IDAJ
integrated digital advanced solution

ennovaCFD v1.8.1
Post Process Tool User Guide

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Analysis Technology
Department 8

Post Process Tool User Guide

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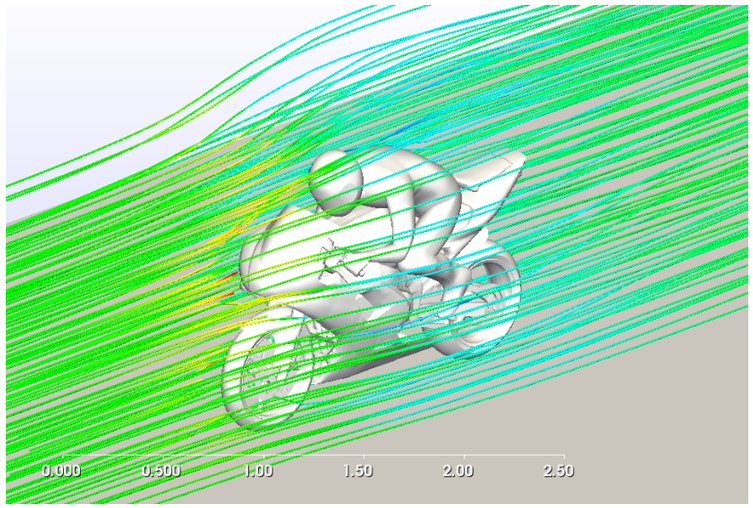
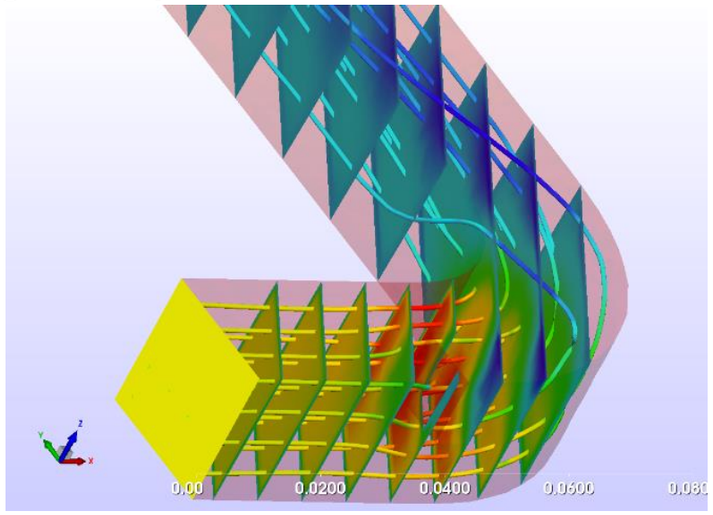
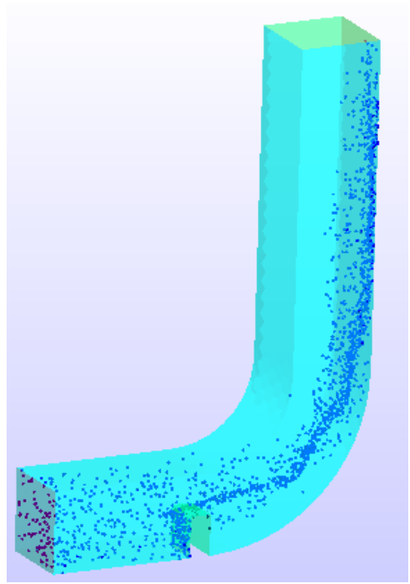
1. Introduction

- ennovaCFD provides functions for visualizing iconCFD/OpenFOAM results.
- This guide explains the functions of the Post Process tool and provides specific operating procedures using sample data.

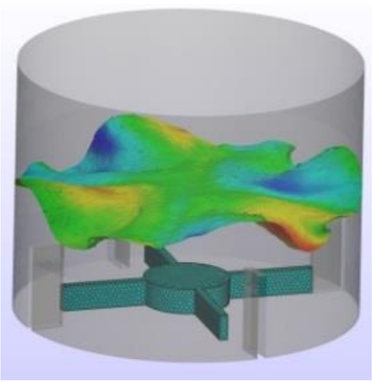


■Streamline Display

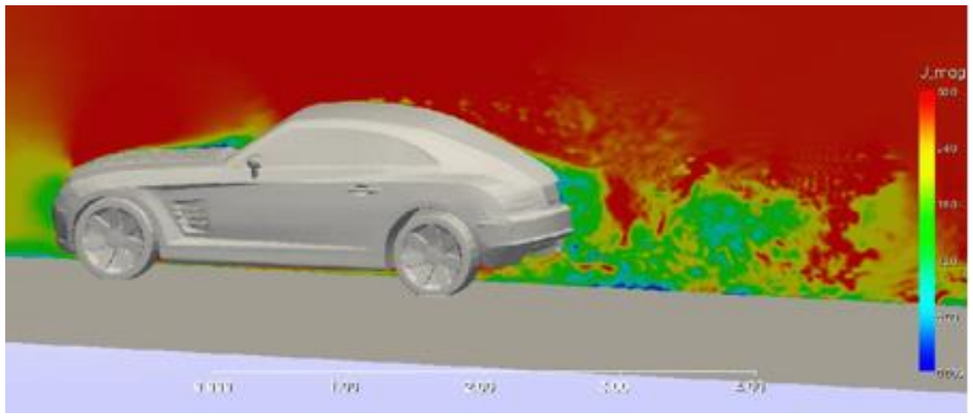


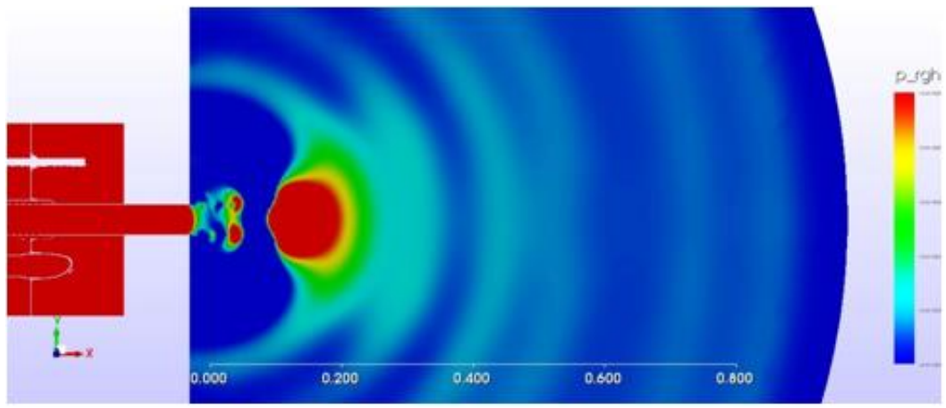


■Particle Display



■Isosurface Display

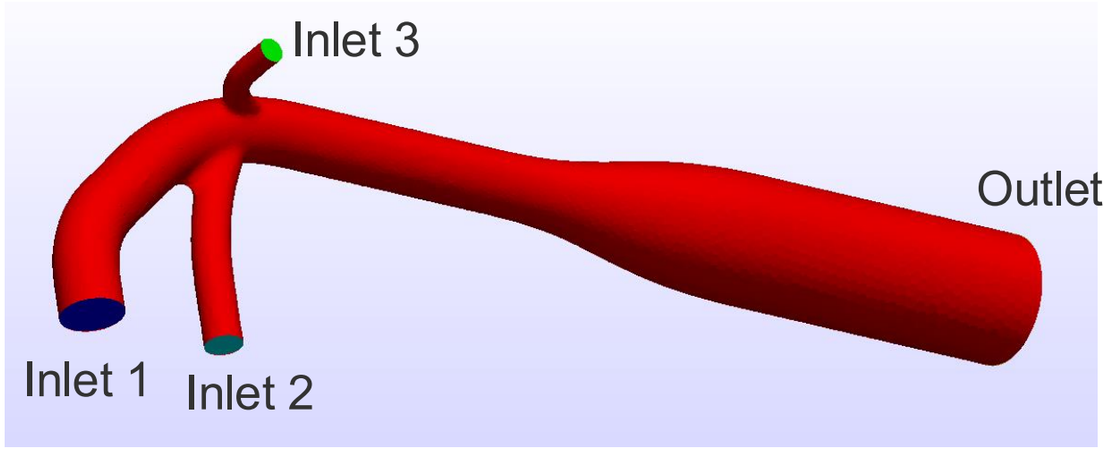




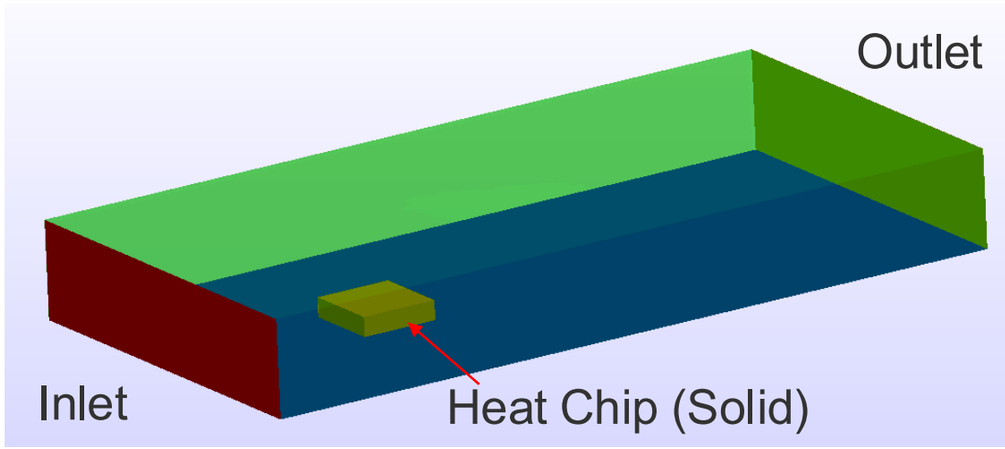
■Contour Display

2. Sample Data Description

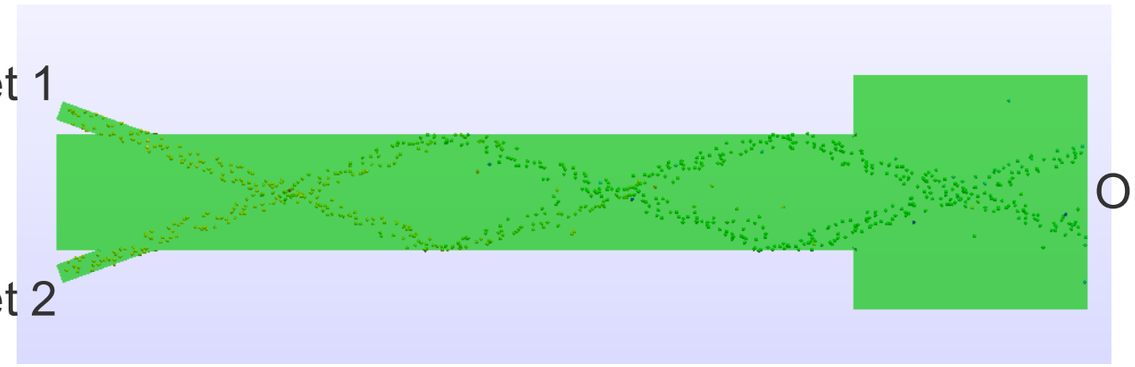
- The sample data “post_process.zip” used in this guide contains result data for the following three cases.
- Steady-state thermal-flow analysis results (ManifoldPipe)
- Conjugate heat-transfer analysis results (HeatChip)
- Particle-analysis results (Lagrange)



ManifoldPipe



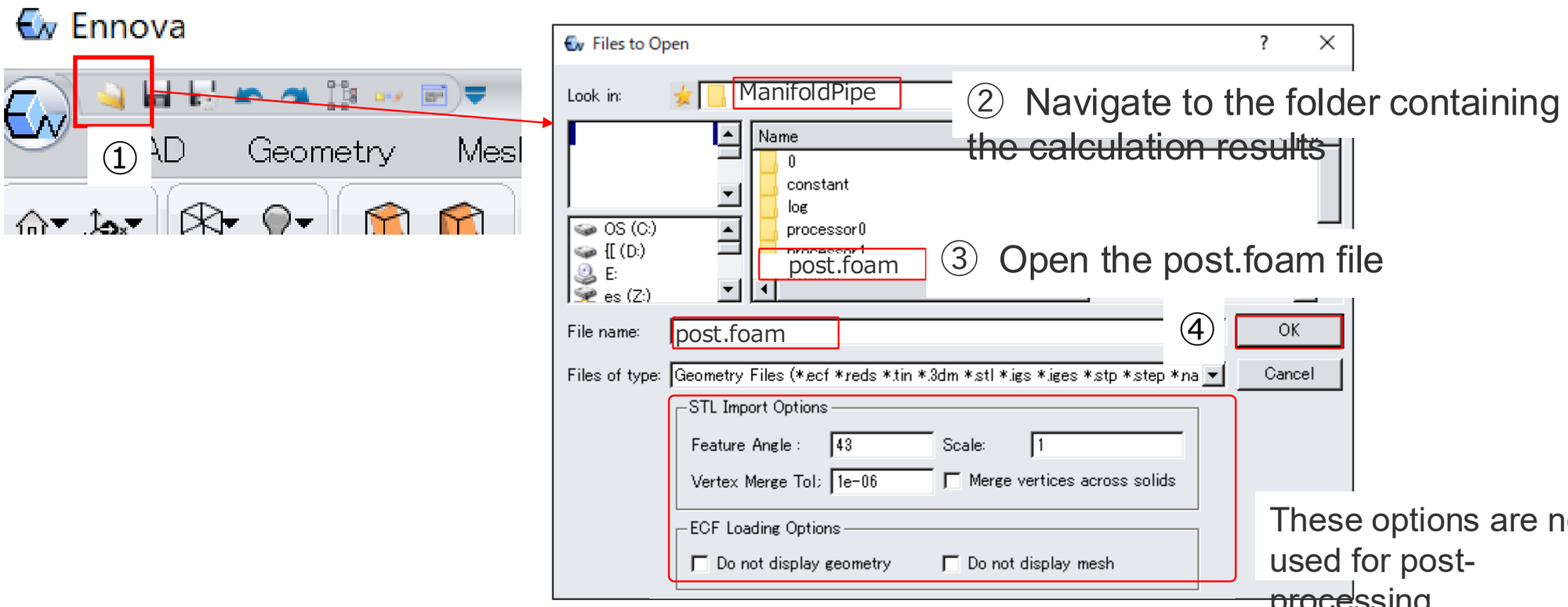
HeatChip



Lagrange

3. How to Load iconCFD / OpenFOAM Result Data

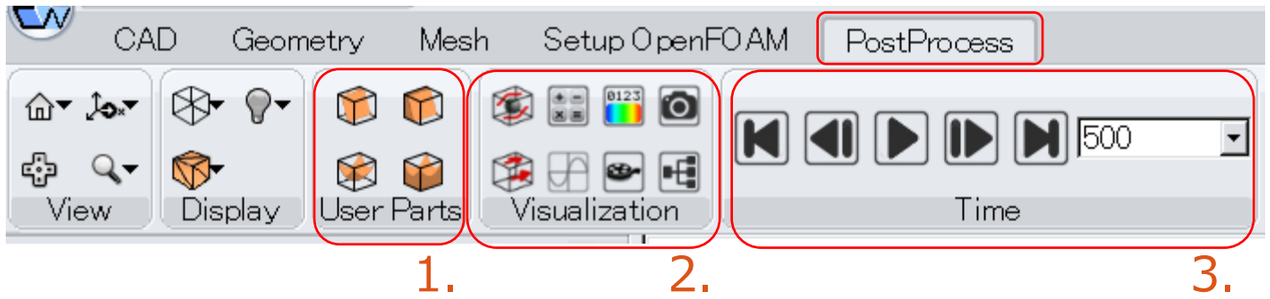
- When ennovaCFD reads a file with the .foam extension, it imports the calculation results in that folder. The sample case contains a post.foam file. This file is created automatically when the calculation is run using run.sh.



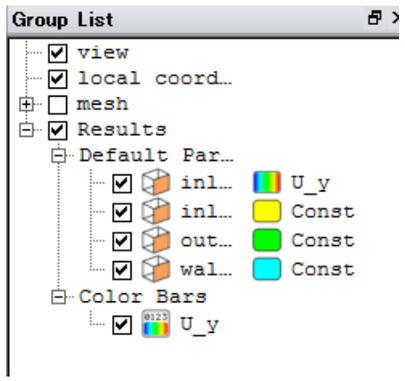
Using the procedure above, import the ManifoldPipe result data.

4. Post Process Tab

- The Post Process tab can be used to visualize calculation results.
- The function ribbon on the PostProcess tab contains the following menus:

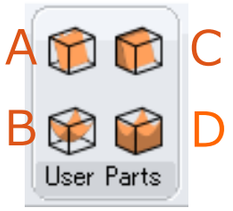


- User Parts
- Visualizes results using Slice, IsoSurface, Clip, and Threshold display methods.
- Visualization
- Performs visualizations such as vector plots and streamlines, as well as calculations of physical quantities.
- Time
- Selects the time/iteration of the analysis results.
- Group List
- Lists parts contained in the analysis model and objects created with User Parts and Visualization, and controls their display.

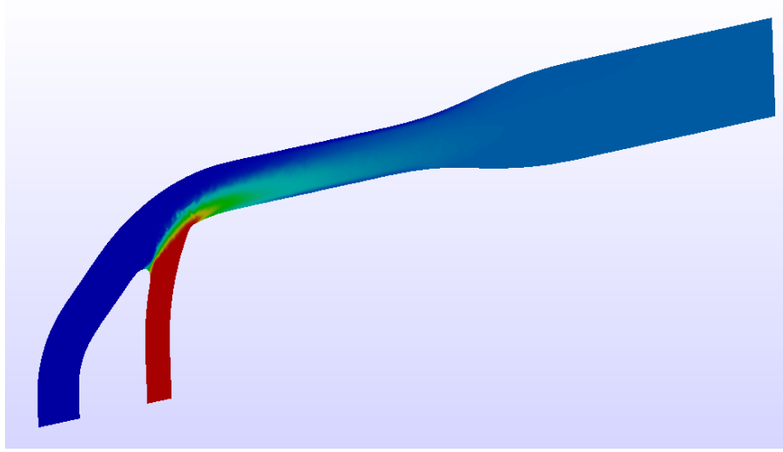


4. Functions

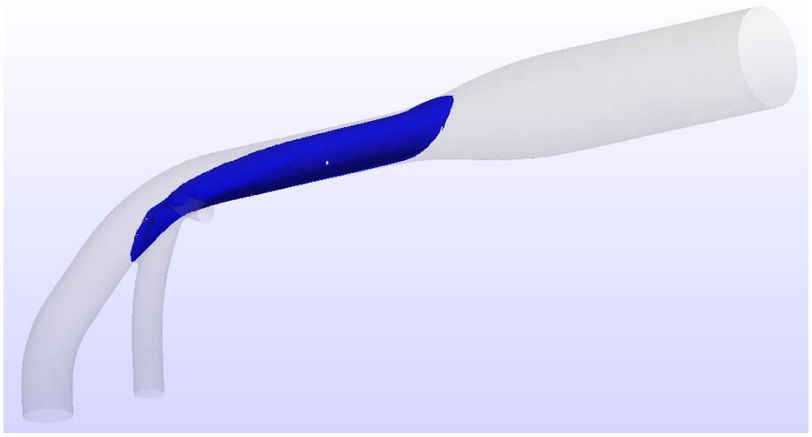
4.1 User Parts



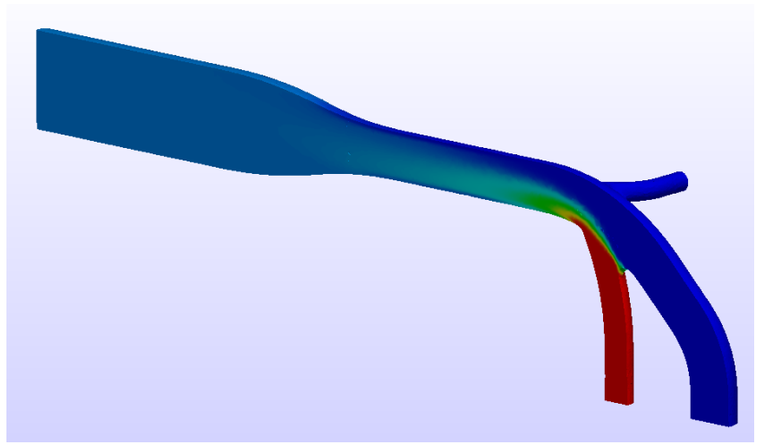
- A Slice Plot
- 2D cross-section display
- B Isosurface Plot
- Isosurface display
- C Clip Plot
- Clipping display by coordinate values (coordinate-range specification)
- D Threshold Plot
- Isovolume display



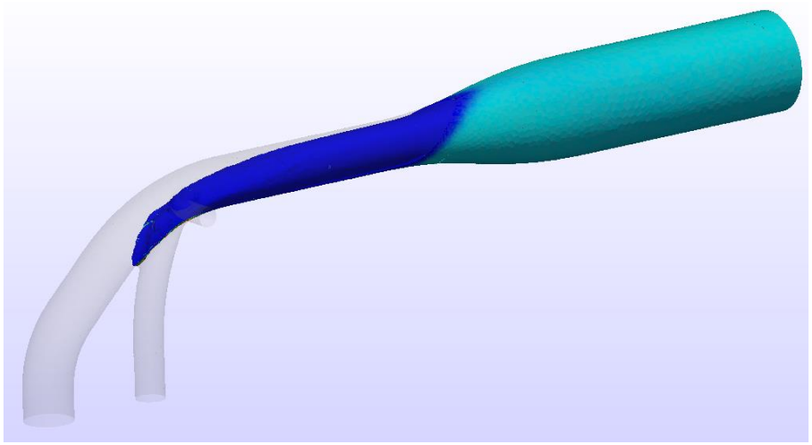
Slice Plot



Isosurface Plot



Clip Plot



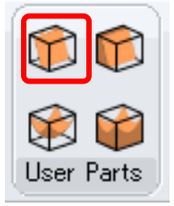
Threshold Plot

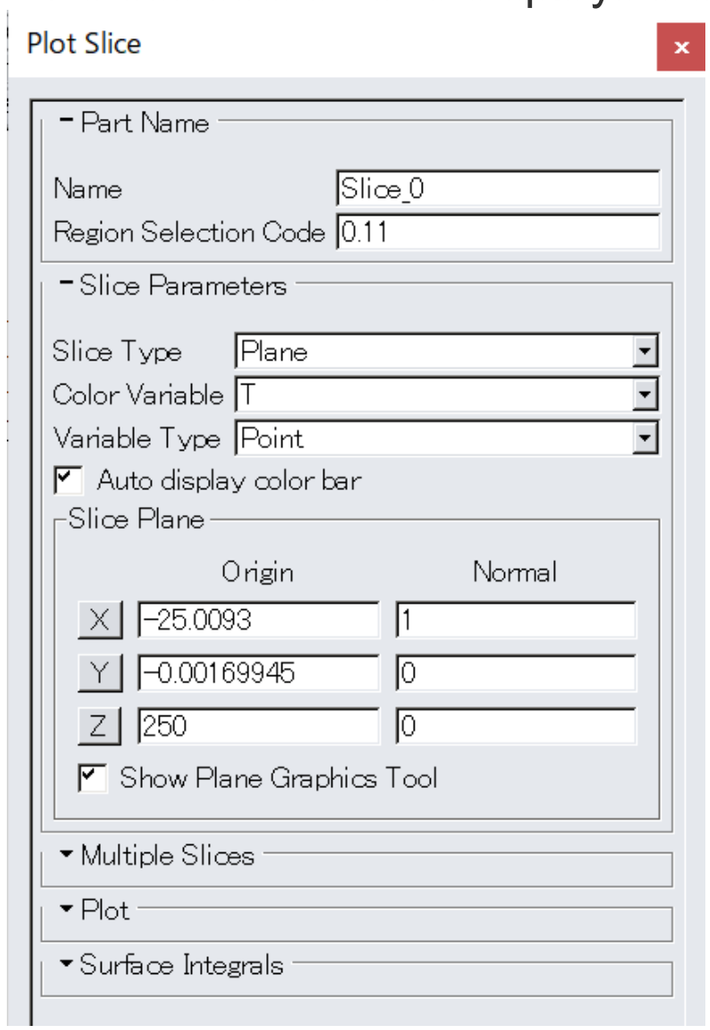
4. Functions

4.1 User Parts

- Slice Plot

- Creates a 2D cross section and displays a scalar contour.



