Scientific Visualization with ParaView

Geilo Winter School 2016

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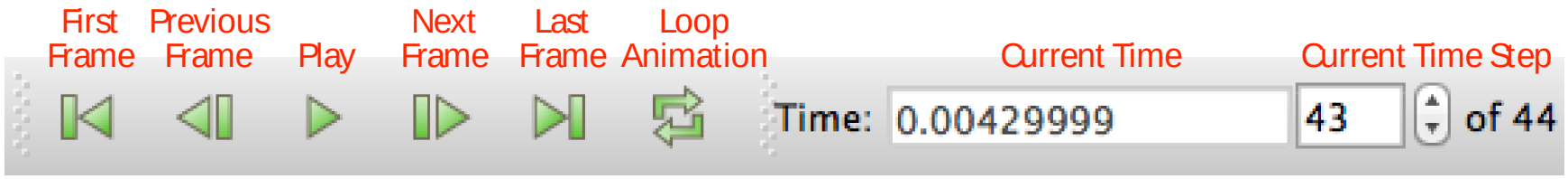
Outline

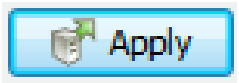
- Part 1 (Monday)
  - Fundamentals
  - Data Filtering
- Part 2 (Tuesday)
  - Time Dependent Data
  - Selection & Linked Views
- Part 3 (Thursday)
  - Python scripting

Time & Animations

Animation Toolbar

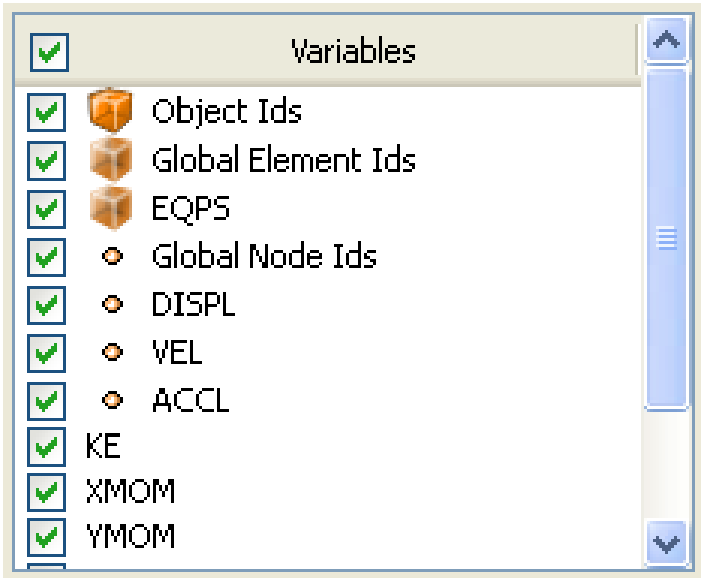


Loading Data with Time

1. Open the file can.ex2
2. Select all variables
3. 

4. 

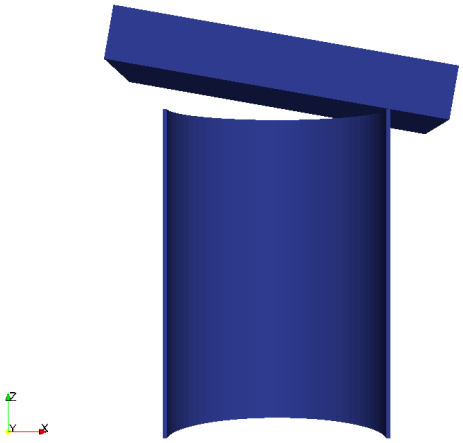
5. 



