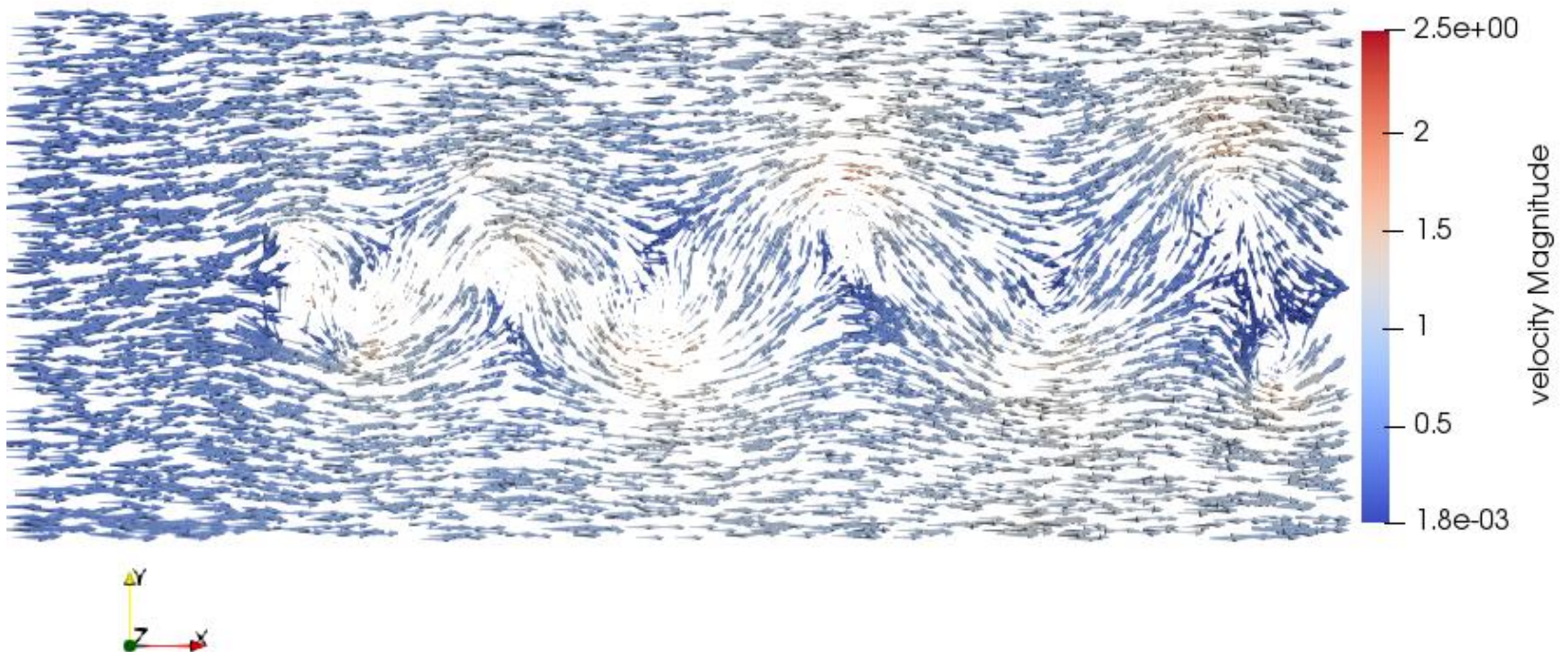


3. Select Scale Factor

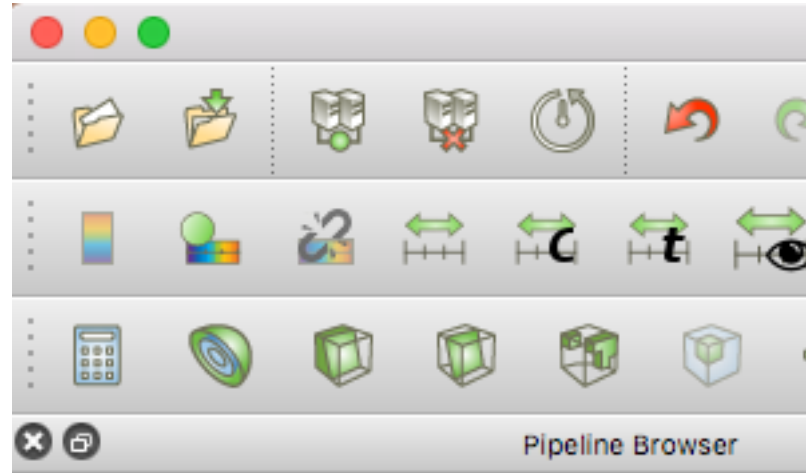


4. Select Coloring for the vectors

Task 2: Velocity vector



Task 3: Pressure iso-surface