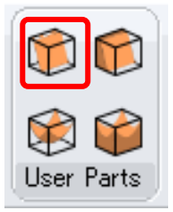


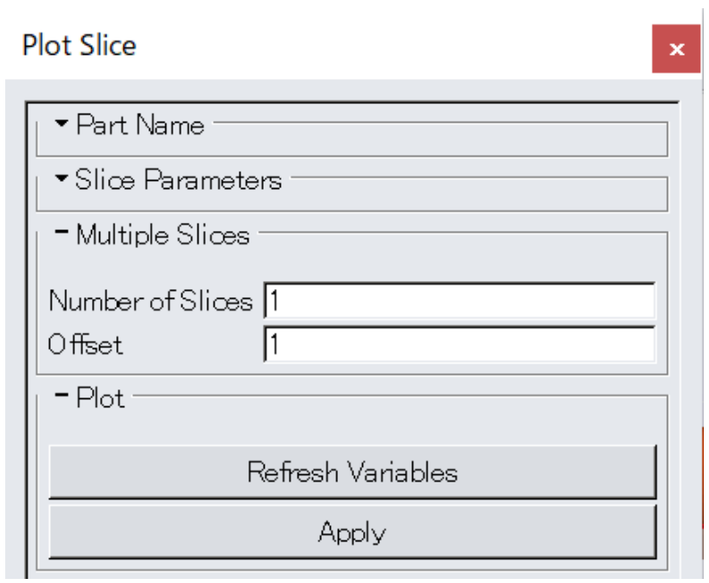
Part Name
Name: Object name displayed in the Group List
Region Selection Code: Used to display multi-region models (see p.11)
Slice Parameters
Slice Type: Select the cross-section shape (Plane only)
Color Variable: Select the variable to display
Variable Type: Select nodal-interpolated display (Point) or cell display (Cell)
Auto display color bar: Automatically display the color bar
Slice Plane: Specify the cross-section position (normal and a point through which the section passes)
Show Plane Graphics Tool: Show/hide the panel for editing the cross-section position in the 3D Viewer

4. Functions

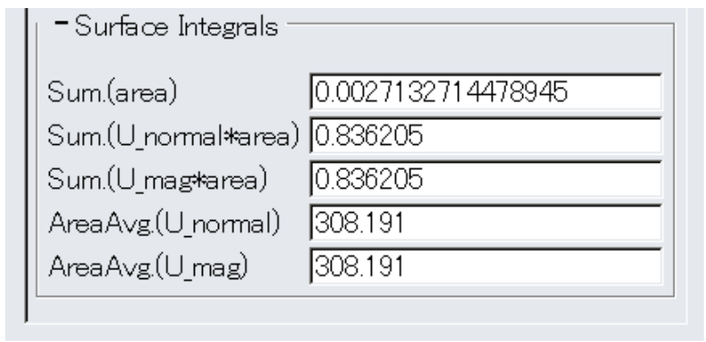
4.1 User Parts

■ Slice Plot (continued)

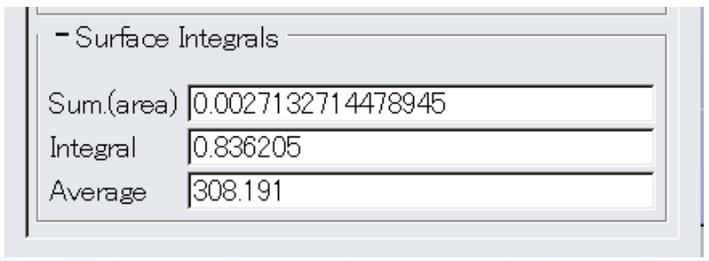




<When U_mag is selected>



<When a variable other than U_mag is selected>



Multiple Slices
Number of Slices: Number of sections when displaying multiple sections
Offset: Offset of multiple sections in the normal direction
Plot
Refresh Variables: Reloads the variable list shown under Color Variable. Use this after creating a variable with Calculator.
Apply: Displays the plot

Surface Integrals
Displays the area, integral, area-average value, etc. for the specified cross section. The displayed items differ for U_mag (total velocity magnitude) and other variables.

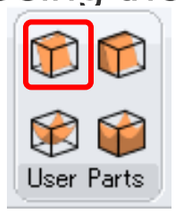
<When U_mag is selected>
Sum(area): Cross-sectional area Σ(area)
Sum(U_normal*area): Volumetric flow rate Σ(U_normal*area)
Sum(U_mag*area): Area integral of U_mag Σ(U_mag×area)
AreaAvg(U_normal): Area average of U_normal
Σ(U_normal×area)/Σ(area)
AreaAvg(U_mag): Area average of U_mag Σ(U_mag×area)/Σ(area)
<When a variable other than U_mag is selected>
Sum(area): Cross-sectional area Σ(area)
Integral: Area integral of the physical quantity Σ(Φ×area)
Average: Area average of the physical quantity Σ(Φ×area)/Σ(area)

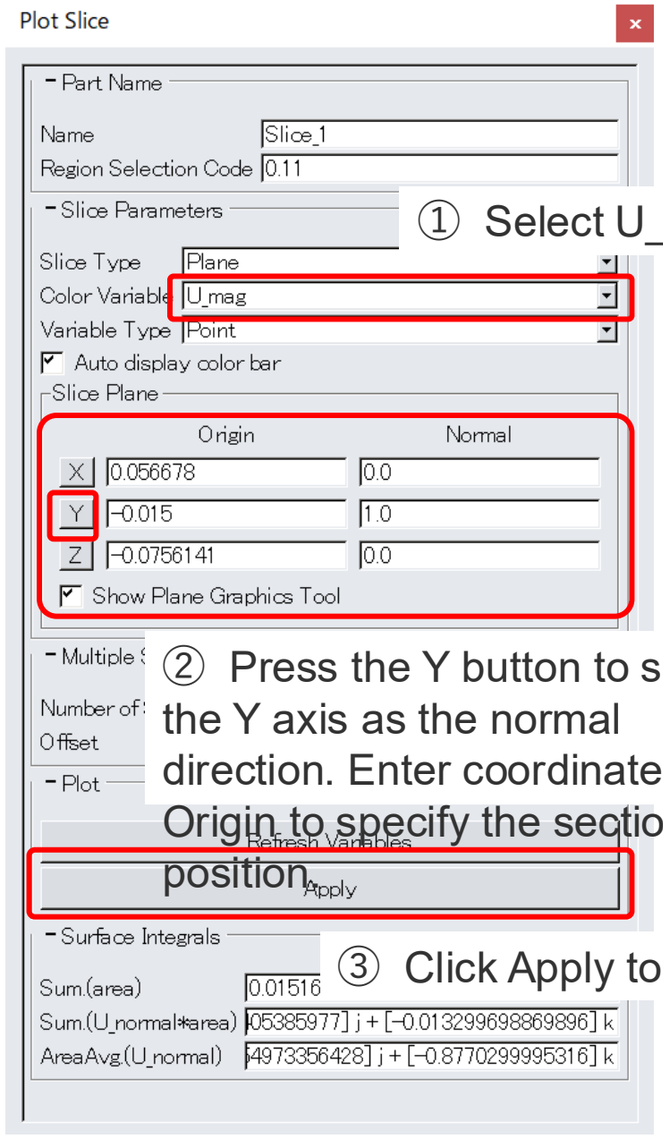
4. Functions

4.1 User Parts

- Slice Plot (continued)

- Using the ManifoldPipe sample data, this example displays a velocity contour on a cross section.

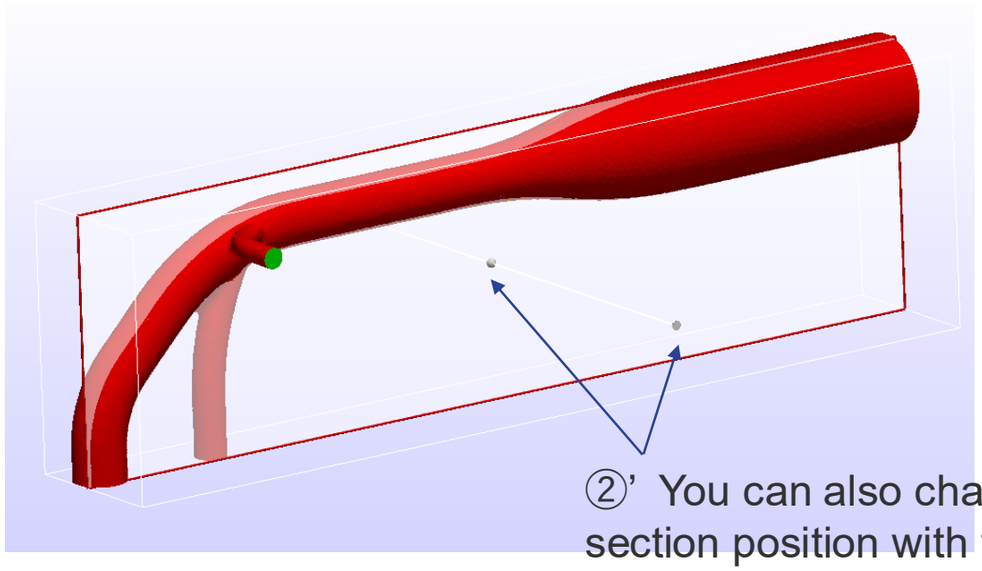




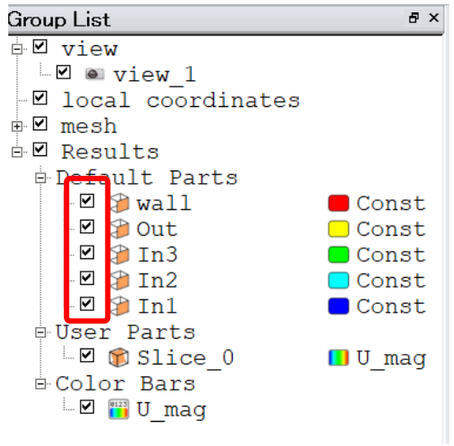
① Select U_mag

② Press the Y button to set the Y axis as the normal direction. Enter coordinates in Origin to specify the section position.

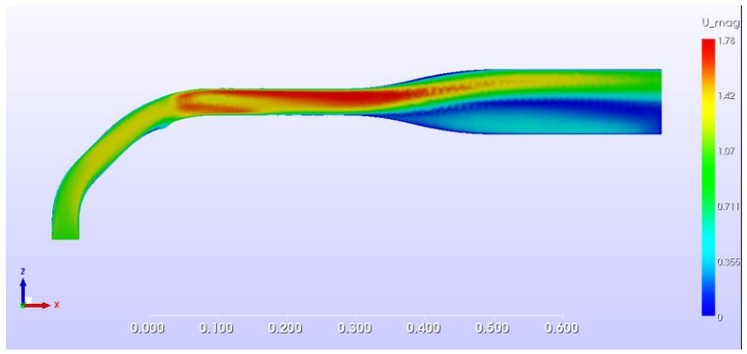
③ Click Apply to display



②’ You can also change the section position with the mouse using the section editing tool.



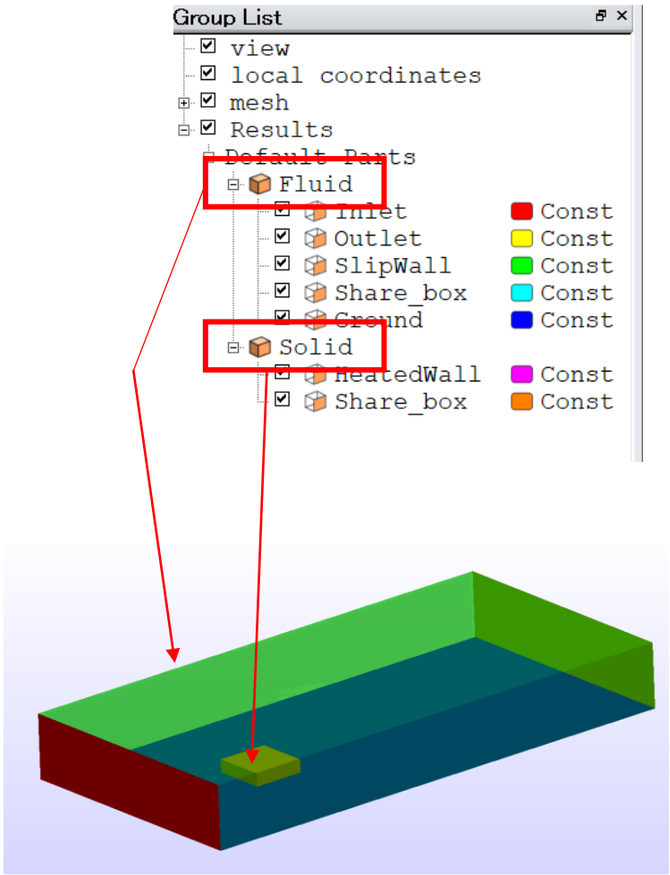
⑤ Hide Default Parts so that only the Slice Plot is displayed.

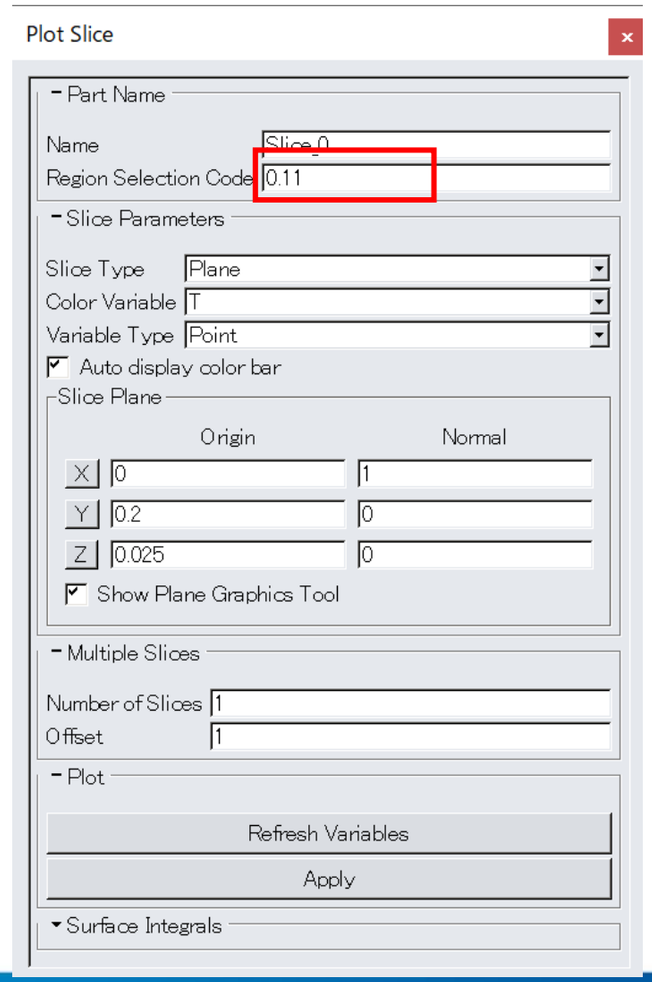


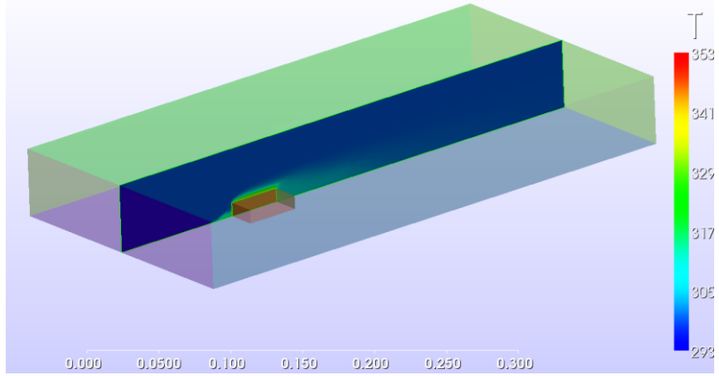
4. Functions

4.1 User Parts

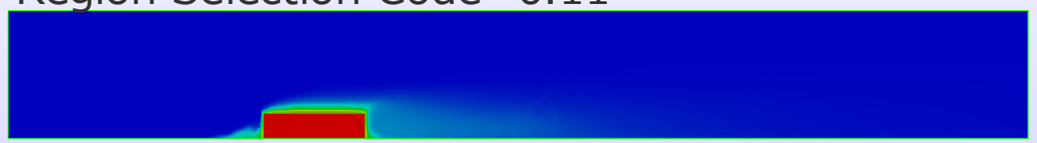
- Slice Plot (continued)
- Region Selection Code: Used to display cross sections of multi-region models such as conjugate heat-transfer analyses.
- This function is explained using the HeatChip sample data. As shown in the Group List, these results are from a fluid-solid conjugate heat-transfer analysis with two regions: Fluid and Solid.
- The Region Selection Code controls display by region. The first digit after the decimal point is the flag for the first region (Fluid in this case), and the second digit is the flag for the second region (Solid). 1 means displayed and 0 means hidden. This allows both regions, only the fluid, or only the solid to be displayed. See the figures at lower right.



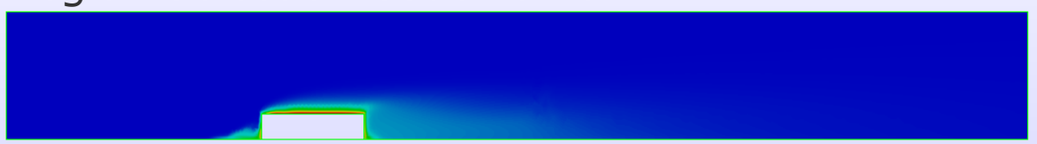




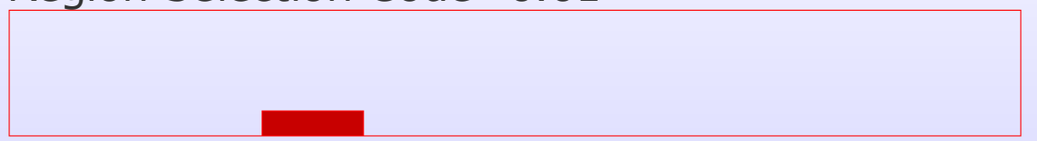
Region Selection Code=0.11



Region Selection Code=0.10



Region Selection Code=0.01

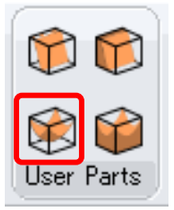


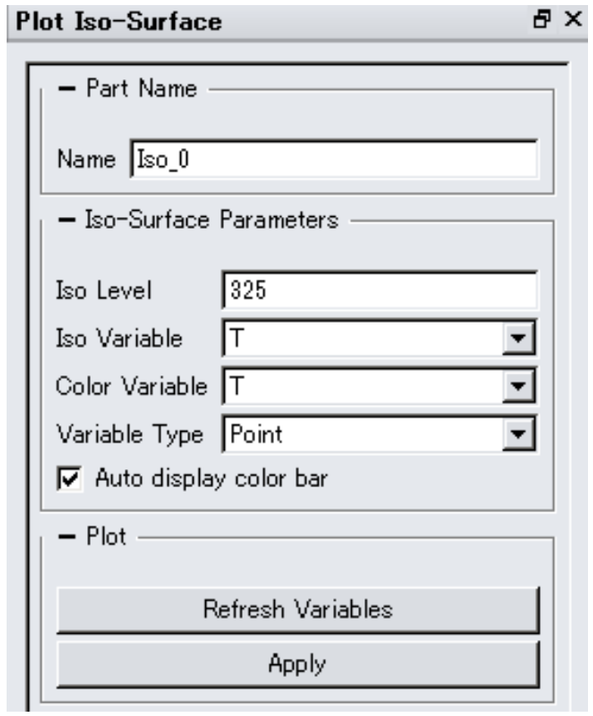
4. Functions

4.1 User Parts

- IsoSurface Plot

- Creates an isosurface and displays a scalar contour.