Animation Pitfall

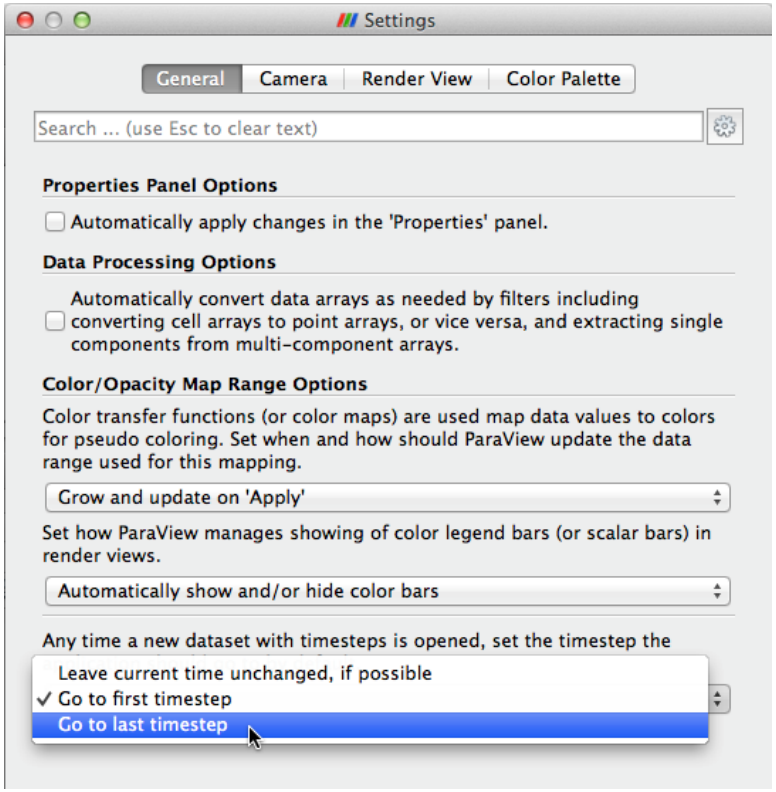
1. Go to first time step 
2. Color by EQPS variable
3. Play 

   or skip to last time step 

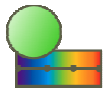


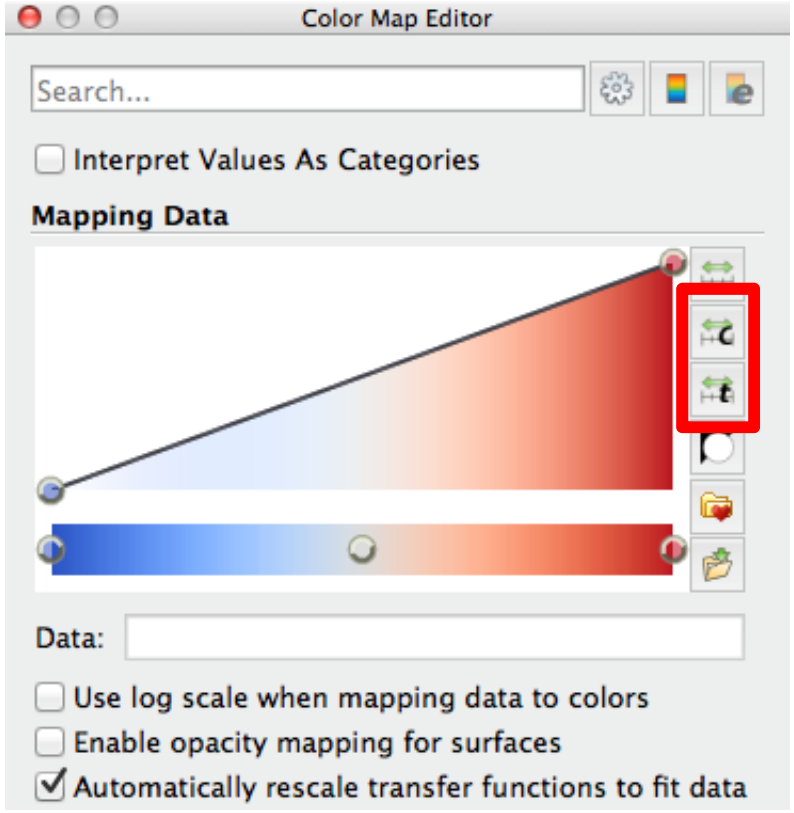
Data Range Workarounds

- Go to representative time and hit 
- In Settings change On File Open to Goto last timestep
  - May not work!