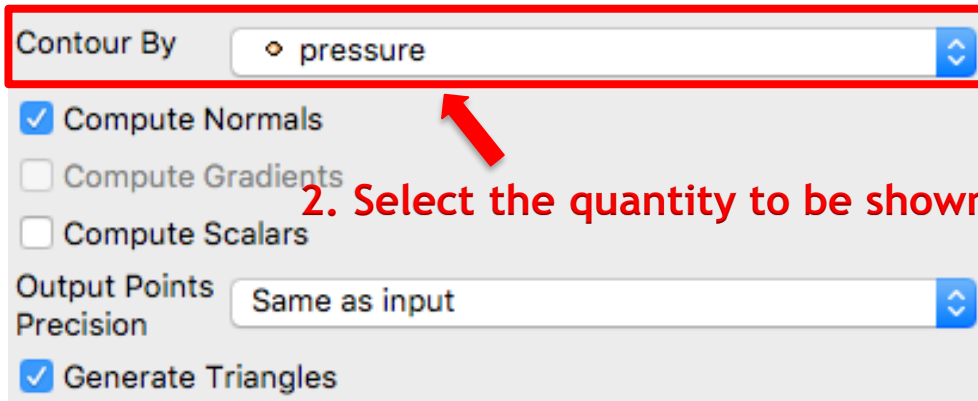
1. Activate "Slice1"

2. Deactivate "Glyph1"

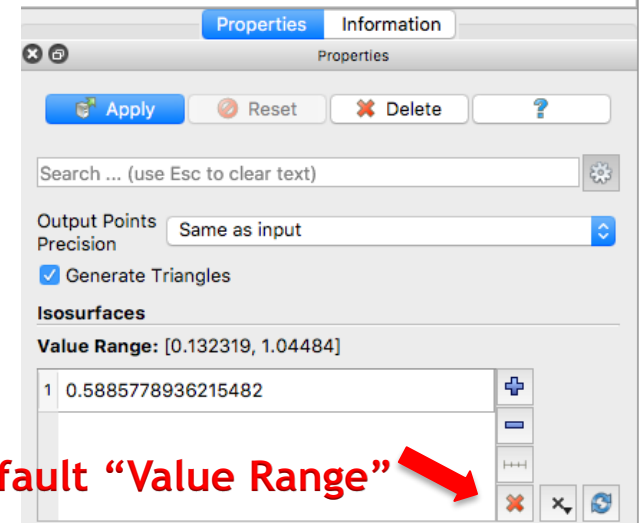
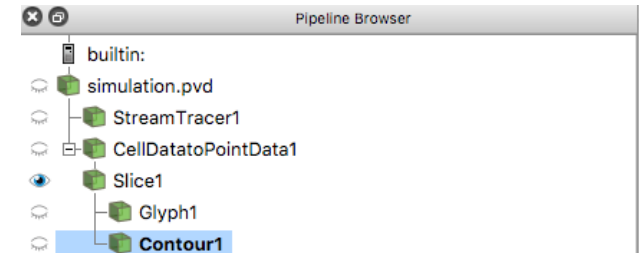
Task 3: Pressure iso_surface