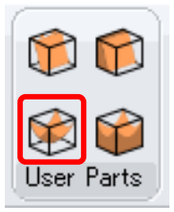


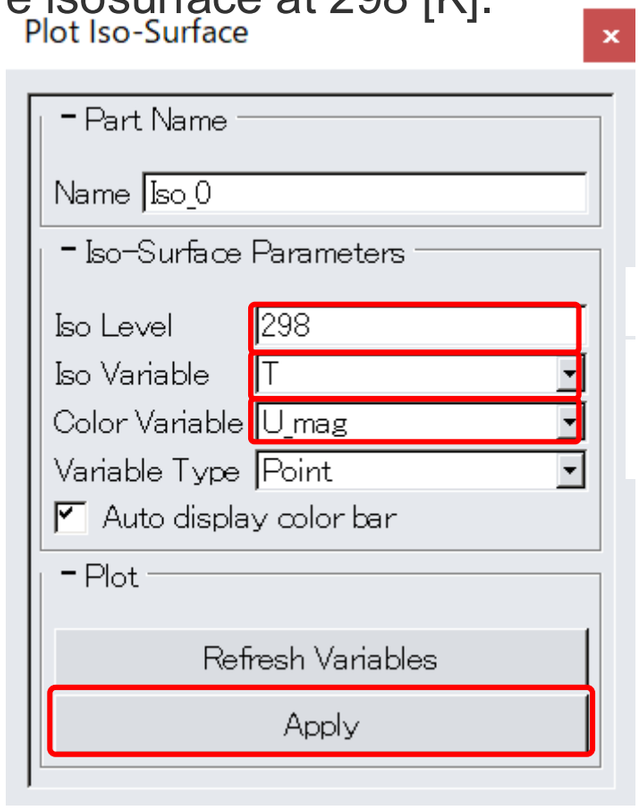
Part Name
Name: Object name displayed in the Group List
Iso-Surface Parameters
Iso Level: Enter the value at which to extract the isosurface
Iso Variable: Select the variable used to extract the isosurface
Color Variable: Select the variable to display
Variable Type: Select nodal-interpolated display (Point) or cell display (Cell)
Auto display color bar: Automatically display the color bar
Plot
Refresh Variables: Reloads the variable list shown under Color Variable. Use this after creating a variable with Calculator.
Apply: Displays the plot

4. Functions

4.1 User Parts

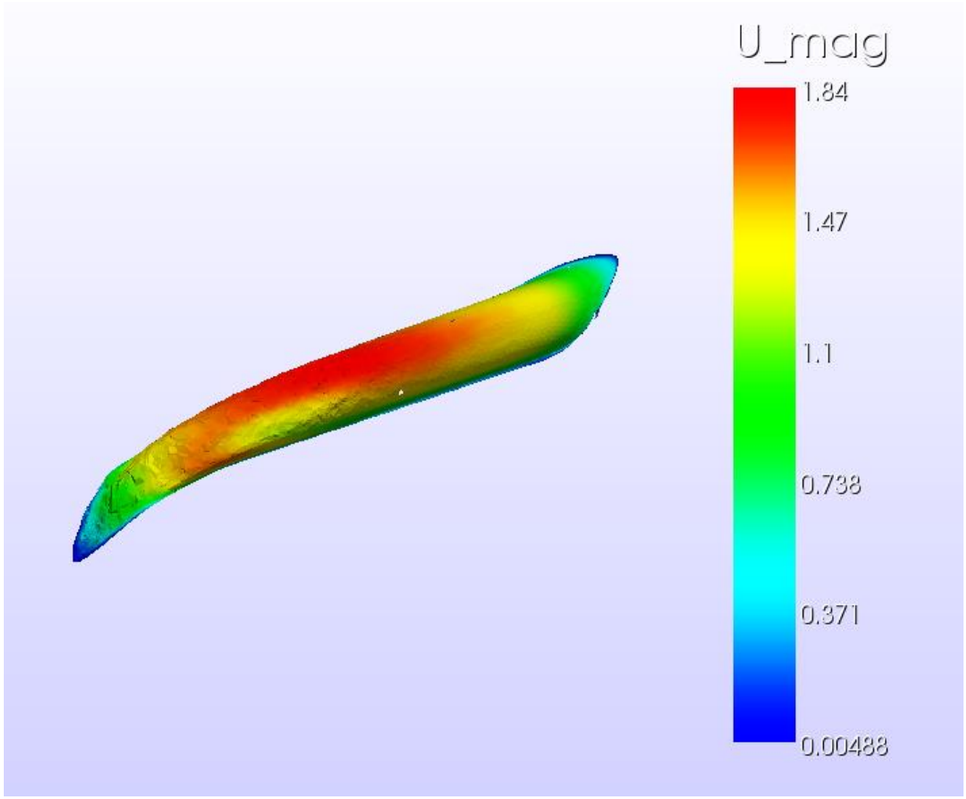
- IsoSurface Plot (continued)
- Using the ManifoldPipe sample data, this example explains how to display a velocity contour on the temperature isosurface at 298 [K].





① Enter 298
② Select T
③ Select U_mag

④ Click Apply to display

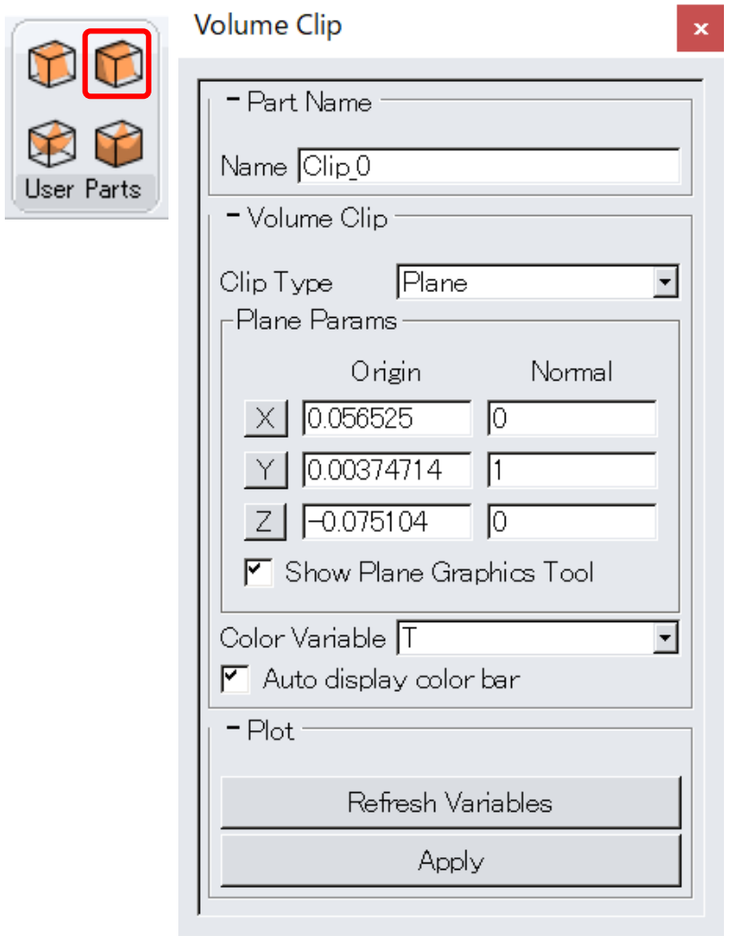


4. Functions

4.1 User Parts

- Clip Plot

- Clips the analysis model to a specified coordinate range and displays a scalar contour.



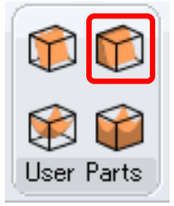
Part Name
Name: Object name displayed in the Group List
Volume Clip
Clip Type: Select the clipping shape (Plane or Box)
Plane Params: Specify the clipping position (normal and a point through which the section passes). Same specification as Slice Plot.
Show Plane Graphics Tool: Show/hide the panel for editing the section position in the 3D Viewer
Color Variable: Select the variable to display
Variable Type: Select nodal-interpolated display (Point) or cell display (Cell)
Auto display color bar: Automatically display the color bar
Plot
Refresh Variables: Reloads the variable list shown under Color Variable. Use this after creating a variable with Calculator.
Apply: Displays the plot

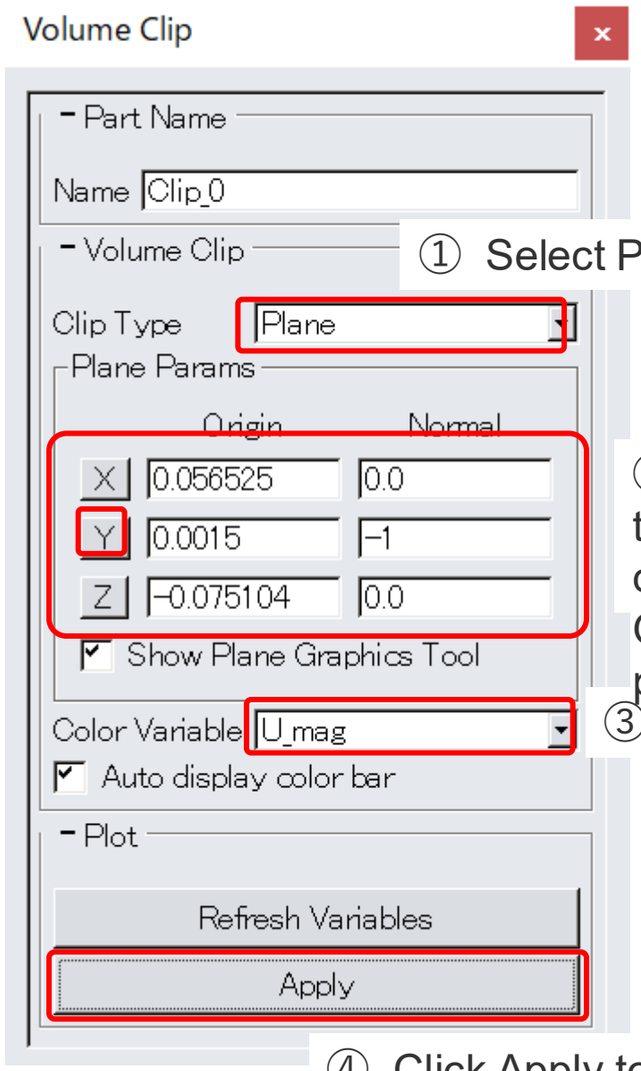
4. Functions

4.1 User Parts

- Clip Plot (continued)

- Using the ManifoldPipe sample data, this example displays a velocity contour on a clipped section.



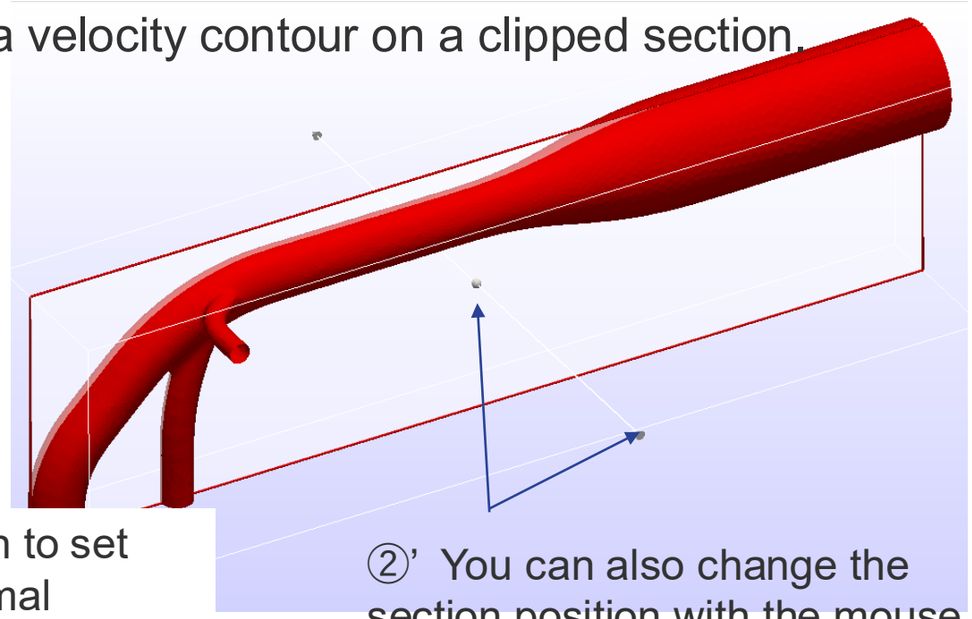


① Select Plane

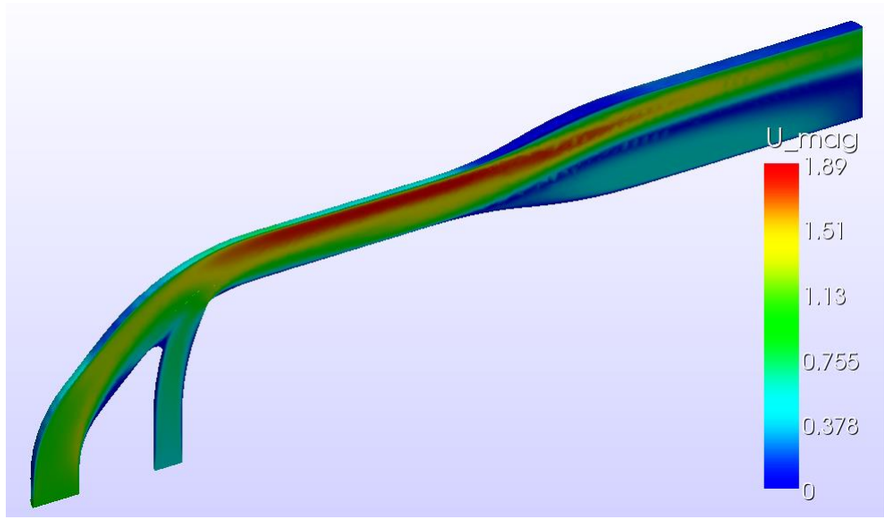
② Press the Y button to set the Y axis as the normal direction. Enter coordinates in Origin to specify the section position.

③ Select U_mag

④ Click Apply to display



②’ You can also change the section position with the mouse using Plane Graphic Tool.

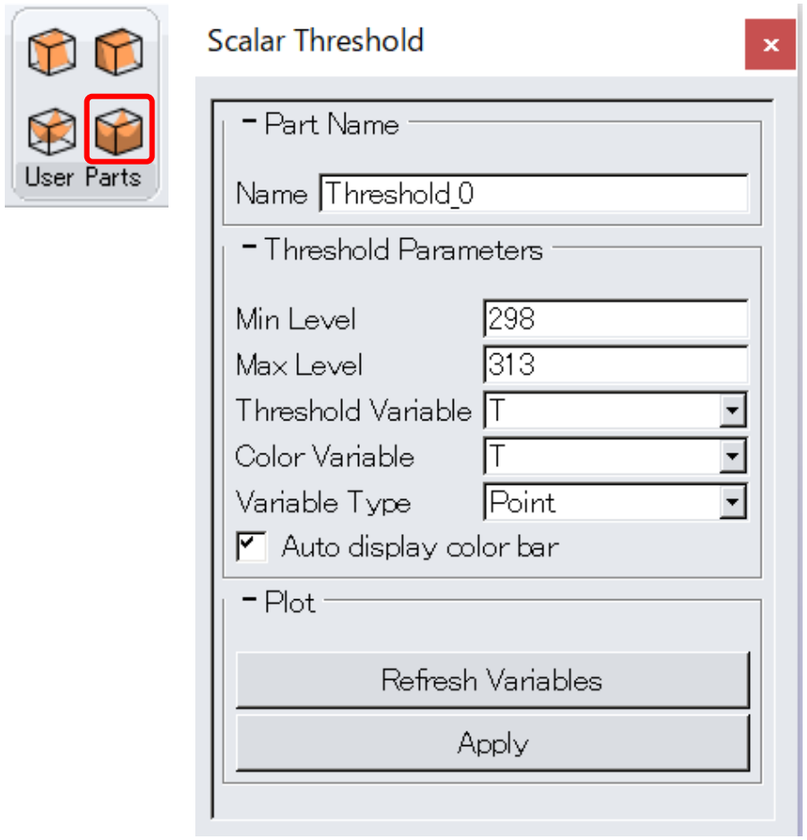


4. Functions

4.1 User Parts

- Threshold Plot

- Creates an isovolume and displays a scalar contour.



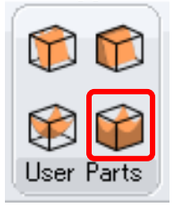
Part Name
Name: Object name displayed in the Group List
Volume Clip
Min Level: Lower limit of the isovolume
Max Level: Upper limit of the isovolume
Threshold Variables: Select the variable used to extract the isovolume
Color Variable: Select the variable to display
Variable Type: Select nodal-interpolated display (Point) or cell display (Cell)
Auto display color bar: Automatically display the color bar
Plot
Refresh Variables: Reloads the variable list shown under Color Variable. Use this after creating a variable with Calculator.
Apply: Displays the plot

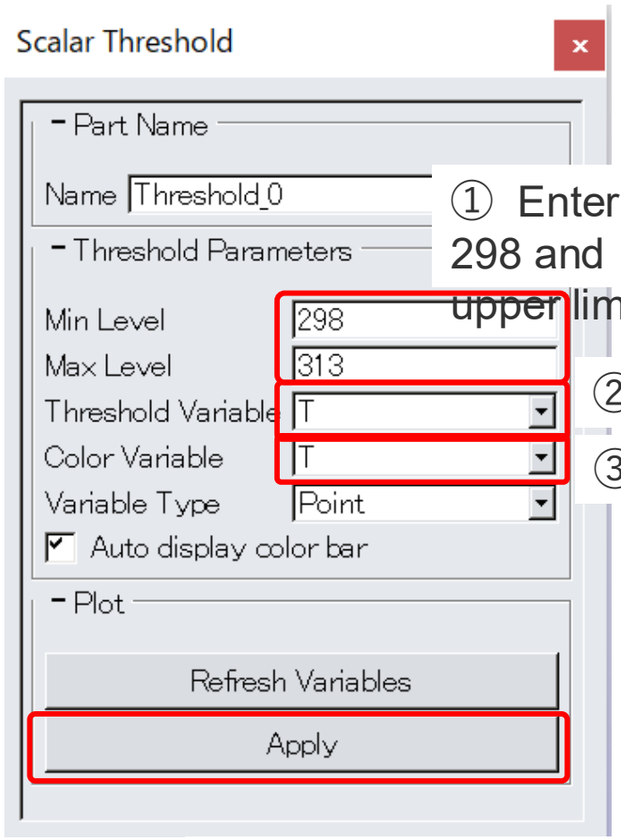
4. Functions

4.1 User Parts

- Threshold Plot (continued)

- Using the ManifoldPipe sample data, this example displays a temperature contour on an isovolume.