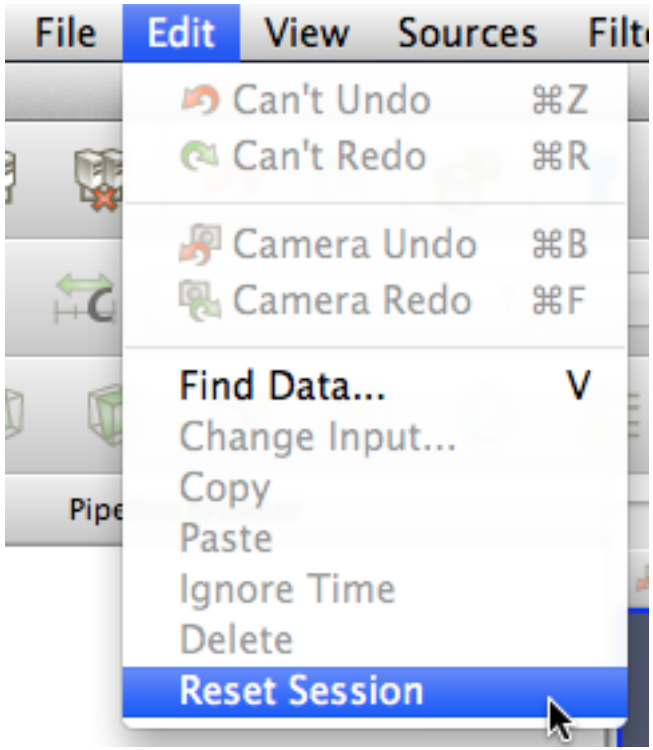
Data Range Workarounds

- Open color scale editor dialog 
- Set a custom range
- Or re-scale over time
  - Can be slow!