1. Select "Contour" in the menu

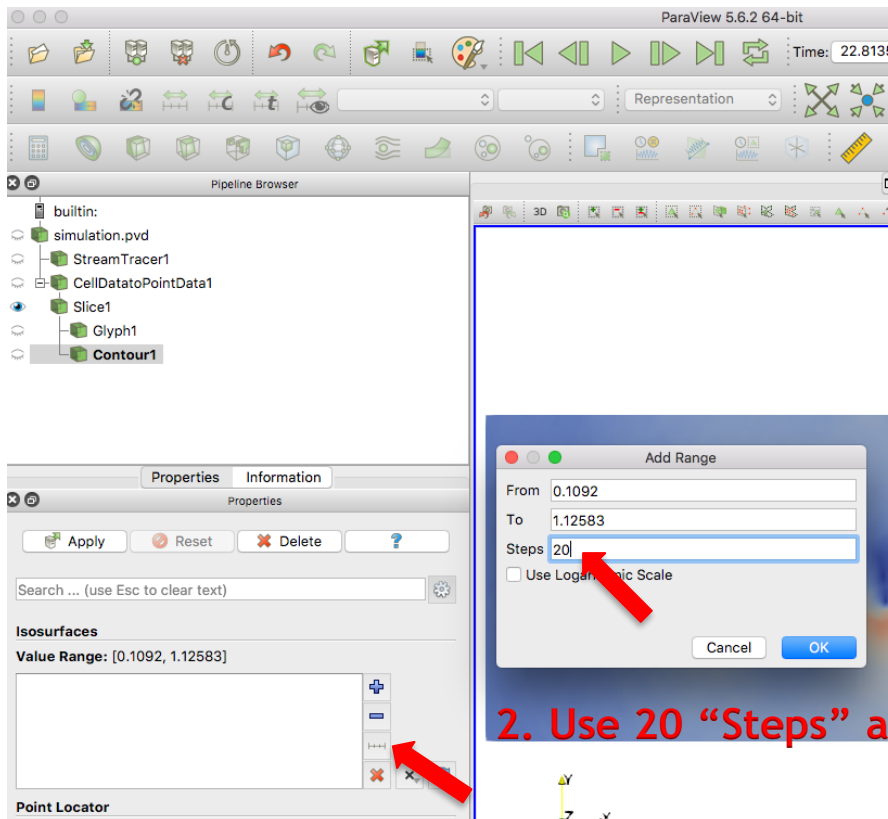


2. Select the quantity to be shown

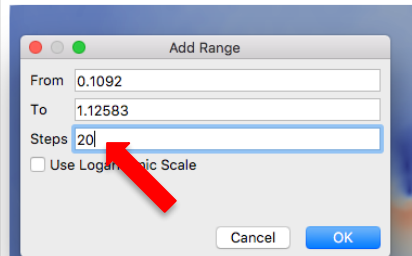


3. Delete default "Value Range"

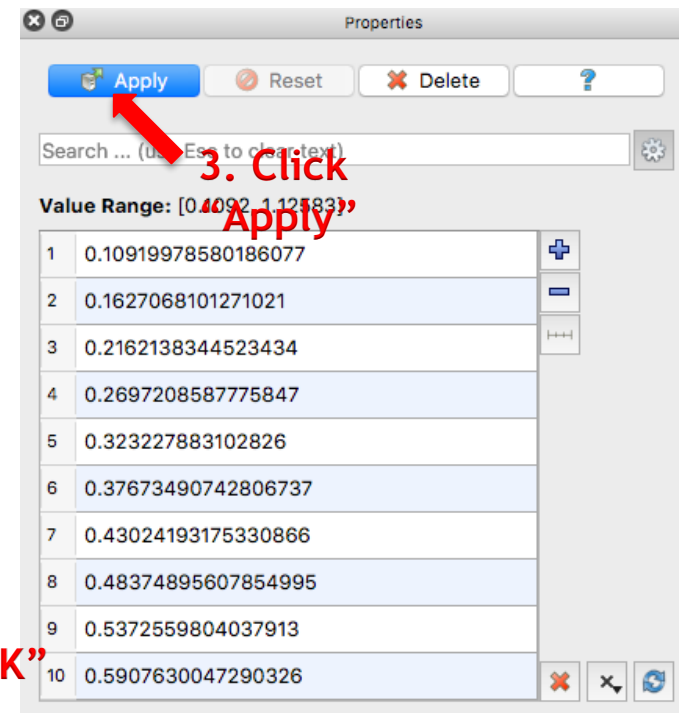
Task 3: Pressure iso_surface



1. Add a values



2. Use 20 "Steps" and click "OK"



3. Click "Apply"

Task 3: Pressure iso-surface

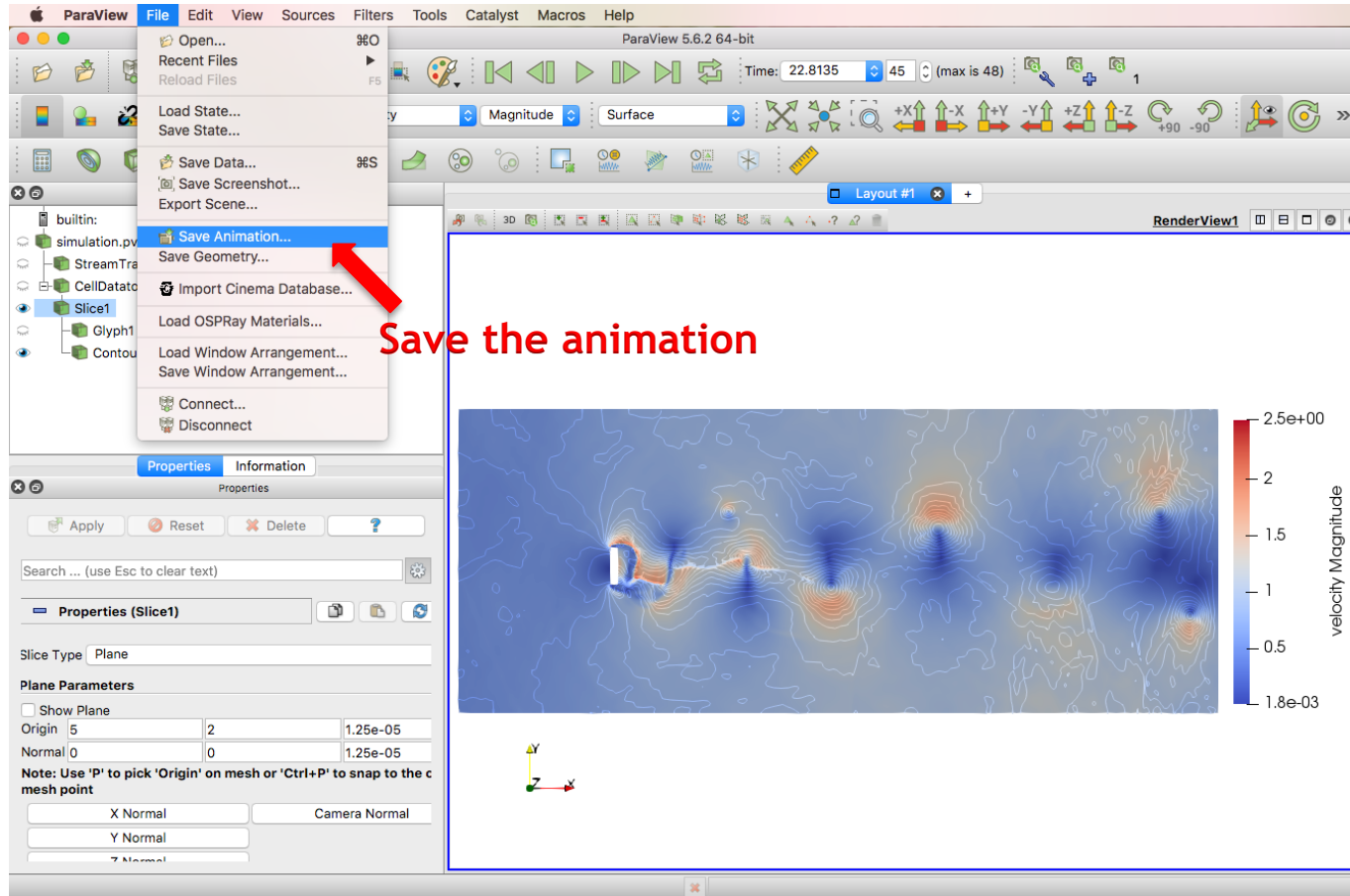
The screenshot shows the ParaView 5.6.2 64-bit interface. The Pipeline Browser on the left shows a hierarchy of objects: builtin, simulation.pvd, StreamTracer1, CellDatatoPointData1, Slice1 (highlighted with a red arrow), Glyph1, and Contour1. The Properties panel for Slice1 is visible, showing the Slice Type set to 'Plane' and Plane Parameters (Origin: 5, Normal: 0). The RenderView1 window displays a 3D visualization of a velocity magnitude slice, with a color scale on the right ranging from 1.8e-03 to 2.5e+00. The slice shows a complex flow pattern with high-velocity regions (orange/red) and low-velocity regions (blue). A red arrow points to the 'Play' button in the top toolbar, and another red arrow points to the 'velocity' dropdown menu. A third red arrow points to the 'Slice1' object in the Pipeline Browser.

1. Activate "Slice"

2. Select quantity to be shown

3. Play the animation

Task 4: Save Animation



Task 4: Save Animation

The image shows a screenshot of the ParaView 5.6.2 64-bit interface. The main window displays a 3D visualization of a flow field with a velocity magnitude color scale ranging from 1.8e-03 to 2.5e+00. A 'Save Animation' dialog box is open, showing a file browser with a list of folders and files. A red arrow points to the 'File name' field, and another red arrow points to the 'Files of type' dropdown menu, which is set to 'FFMPEG AVI files (*.avi)'. A second dialog box, 'Save Animation Options', is also open, showing settings for 'Size and Scaling' (Image Resolution: 902 x 626), 'Coloring' (Override Color: No change), and 'File Options' (Format: FFMPEG, Quality: 2 (best quality, larger file)). A red arrow points to the 'Image Resolution' field, and another red arrow points to the 'OK' button. A third red arrow points to the 'Lock' icon in the 'Size and Scaling' section, and a fourth red arrow points to the 'OK' button in the 'Save Animation Options' dialog.

1. Give the animation a name
2. Select the desired format
3. Lock the screen ratio
4. Increase resolution if needed
5. Click "OK"