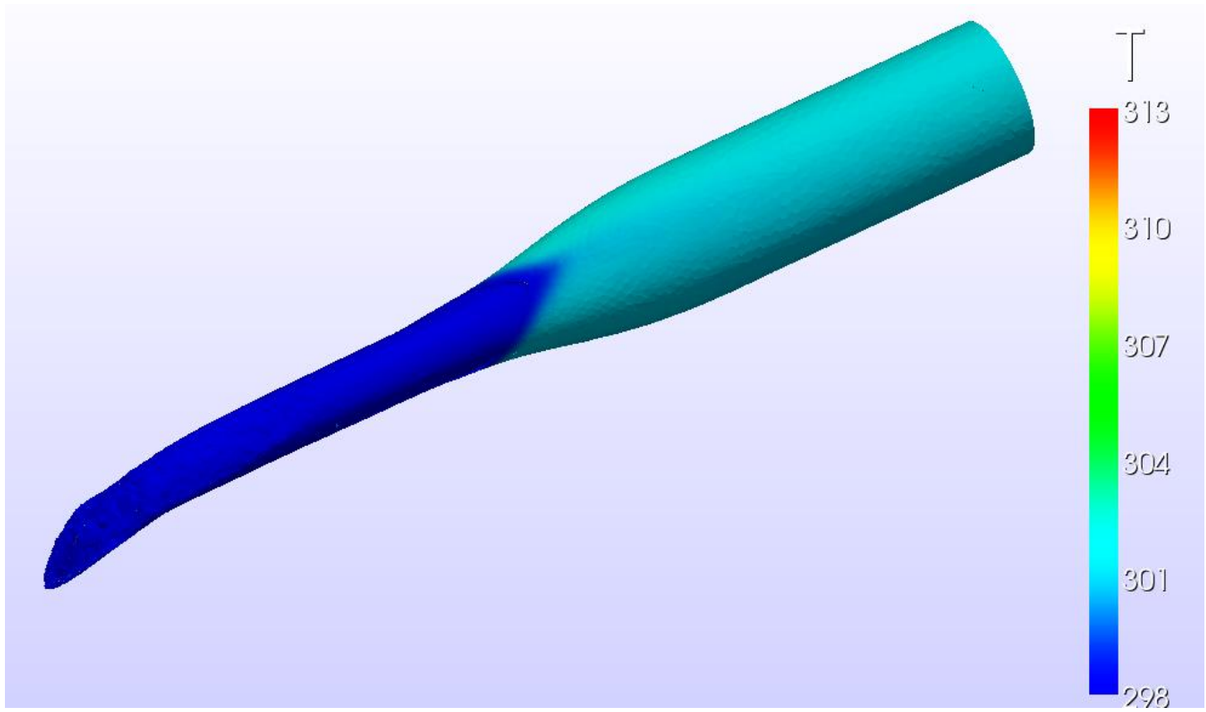


① Enter lower limit 298 and upper limit 313

② Select T

③ Select T

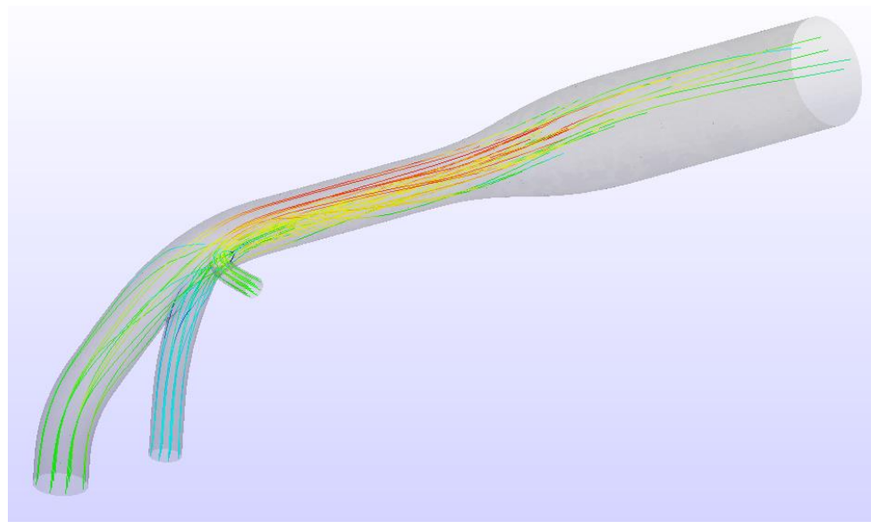
④ Click Apply to display



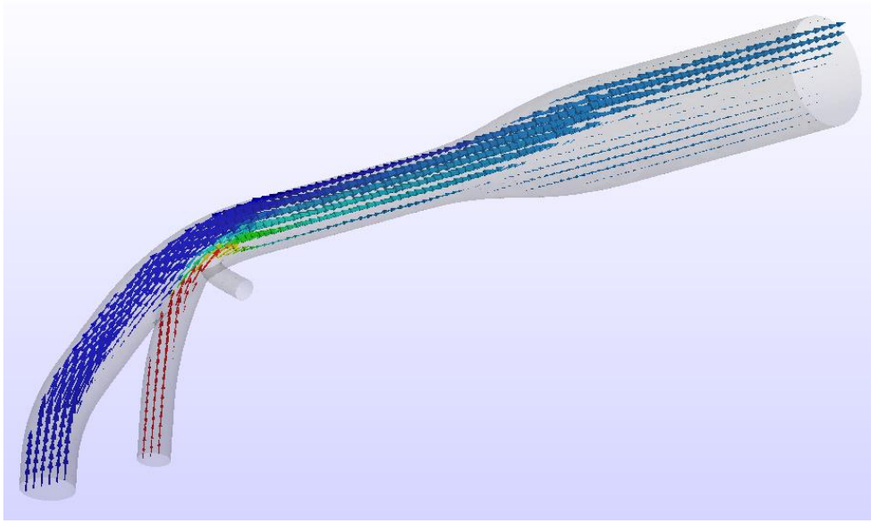
4. Functions

4.2 Visualization

- A Stream Line
- Create streamlines
- B Vector Plot
- Create a vector plot
- C Calculator
- Calculate physical quantities
- D Color Bar
- Display a color bar
- E Animation
- Continuously display transient-analysis results
- F Screen Shot
- Save a screenshot
- G Reconstructed data
- Specify the data-loading method



Stream Line



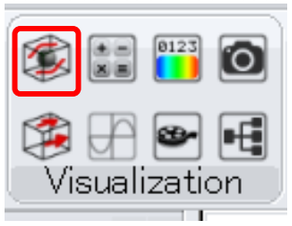
Vector Plot

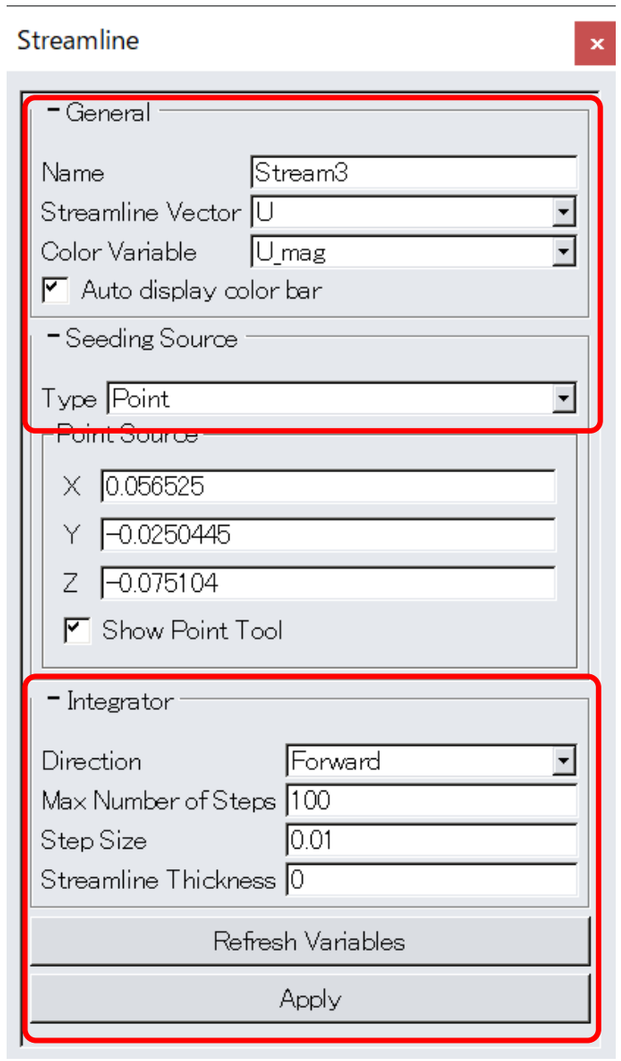
4. Functions

4.2 Visualization

- Stream Line

- Creates streamlines and displays a scalar contour.





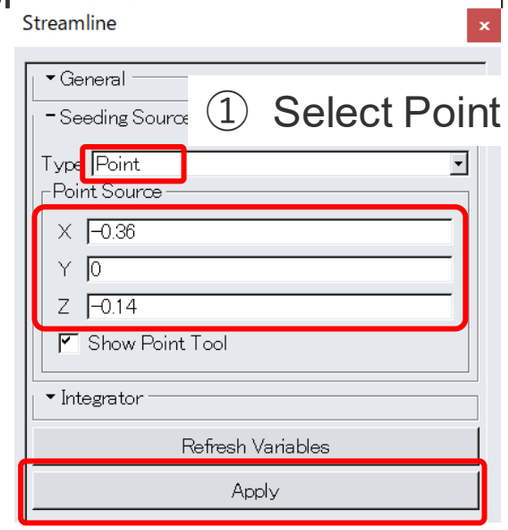
General
Name: Object name displayed in the Group List
Streamline Vector: Physical quantity used to calculate streamlines (only U can be selected)
Color Variable: Select the variable to display
Auto display color bar: Automatically display the color bar
Seeding Source
Type: Select the streamline starting location (Point, Line, Sphere, Boundary; see pp.20–21)
Integrator
Direction: Direction in which streamlines are calculated
Forward: Display streamlines in the flow direction
Backward: Display streamlines opposite to the flow direction
Max Number of Steps: Number of streamline-calculation iterations
Step Size: Step size for streamline calculation
Streamline Thickness: Streamline thickness
Plot
Refresh Variables: Reloads the variable list shown under Color Variable. Use this after creating a variable with Calculator.
Apply: Displays the plot

4. Functions

4.2 Visualization

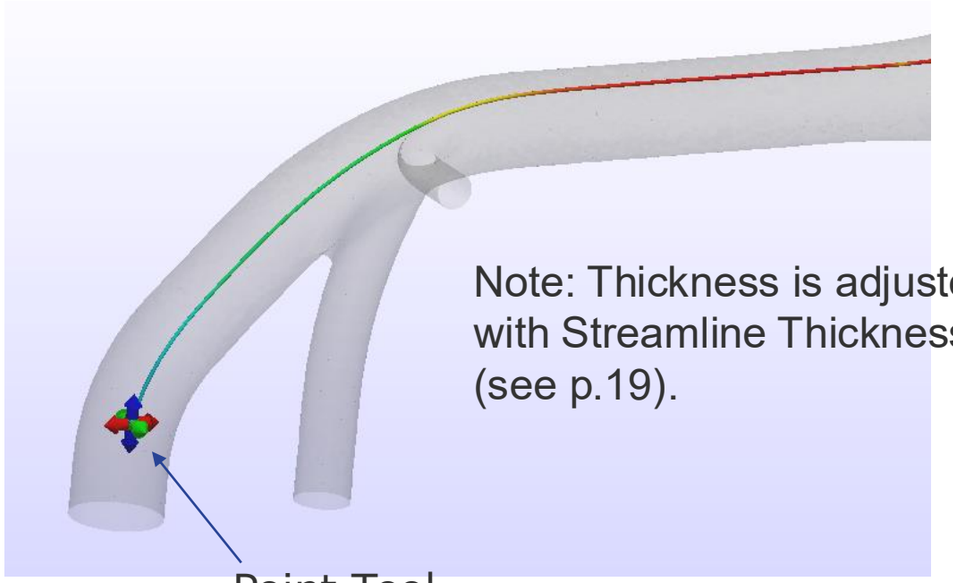
- Stream Line (continued)

- When Point is selected for Seeding Source



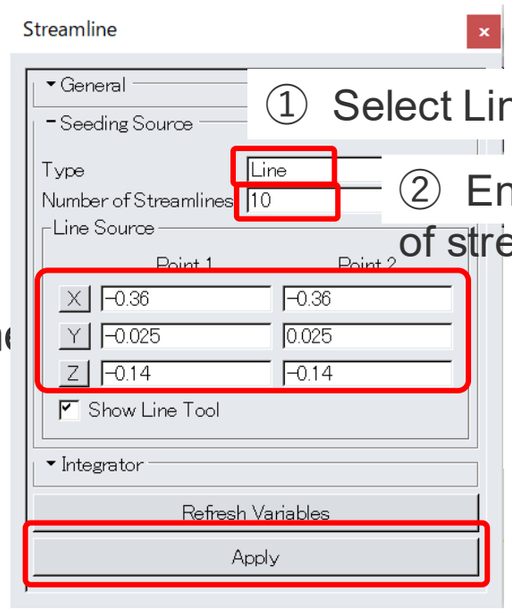
② Set the streamline starting position using coordinates or the Point Tool displayed in the 3D Viewer.

③ Click Apply to display



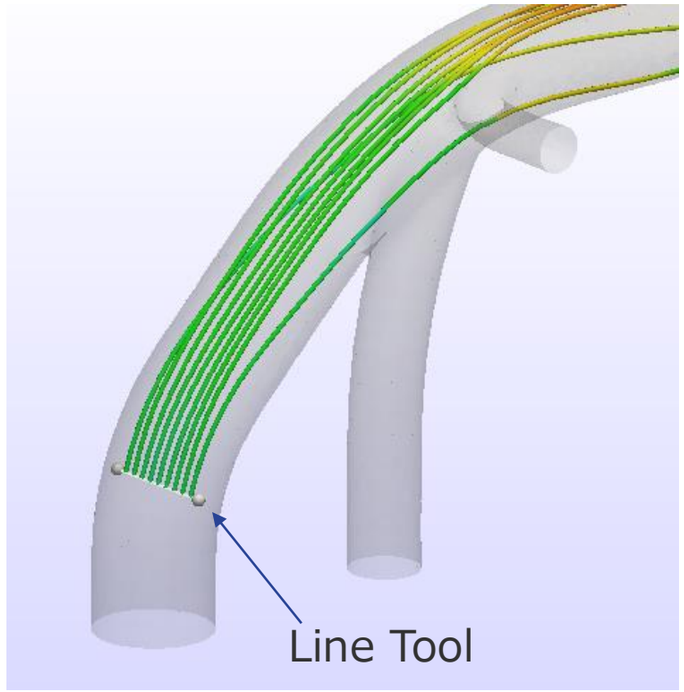
Note: Thickness is adjusted with Streamline Thickness (see p.19).

- When Line is selected for Seeding Source



③ Set the streamline starting position using coordinates or the Line Tool displayed in the 3D Viewer.

④ Click Apply to display

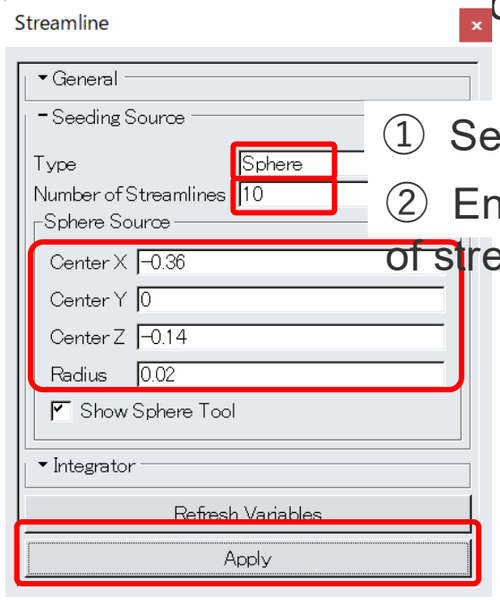


4. Functions

4.2 Visualization

- Stream Line (continued)

- When Sph[illegible]ding Source

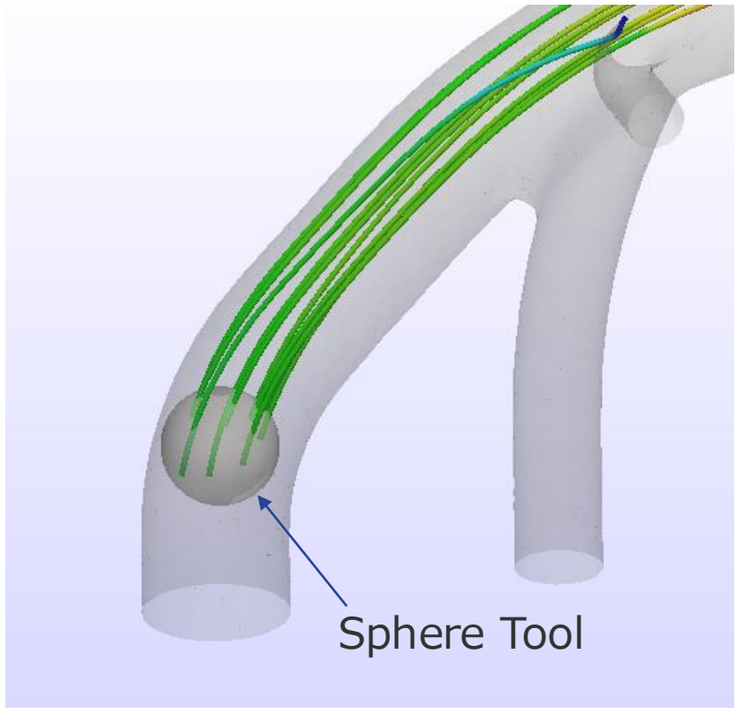


① Select Sphere

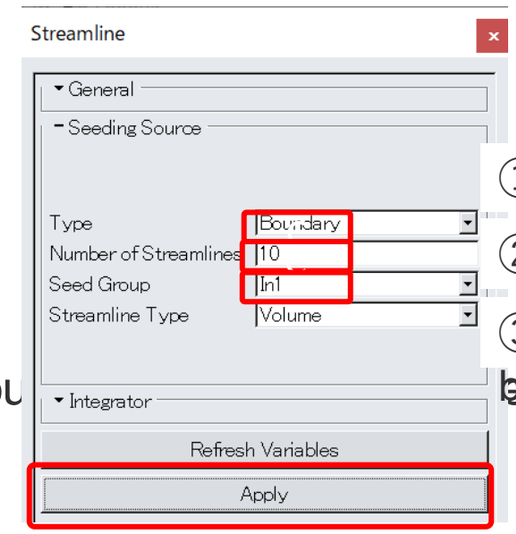
② Enter the number of streamlines

③ Set the streamline starting position using coordinates or the Sphere Tool displayed in the 3D Viewer.

③ Click Apply to display



- When Bou[illegible]

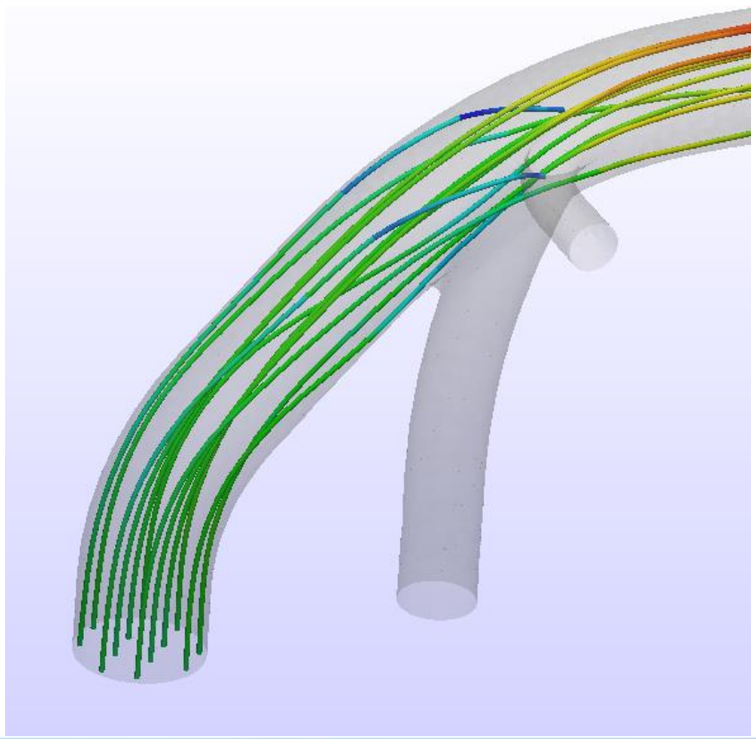


① Select Boundary

② Enter the number [illegible]

③ Select the boundary [illegible] Source

④ Click Apply to display

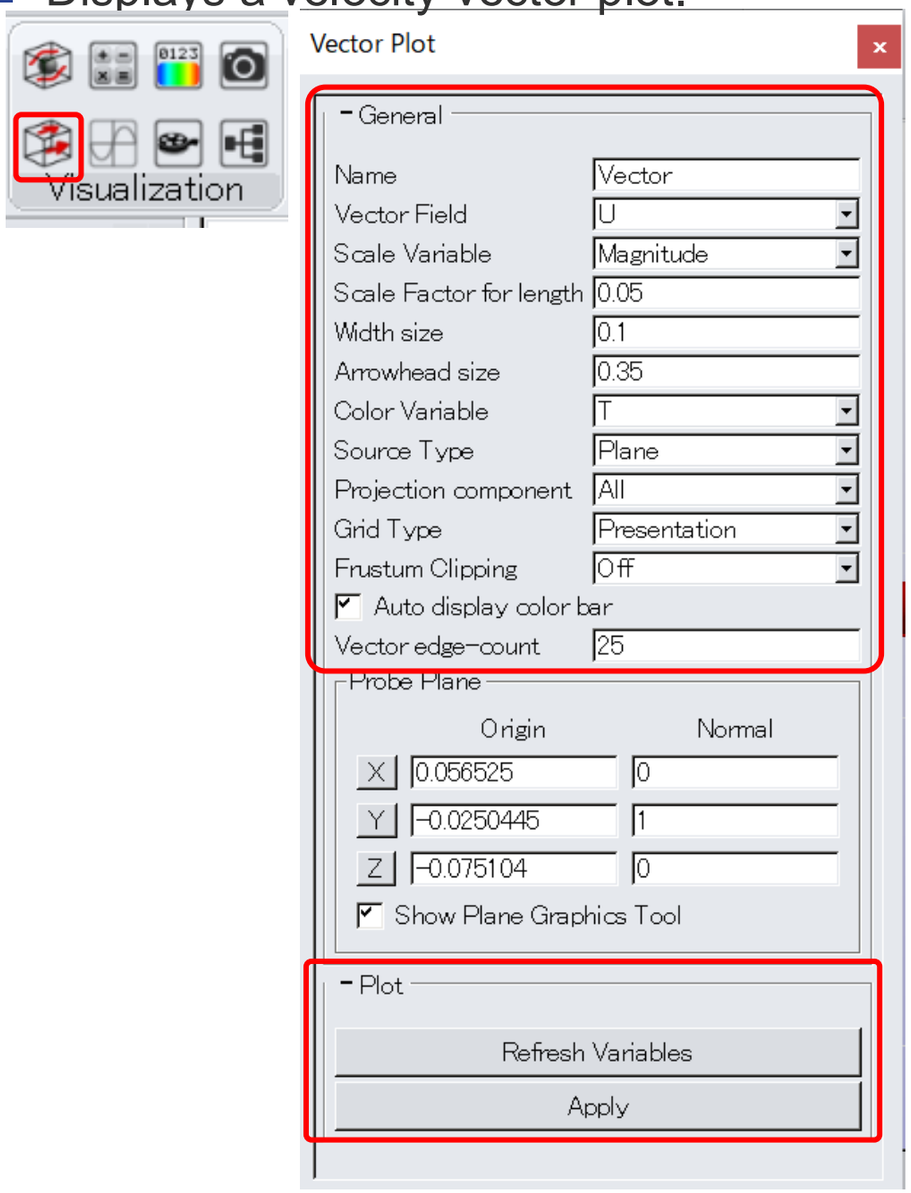


4. Functions

4.2 Visualization

- Vector Plot

- Displays a velocity-vector plot.