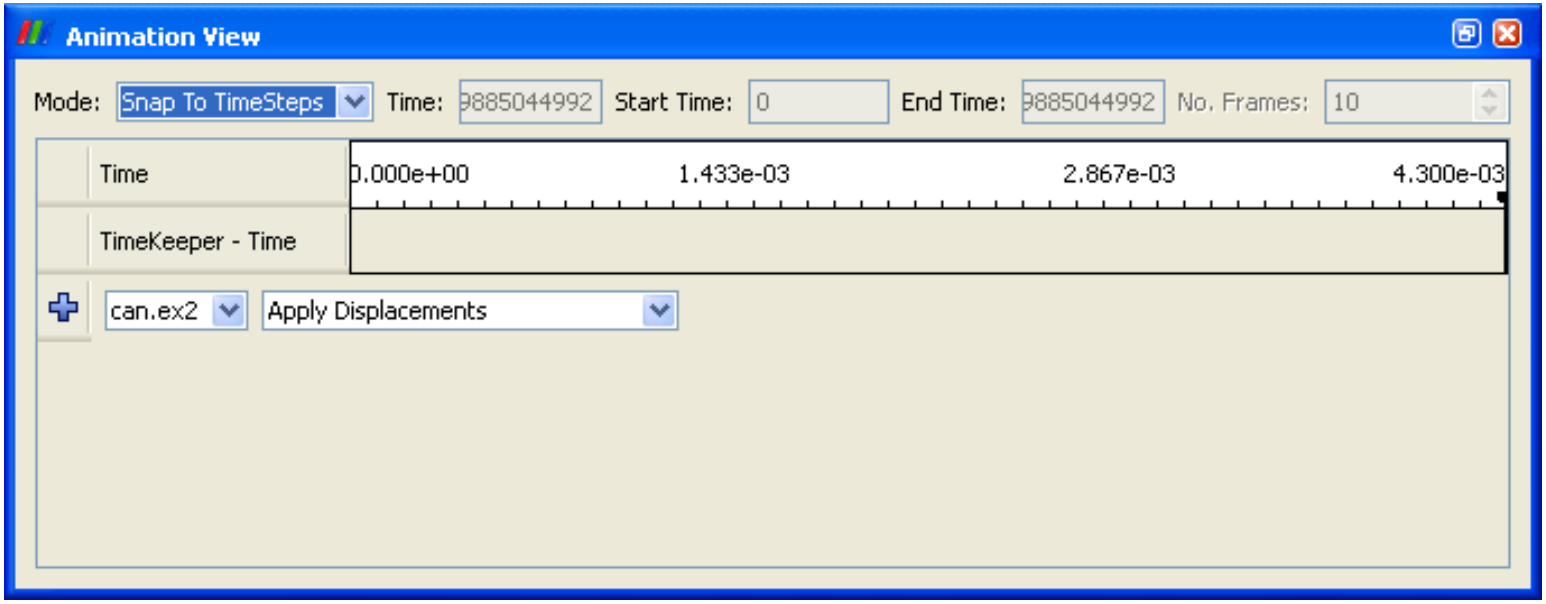
Reset ParaView

Edit → Reset Session



Animation View

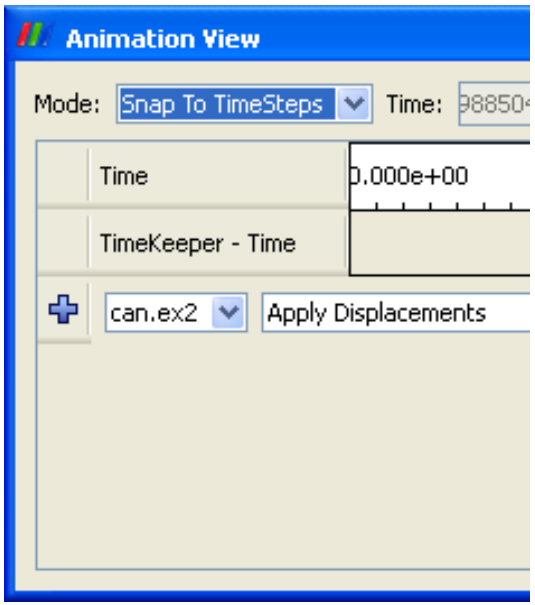
View → Animation View



Animation View

View → Animation View

- Animation Modes
  - Sequence
  - Real Time
  - Snap To TimeSteps

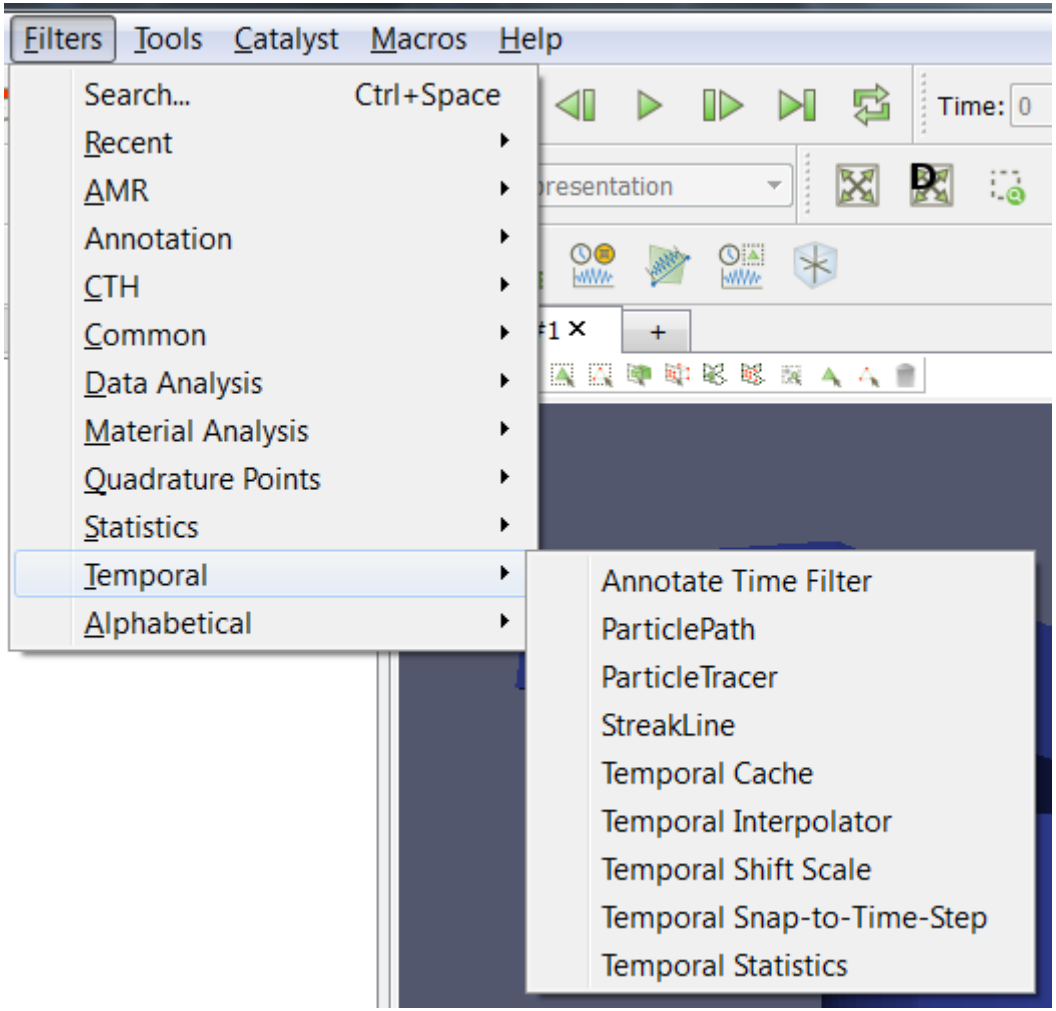


Changing Animation Timing

1. Open can.ex2. Load all variables
2. 