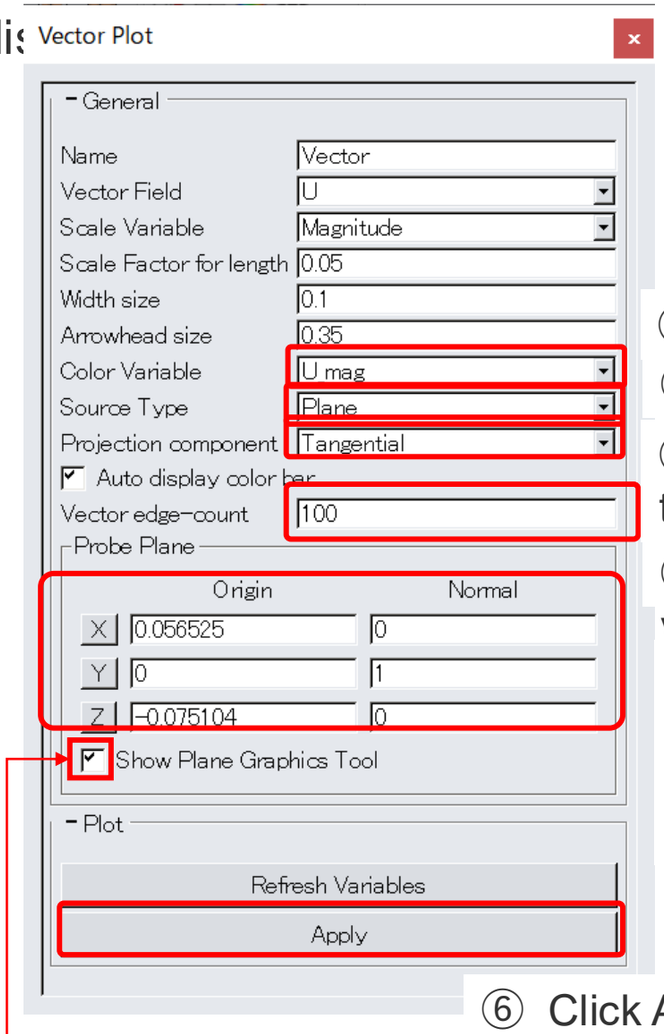
General
Name: Object name displayed in the Group List
Vector Field: Physical quantity to display as vectors (only U can be selected)
Scale Variable: Option specifying arrow length
Magnitude = Vary arrow size according to velocity magnitude
Constant = Constant size
Scale Factor for length: Factor for scaling overall arrow size
Width size: Factor for scaling arrow thickness
Arrowhead size: Ratio of arrow shaft to arrowhead
Color Variable: Select the variable to display
Source Type: Vector-plot display type (Plane, Point, Line, Boundary; see pp.23–26)
Projection component: Select the vector component to display: tangential (Tangential), normal (Normal), or all components (All) relative to the section.*
Grid Type: Select presentation-grid display or per-cell display.*
Frustum Clipping: Turn On to display vectors only within the range currently visible in the 3D Viewer.
Auto display color bar: Automatically display the color bar
* Enabled when Plane is selected for Source Type
Plot
Refresh Variables: Reloads the variable list shown under Color Variable. Use this after creating a variable with Calculator.
Apply: Displays the plot

4. Functions

4.2 Visualization

- Vector Plot (continued)

- When Plane is selected for Source Type, a velocity-vector plot on the specified cross section can be dis



② Select U_mag

① Select Plane

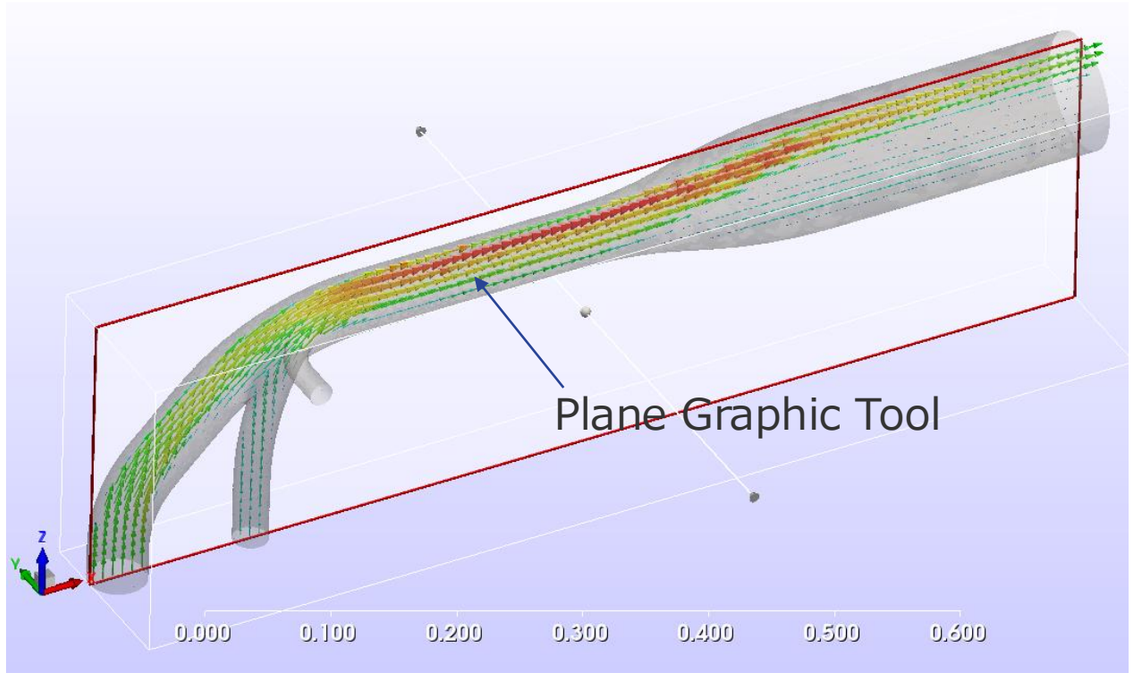
③ Select the tangential component

④ Enter the number of vectors

⑤ Specify the section position (normal and a point through the section). Same as Slice Plot. You can also change the position with the mouse using Plane Graphic Tool.

⑥ Click Apply to display

⑦ Clear the Plane Graphic Tool check box

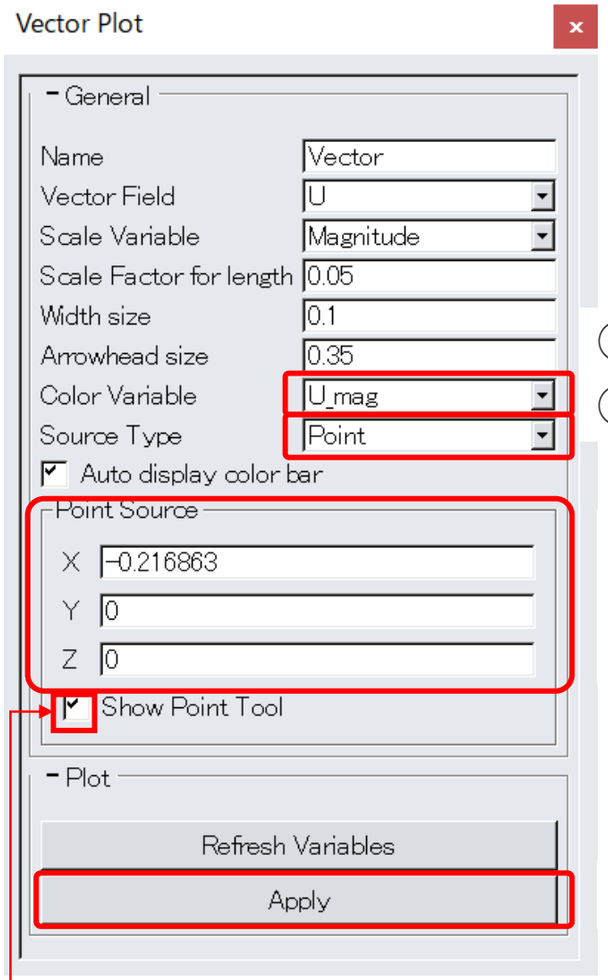


4. Functions

4.2 Visualization

- Vector Plot (continued)

- When Point is selected for Source Type, a velocity-vector plot at the specified location can be displayed.



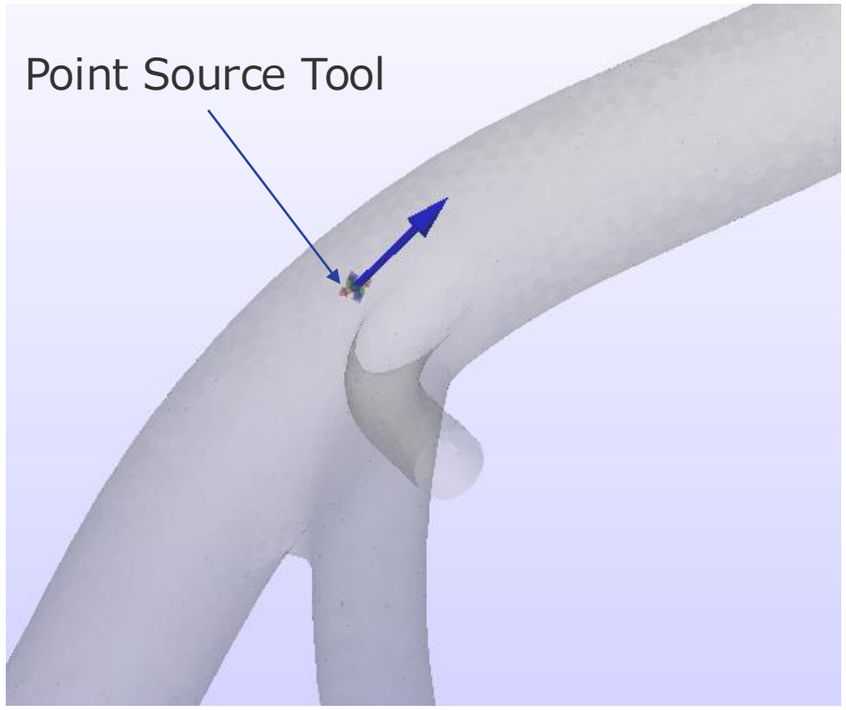
② Select U_mag

① Select Point

③ Enter the Point coordinates. You can also change the position with the mouse using Point Source Tool.

④ Click Apply to display

⑤ Clear the Point Source Tool check box

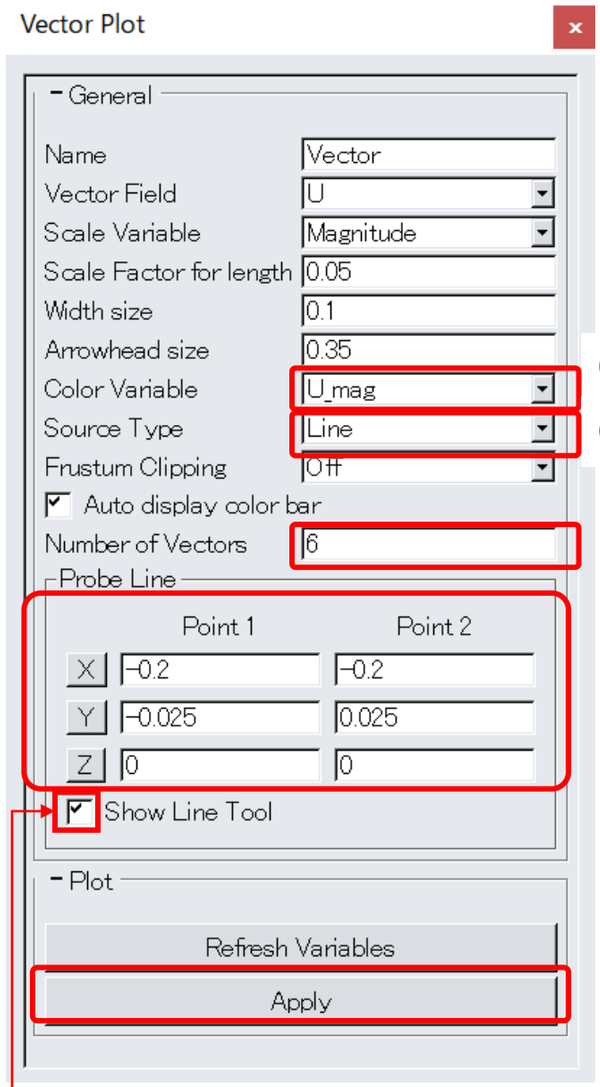


4. Functions

4.2 Visualization

- Vector Plot (continued)

- When Line is selected for Source Type, a velocity-vector plot along the specified line can be displayed.



② Select U_mag

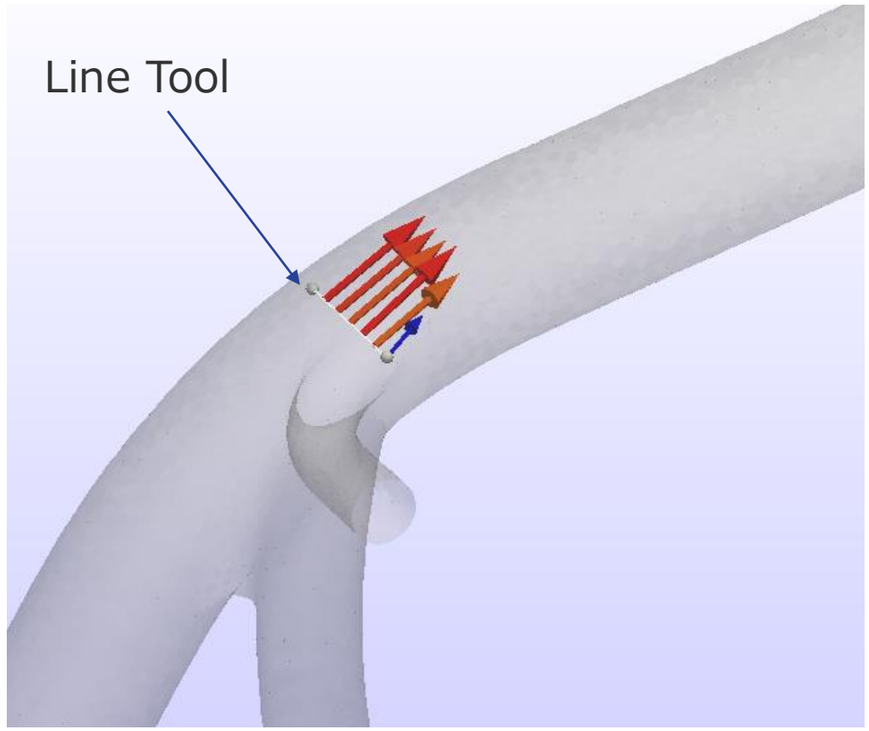
① Select Line

③ Enter the number of vectors

④ Enter the Line coordinates. You can also change the position with the mouse using Line Tool.

⑤ Click Apply to display

⑥ Clear the Point Source Tool check box

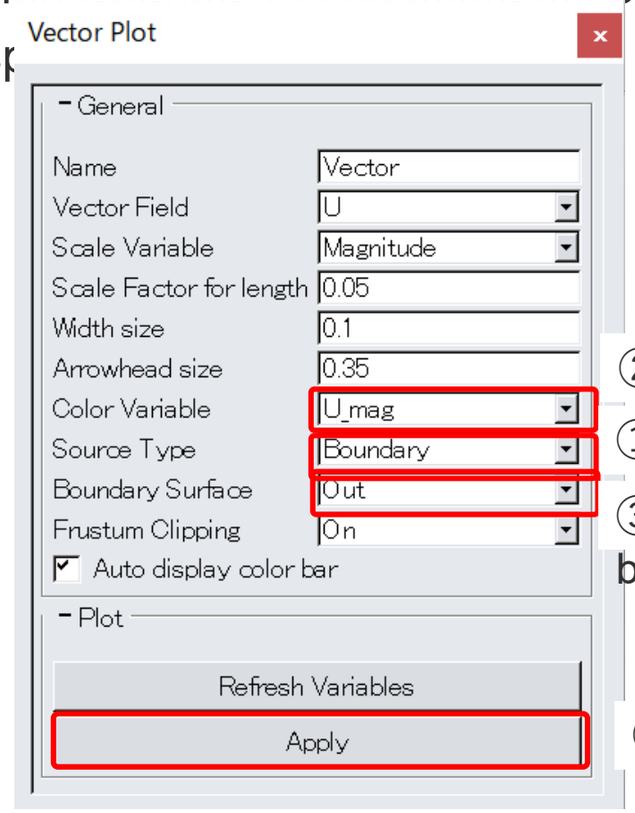


4. Functions

4.2 Visualization

- Vector Plot (continued)

- When Boundary is selected for Source Type, a velocity-vector plot on the boundary surface can be disp

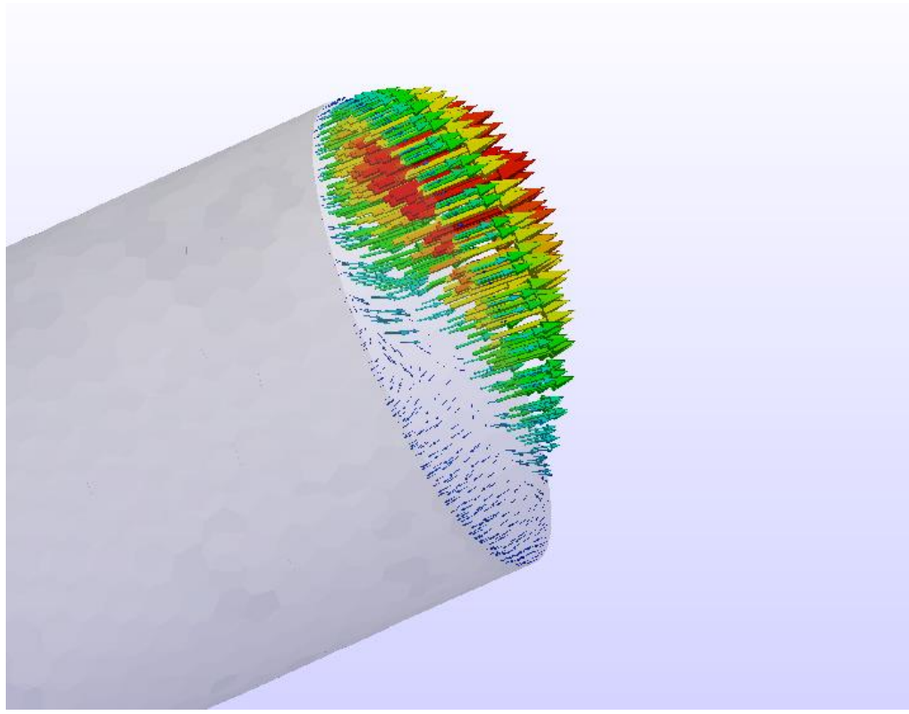


② Select U_mag

① Select Boundary

③ Select the boundary

⑤ Click Apply to display

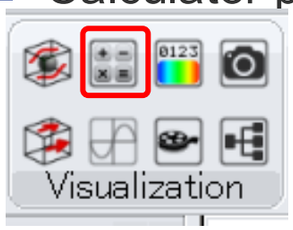


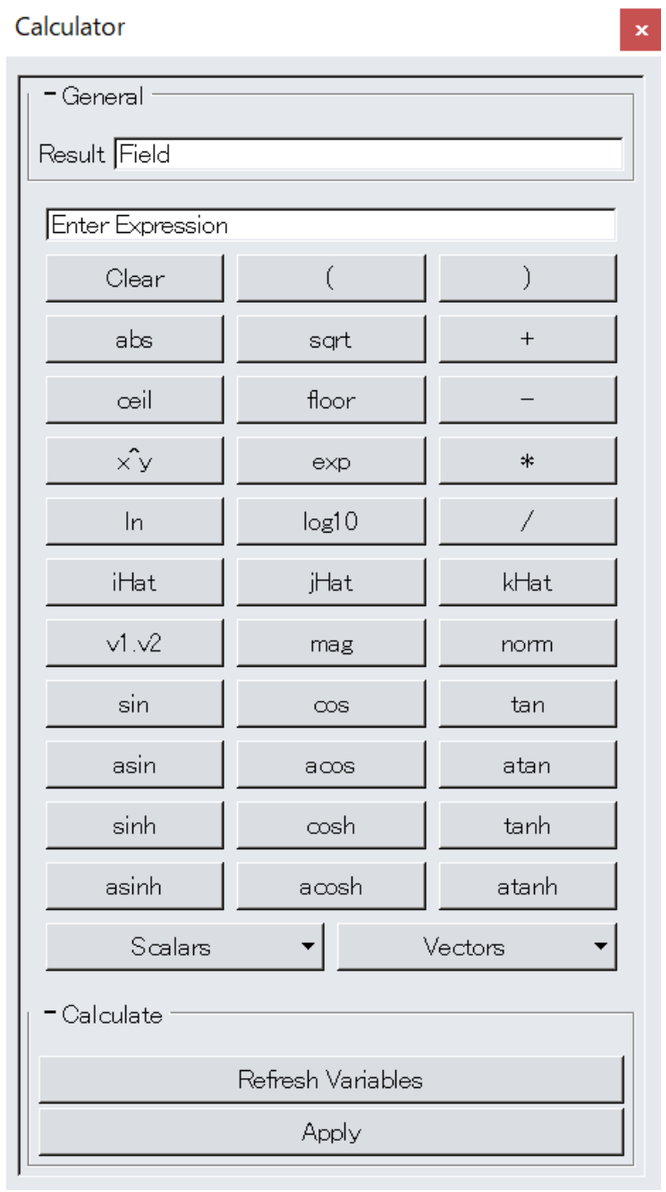
4. Functions

4.2 Visualization

- Calculator

- Calculator performs calculations on field data.



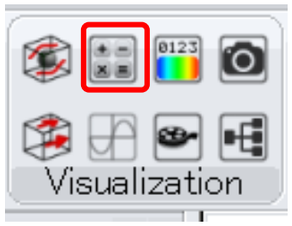


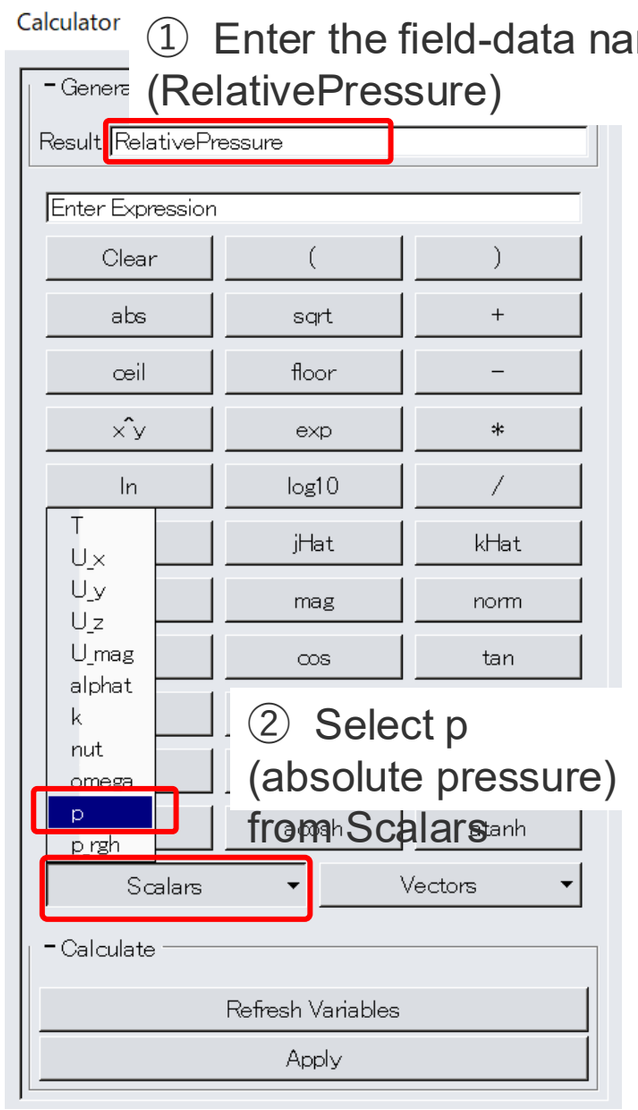
General
Name: Name of the field data to create
Enter Expression
Input field for the calculation expression. Calculate field data using the provided functions and scalar/vector variables.
Scalars: Select scalar data contained in the calculation results
Vectors: Select vector data contained in the calculation results
Calculate
Refresh Variables: Use this to add newly created field data to the Scalars/Vectors lists.
Apply: Confirms the calculation expression

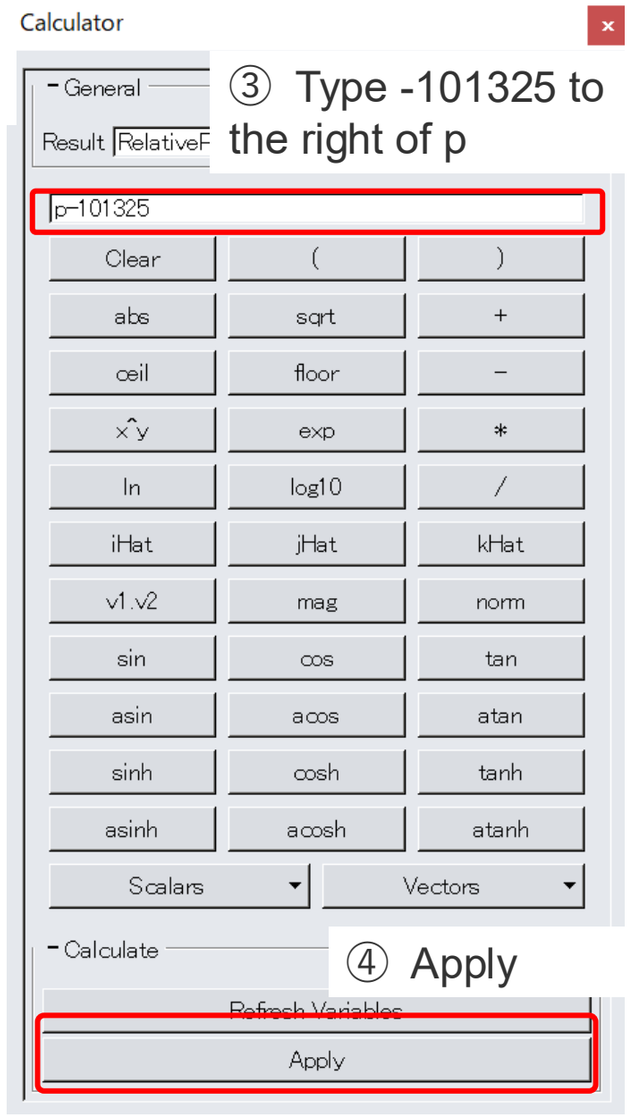
4. Functions

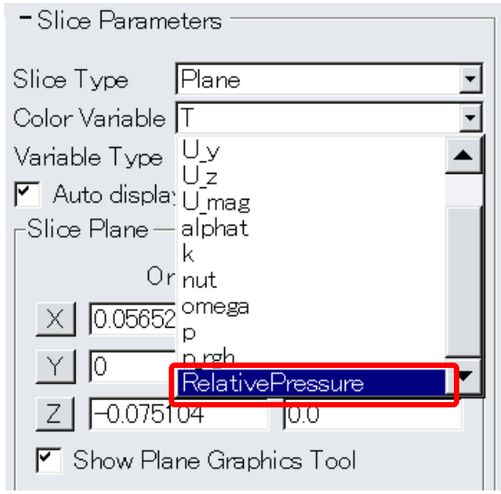
4.2 Visualization

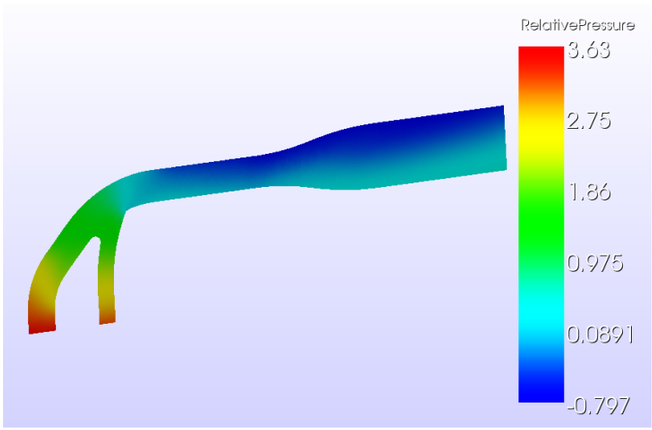
- Calculator (continued)
- As an example, this section explains how to create relative pressure.
- In the ManifoldPipe sample data, results are output as absolute pressure (this varies by solver). Create relative-pressure field data by subtracting the reference pressure 101325 from the result pressure p.









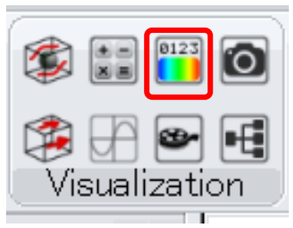


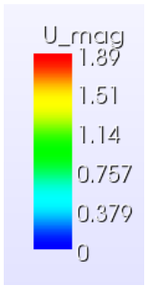
Select RelativePressure in Slice Plot, etc., to display it.

4. Functions

4.2 Visualization

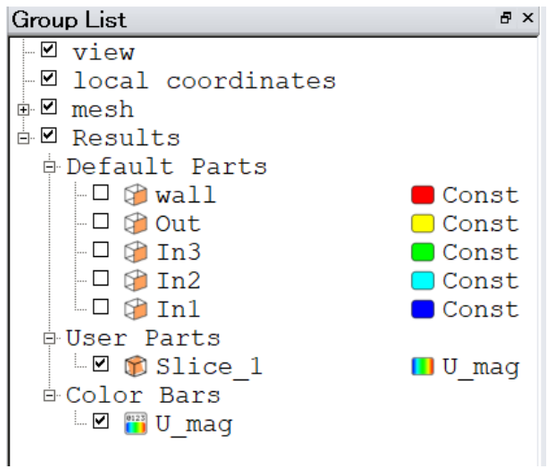
- Color Bar





- Color Bar controls the color scale for contour and vector plots. Tools for displaying contour and vector plots under User Parts and Visualization include an Auto display color bar switch, so the Color Bar is displayed automatically. If the Color Bar is deleted, it can be displayed again by pressing this button.

- The created Color Bar appears in the Group List.

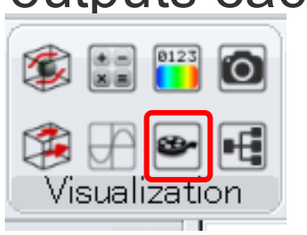


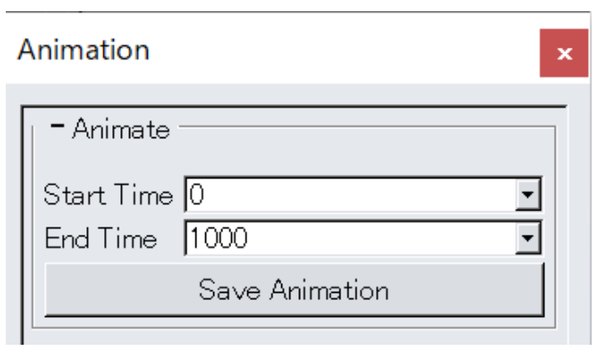
4. Functions

4.2 Visualization

- Animation

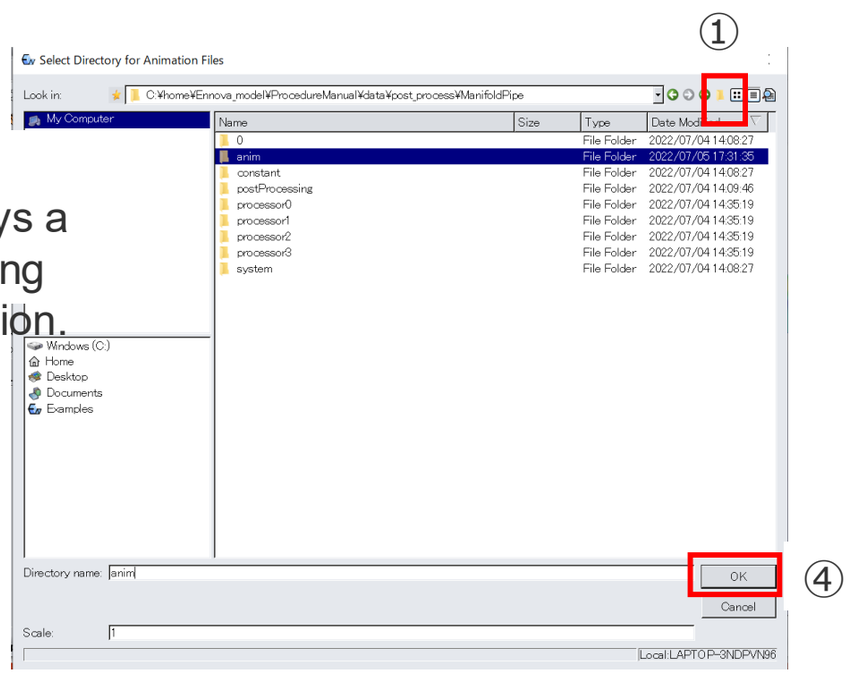
- Continuously displays transient-analysis results that contain time-history result data, and outputs each rendered frame in PNG format.

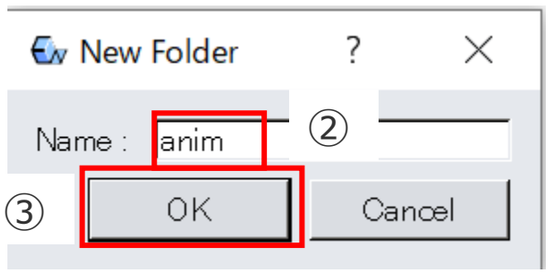




Animate
Start Time: Animation start time/iteration
End Time: Animation end time/iteration
Save Animation: Output to PNG files

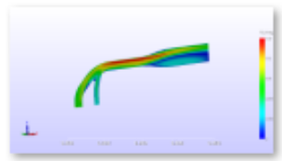
Pressing Save Animation displays a panel for specifying the save destination.





Create a destination folder and press OK to output the PNG files.

AnimationFrame_00000000_Time_0.png

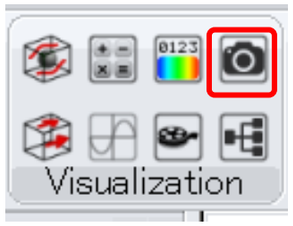


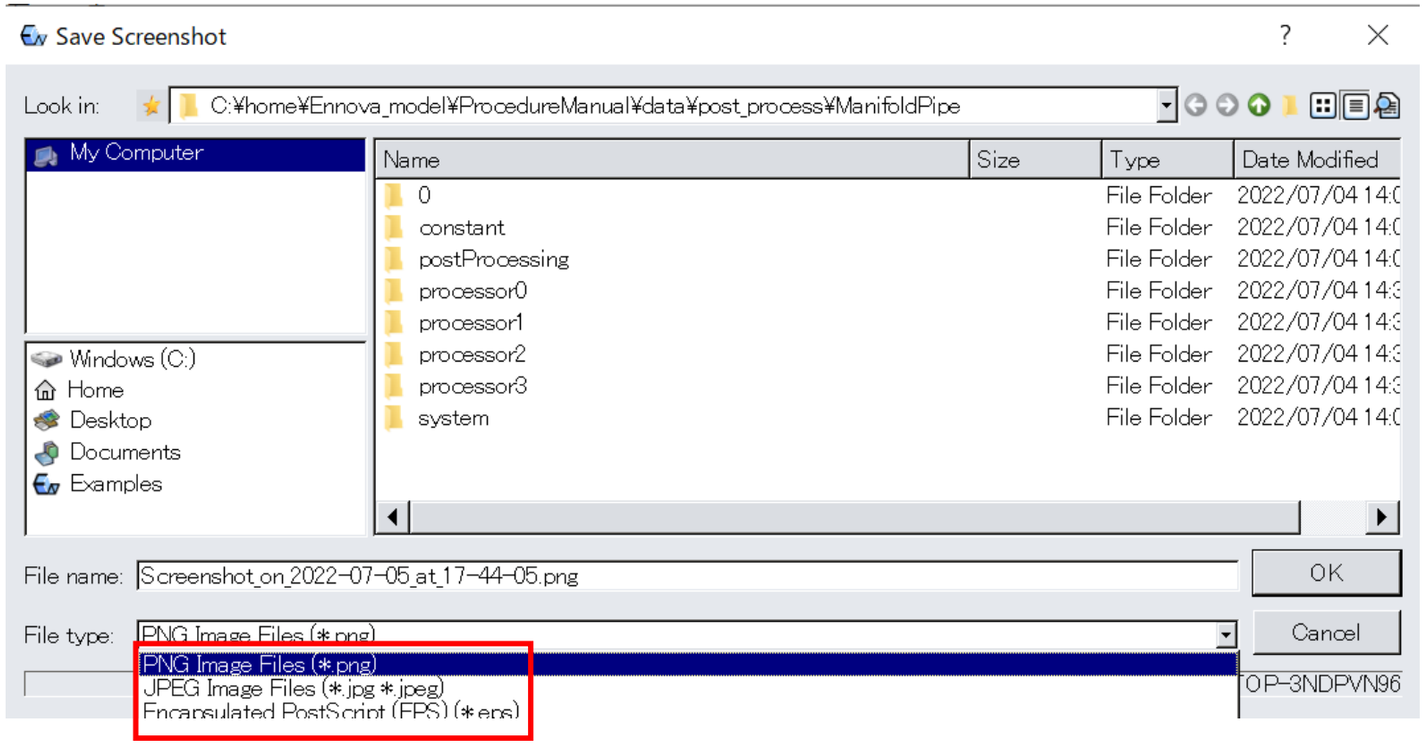
AnimationFrame_00000001_Time_1000.png

4. Functions

4.2 Visualization

- Screen Shot
- Outputs the 3D Viewer display in PNG, JPEG, or EPS format.

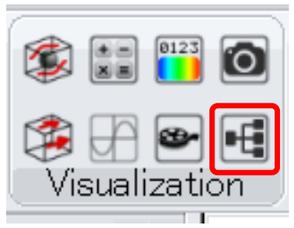




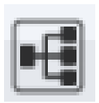
4. Functions

4.2 Visualization

- Reconstructed data
- In iconCFD/OpenFOAM, when a calculation is run on one core, result data is output directly under the calculation folder (reconstructed data). In a parallel calculation, result data is output under folders divided by calculation core (decomposed data).
- If both decomposed and reconstructed data exist, this function specifies which one to import. If only one type exists, the available data is loaded automatically.

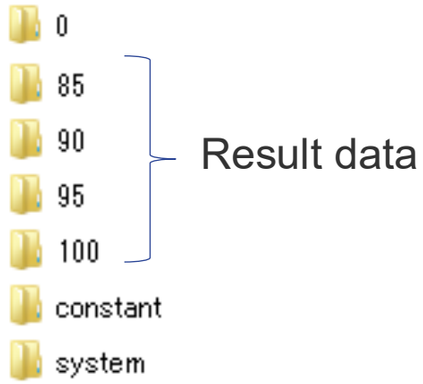


Import reconstructed data

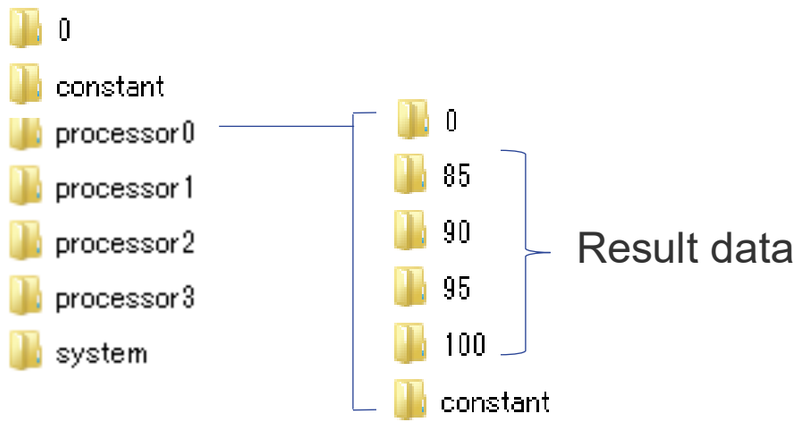


Import decomposed data

1-core result data
(Reconstructed data)



4-core result data
(Decomposed data)



4. Functions

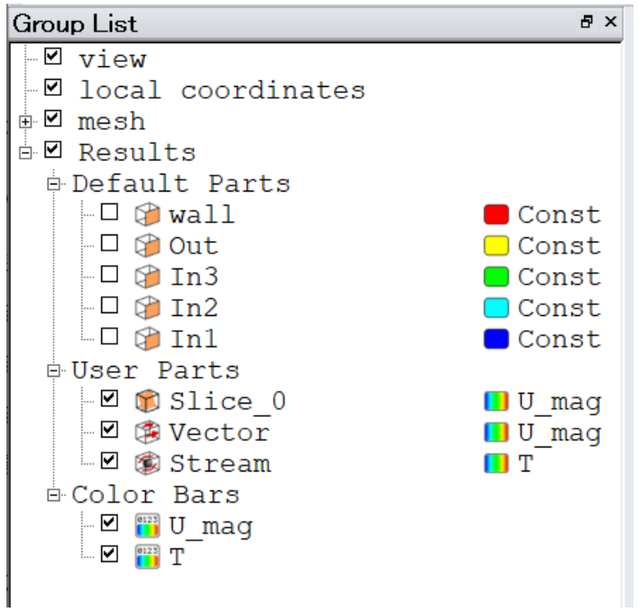
4.3 Time

- A First Time
- Displays the first time/iteration in the results.
- B Previous Time
- Displays the time/iteration immediately preceding the currently displayed result.
- C Play
- If the results contain multiple times/iterations, continuously displays the result at each time/iteration.
- D Next Time
- Displays the time/iteration immediately following the currently displayed result.
- E Last Time
- Displays the last time/iteration in the results.
- F Screen Time
- Shows the time/iteration currently displayed in the GUI.