3. View → Animation View
4. Change Mode to Real Time
   Default animation duration is 10 sec
5. 
6. Change Duration to 60 sec
7. 

Temporal Filters



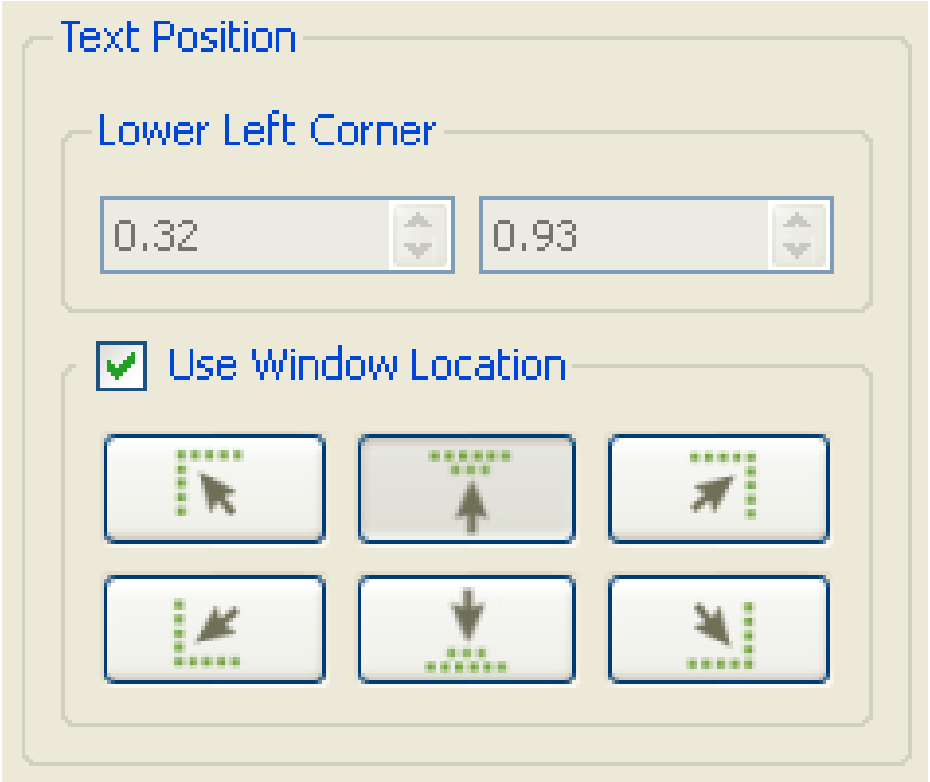
Smoothing the Animation

1. Make sure can.ex2 highlighted
2. Add a Temporal Interpolator filter
3. Split view 
4. Show can.ex2 in one and TemporalInterpolator1 in the other
5. Link the cameras
6. 