4. Functions

4.4 Group List

- Parts contained in the result data and objects created with User Parts or Visualization are shown in the Group List, where their display in the 3D Viewer can be controlled.

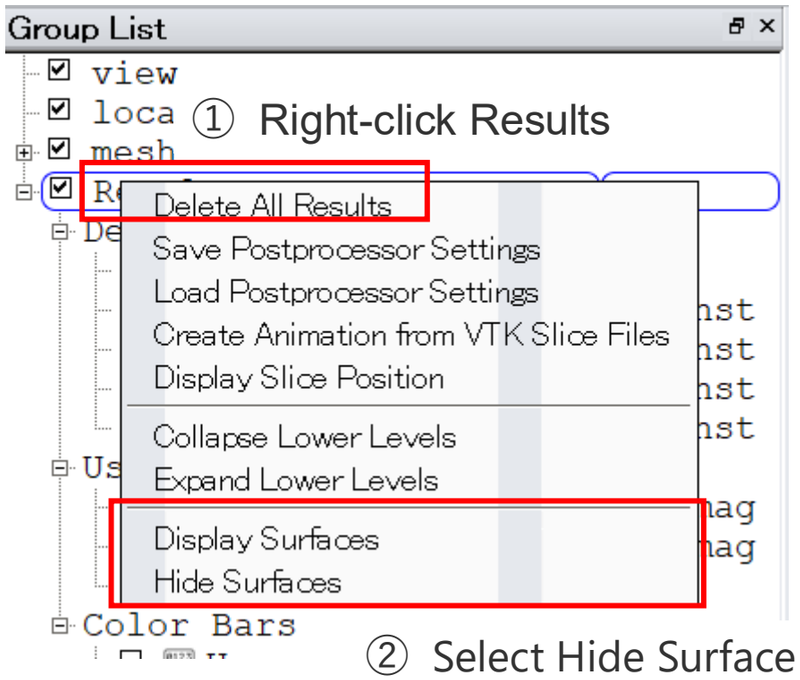


4. Functions

4.4 Group List

How to Show/Hide Parts

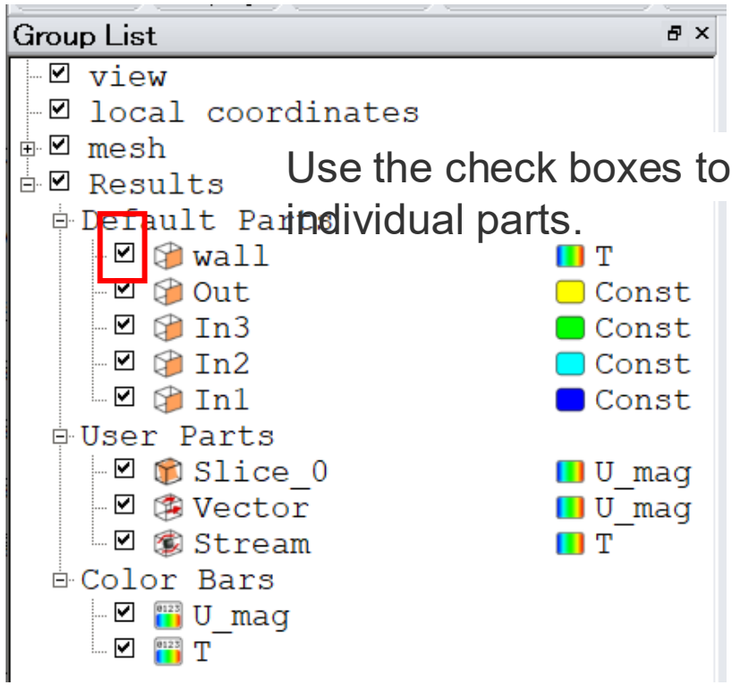
Hide/show all parts at once



① Right-click Results

② Select Hide Surface to hide all, or Display Surface to show all.

Hide/show individual parts

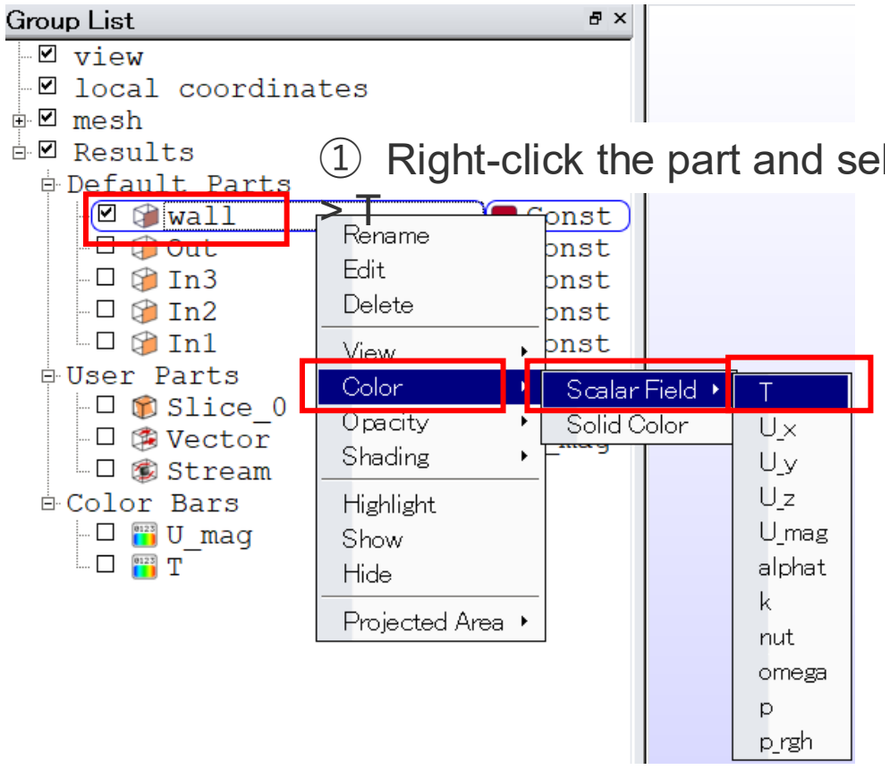


Use the check boxes to show or hide individual parts.

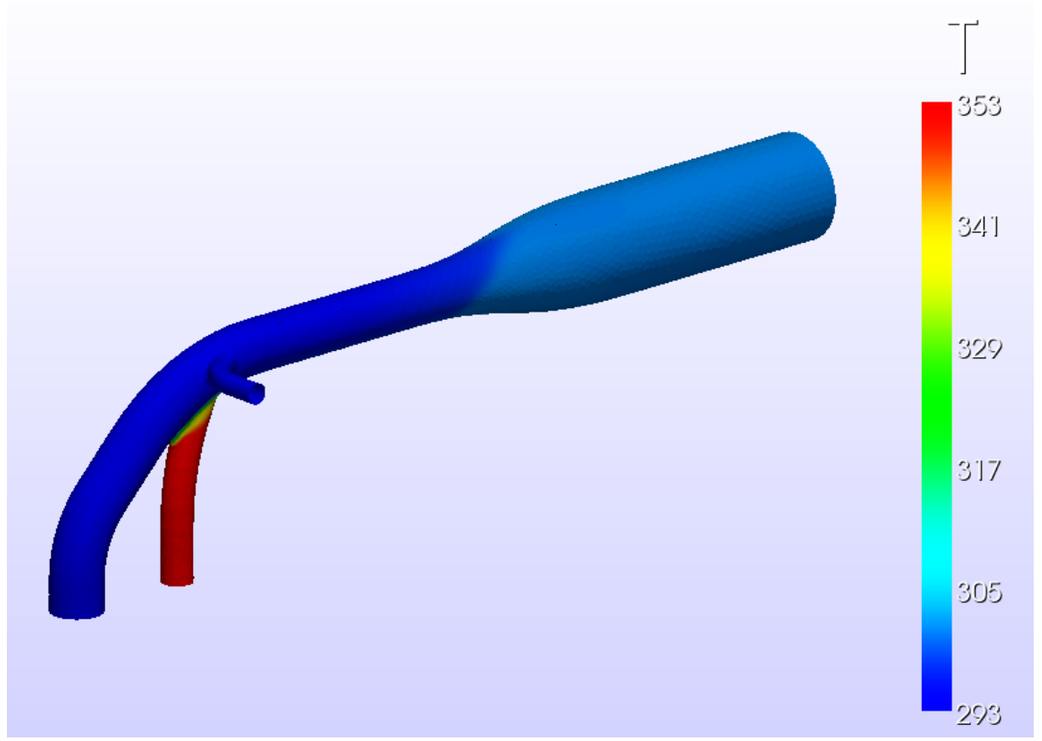
4. Functions

4.4 Group List

- How to Display a Surface Contour (Example: Surface Temperature Contour)



① Right-click the part and select Color > Scalar Field

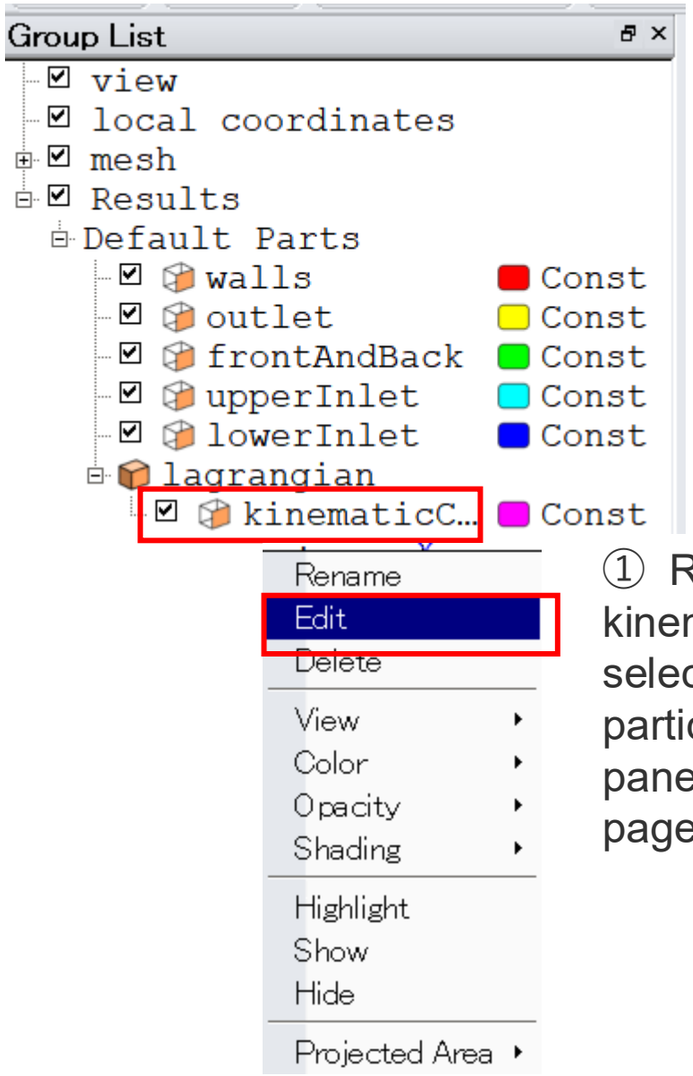


Surface temperature contour

4. Functions

4.4 Group List

- How to Display Particle Results
- Using the Lagrange sample data, this section displays particle results. When particle-calculation data is imported, an object named lagrangian > kinematicCloud appears in the Group List.



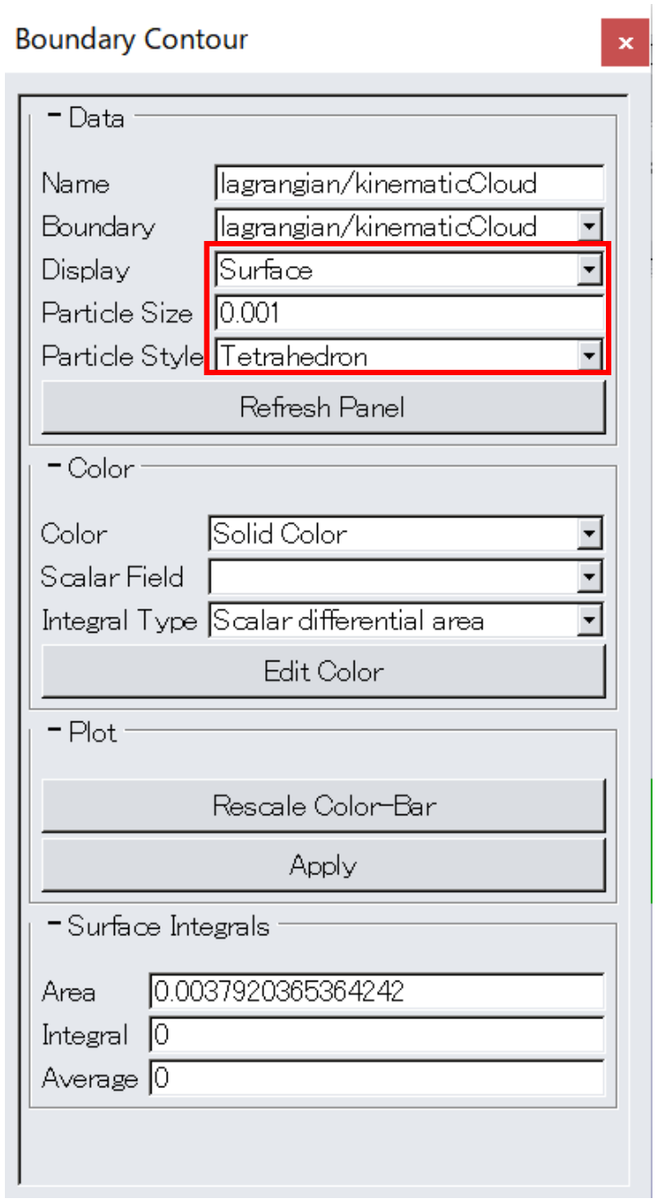
① Right-click kinematicCloud and select Edit to display the particle-display control panel (continued on next page).

Lagrange result data

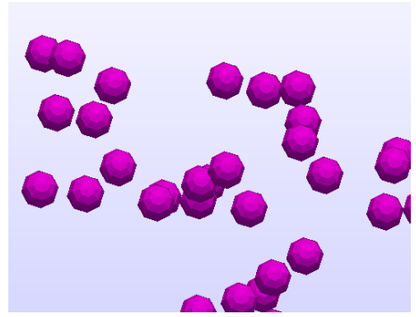
4. Functions

4.4 Group List

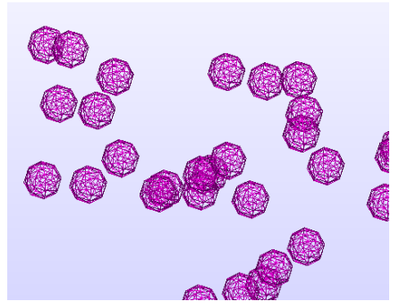
- How to Display Particles (continued)



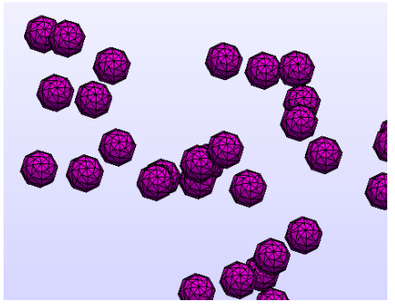
Data
Display: Particle display method



Surface

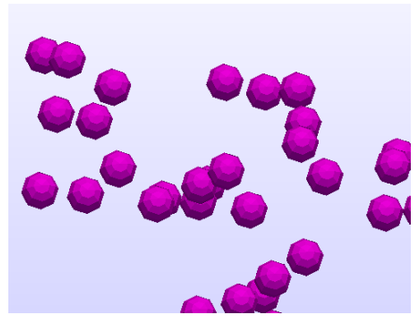


Wireframe

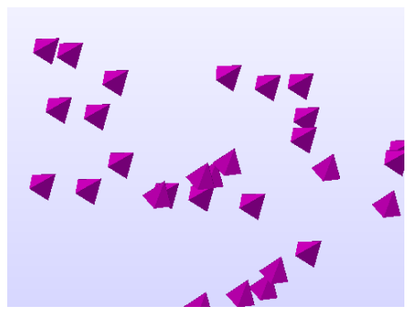


Surface + Edge

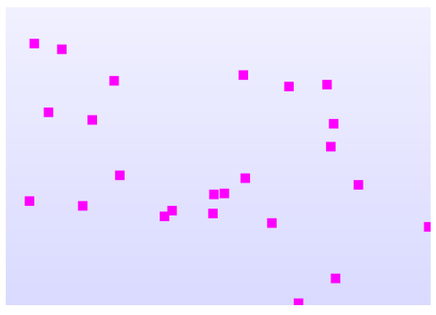
Particle Size: Display size of particles
Particle Style: Particle display shape (display load decreases in the order Sphere → Tetrahedron → 2D dot)



Sphere



Tetrahedron

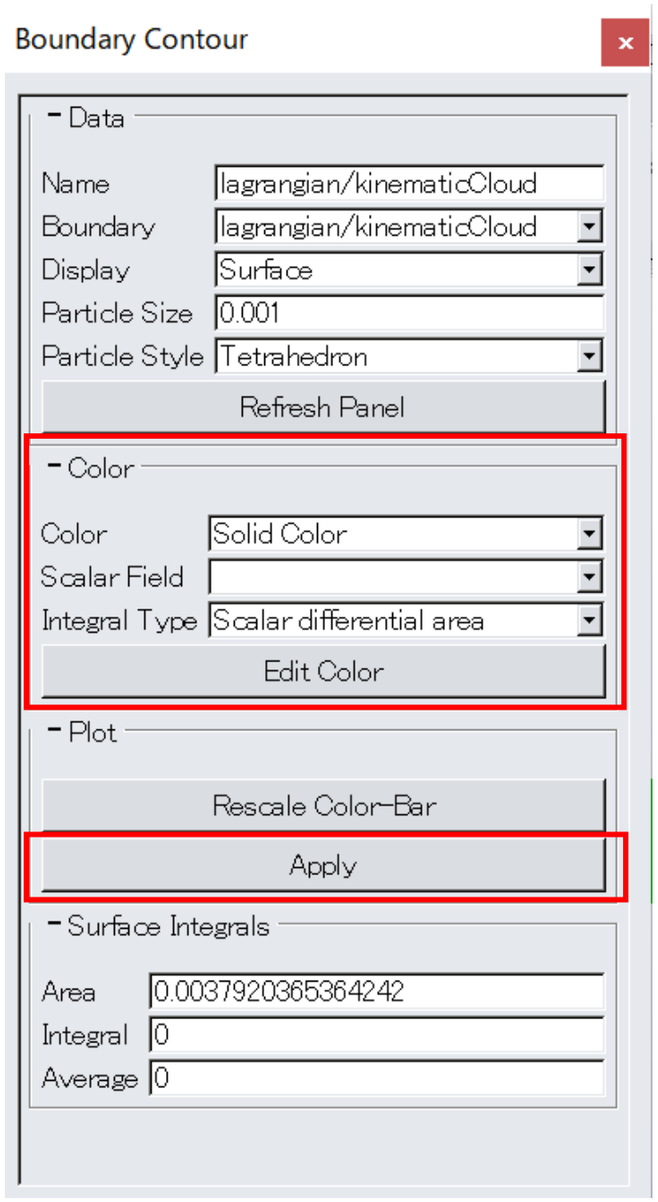


2D dot

4. Functions

4.4 Group List

- How to Display Particles (continued)

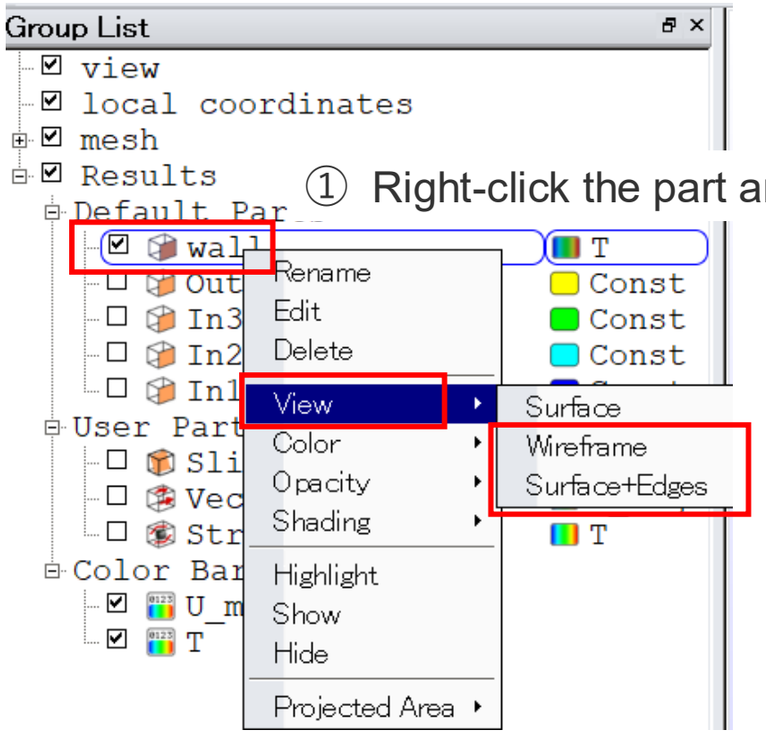


Color
Color: Particle display color
Solid Color: Display using the specified color
Scalar Field: Color using result data
Scalar Field: Select the result data used for coloring
Edit Color: Select the color used for coloring
Plot
Apply: Displays the plot

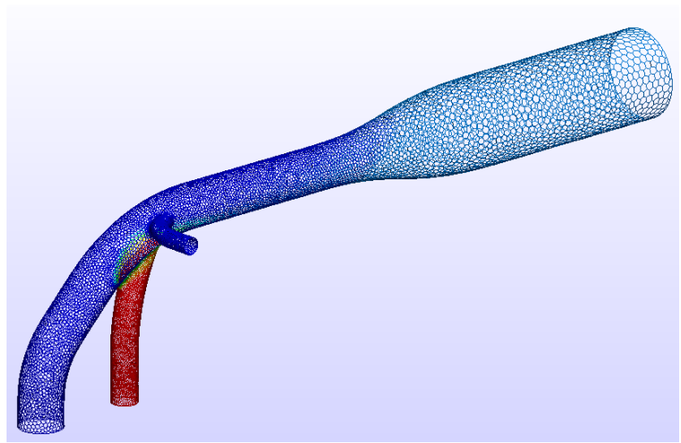
4. Functions

4.4 Group List

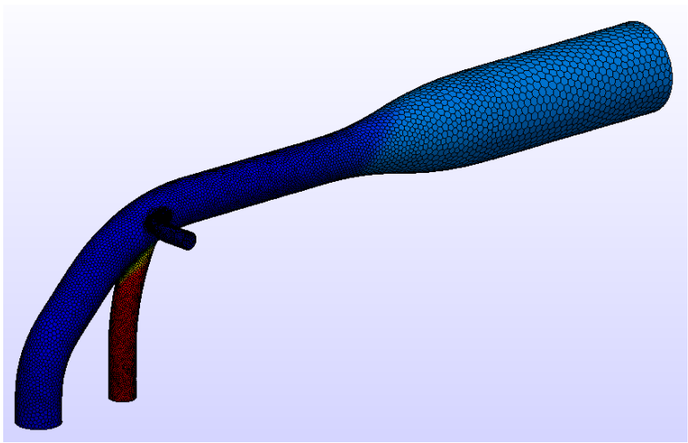
- How to Display Mesh Lines



① Right-click the part and select View > Wireframe/Surface+Edge



Wireframe

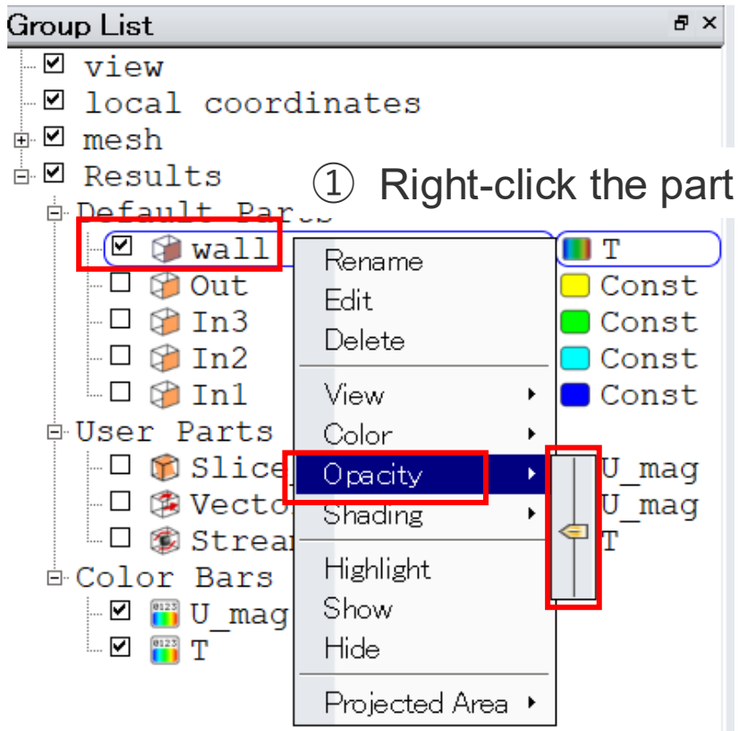


Surface + Edge

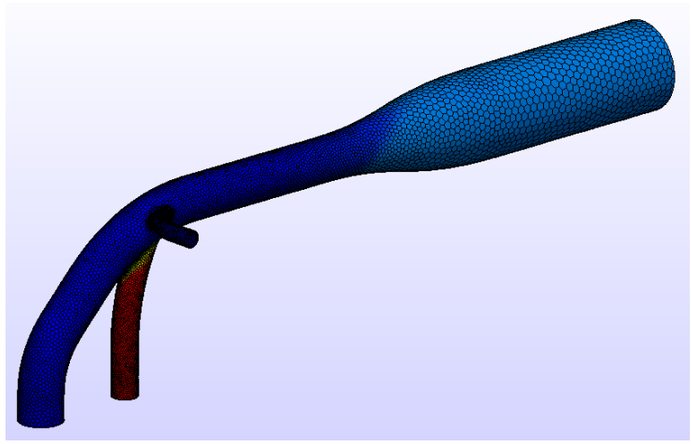
4. Functions

4.4 Group List

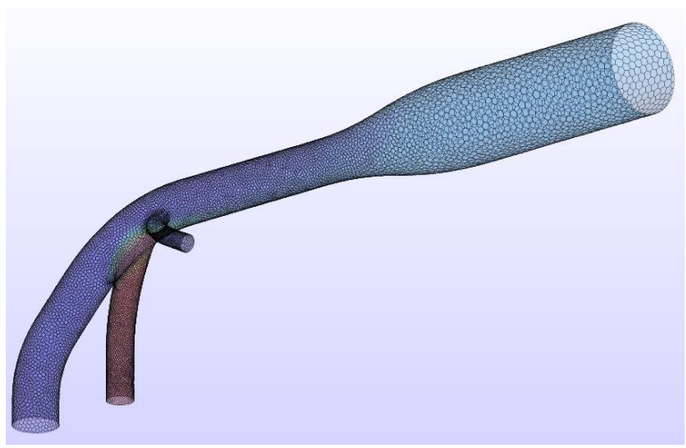
■ How to Set Transparency



① Right-click the part and change the transparency under Opacity



Opaque

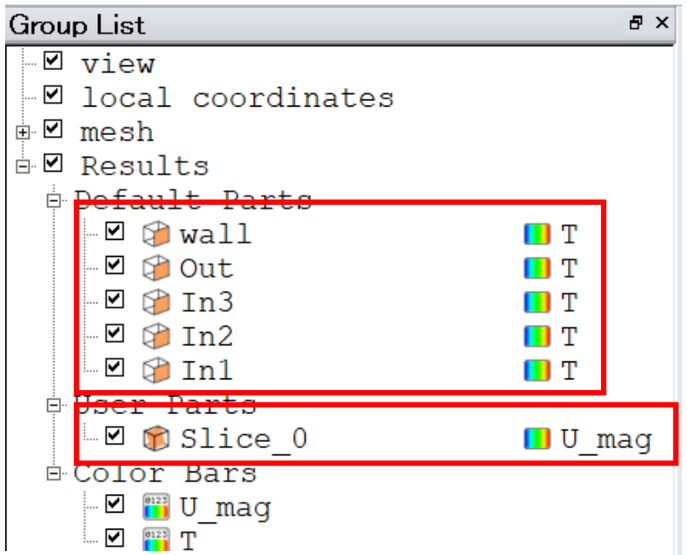


Transparent

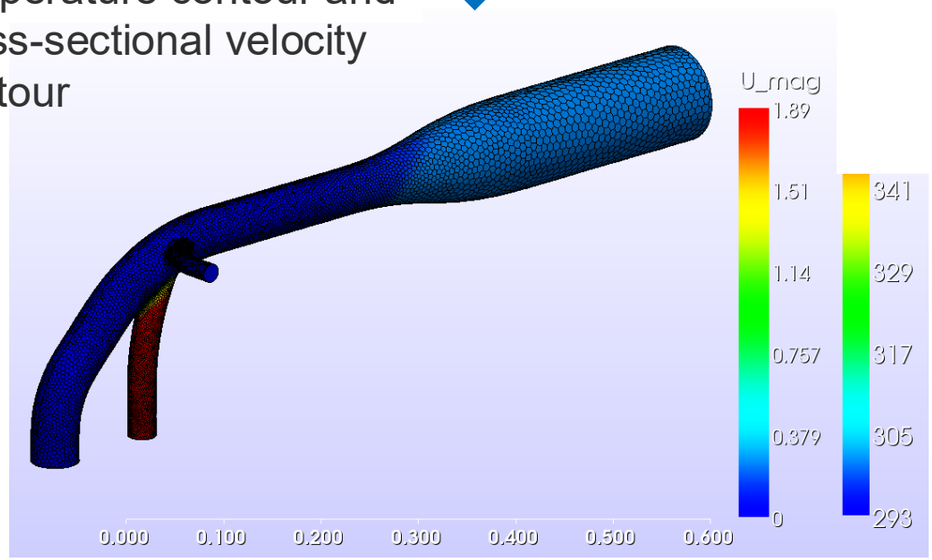
4. Functions

4.4 Group List

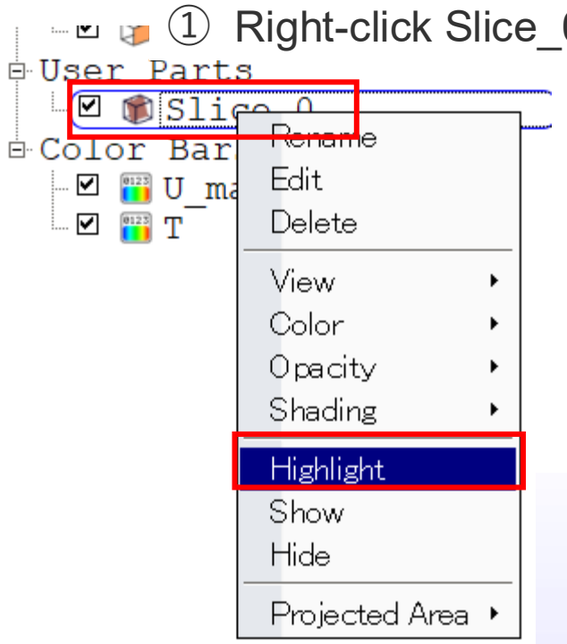
- Highlight Display
- When multiple parts are displayed, all parts other than the selected part can be displayed transparently.

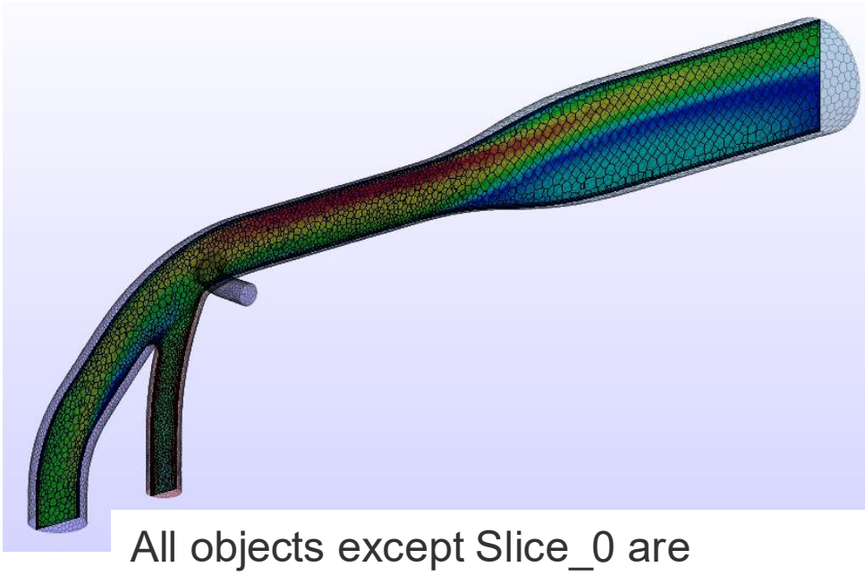


Display the surface-temperature contour and cross-sectional velocity contour



① Right-click Slice_0 and select Highlight



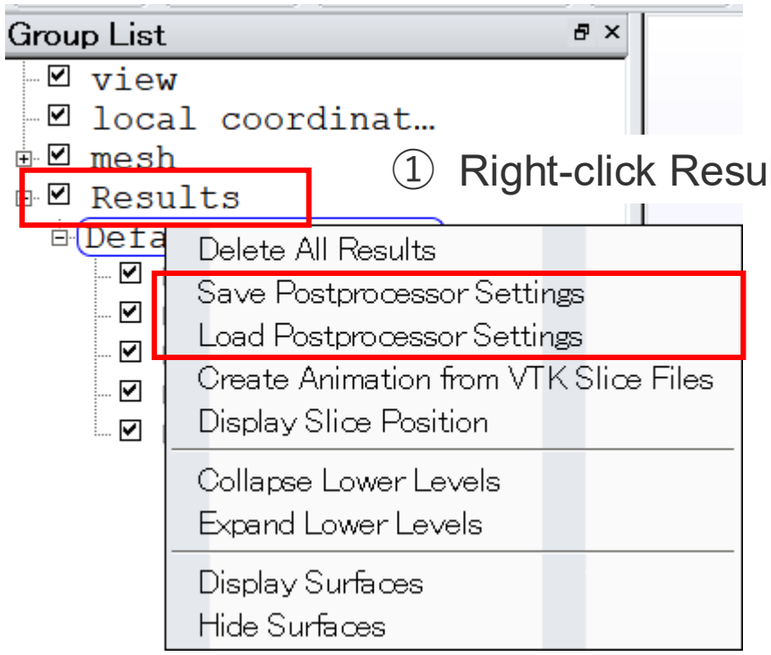


All objects except Slice_0 are changed to transparent display.

4. Functions

4.4 Group List

- Saving/Restoring Post-Processing
- Save Postprocessor Settings
- Saves post-processing objects created with User Parts and Visualization. The saved information is stored in the dedicated .epf file format.
- Load Postprocessor Settings
- Loads information saved in an .epf file and restores the post-processing state.

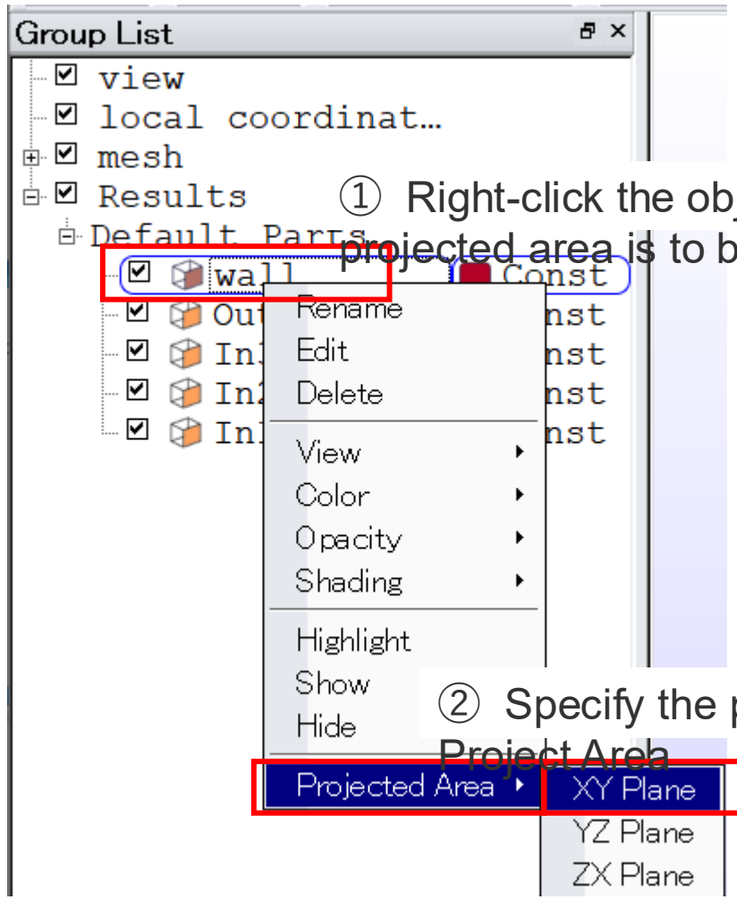


① Right-click Results and select Save/Load Postprocessor Settings

4. Functions

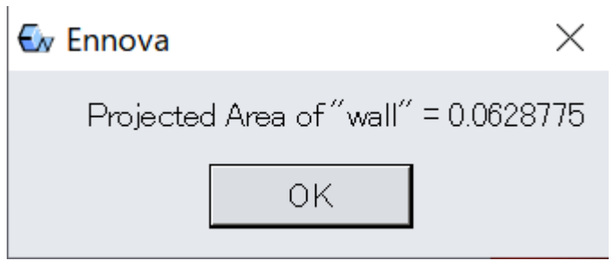
4.4 Group List

■ Calculating Projected Area



① Right-click the object for which projected area is to be calculated

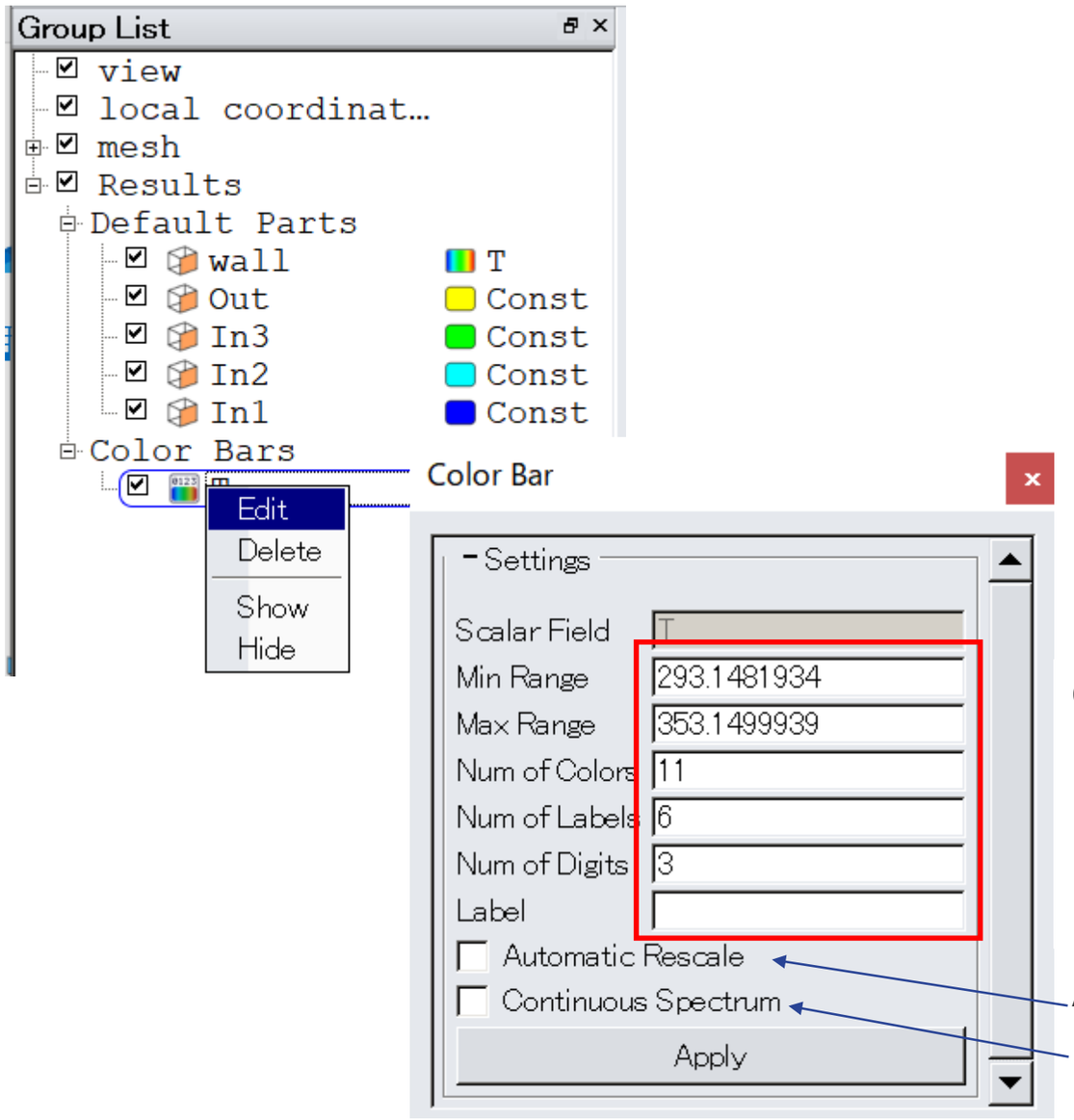
② Specify the projection plane under Project Area



4. Functions

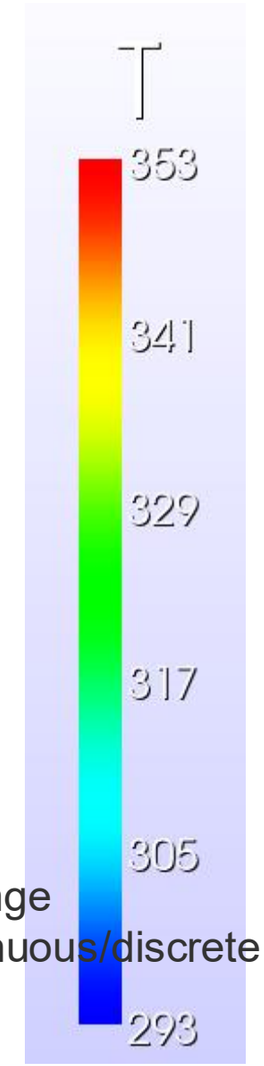
4.4 Group List

- Editing the Color Bar



Color-bar range (maximum, minimum)

Number of colors
Number of values
Number of digits in values
Add text to the color bar
Automatically adjust the color-bar range
Switch contour colors between continuous/discrete



Thank you for your kind attention.
We are looking forward to doing business with you.

Contact Us

- web: https://www.idaj.co.jp/
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