Adding Text Annotation

1. If needed, reset ParaView and reload can.ex2
2. Add a Text source
3. Type a message in text edit box
4. 

Text Position



Annotate Time

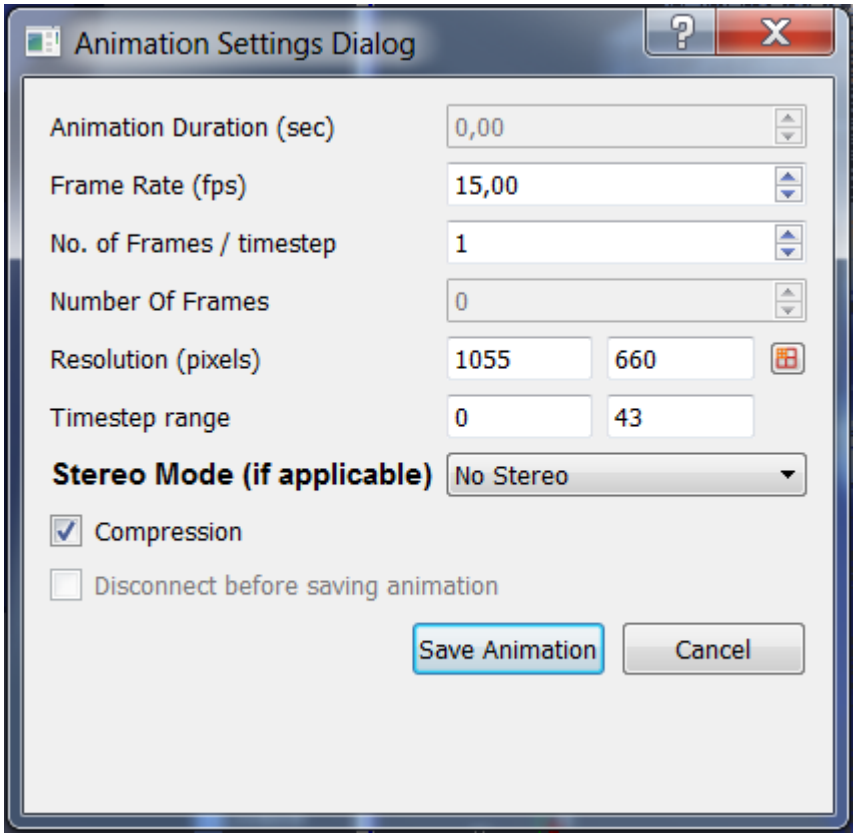
1. Add an Annotate Time source

   OR

1. Select can.ex2
2. Add an Annotate Time filter

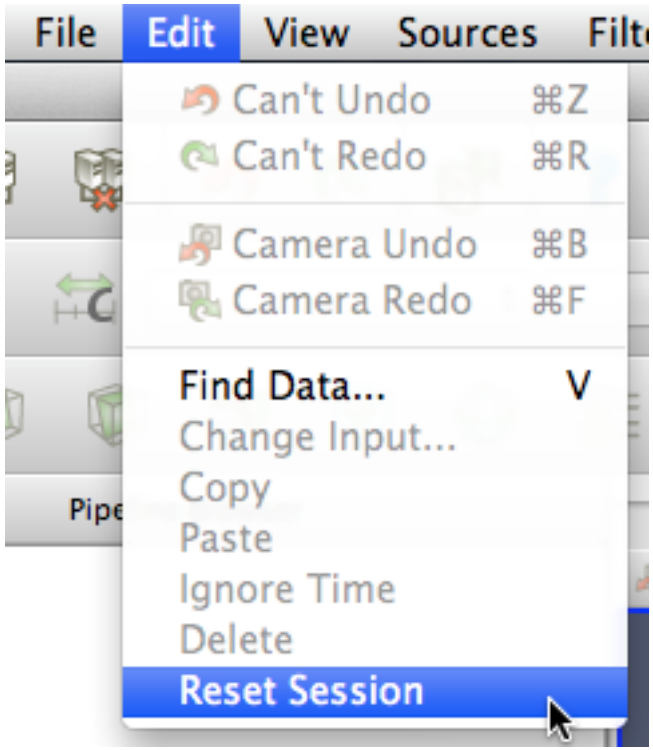
Save Animation

- Chose File → Save Animation 



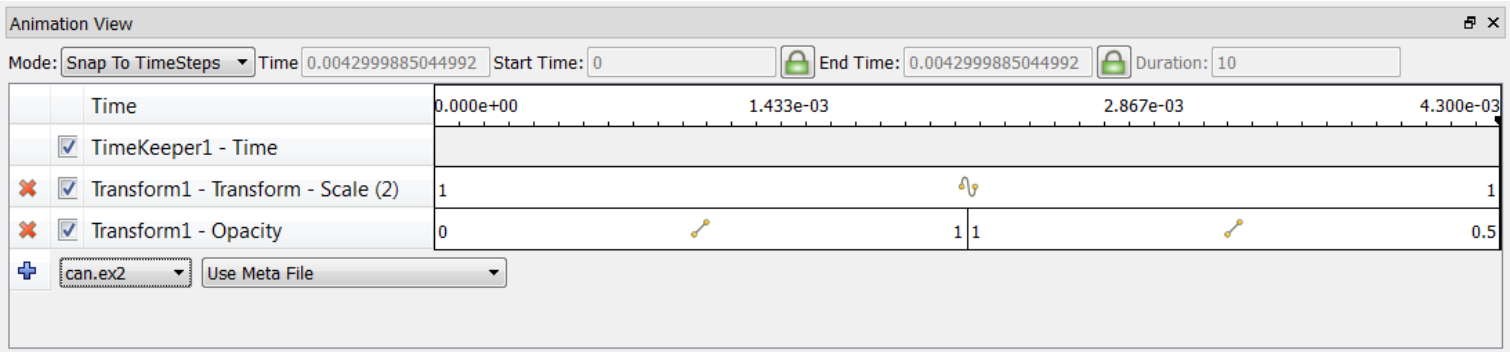
Reset ParaView

Edit → Reset Session

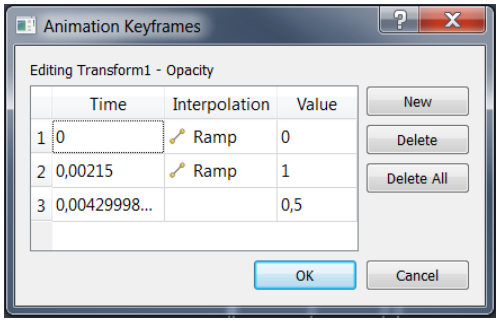


Make an Animation

- ParaView supports the animation of various properties of sources/filters over time
  - Source/filter settings
  - Visibility and opacity



- Animations are based on key-frames



Make an Animation

1. Add a Sphere source
2. Make animation view visible
3. Change No. Frames to 50
4. Select Sphere1, Start Theta, press 
5. Double-click Sphere1 – Start Theta
6. Make a new keyframe
7. First keyframe value→360, second keyframe time→0.5 value→0.
8. Click OK and play 

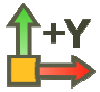
Animating Two Properties

1. Open Sphere1 – Start Theta
2. Delete the first keyframe (at time 0)
3. Click OK
4. Select Sphere1 – End Theta, press 
5. Open Sphere1 – End Theta
6. Change second key frame time to 0.5
7. Click OK and play 

Camera Orbit

1. Place the camera where the orbit should start.
2. Make animation view visible.
3. Select Camera – Orbit, press
4. Accept default values (click OK).
5. 

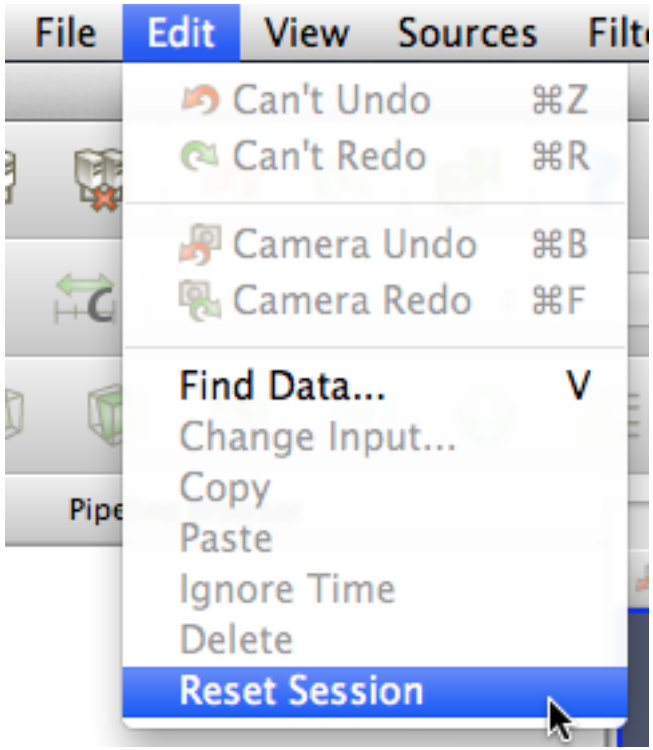
Following Data

1. Open can.ex2. Load all variables.
2. 

3. Make animation view visible.
4. Select Camera – Follow Data, press 
5. 

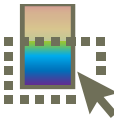
Reset ParaView

Edit → Reset Session

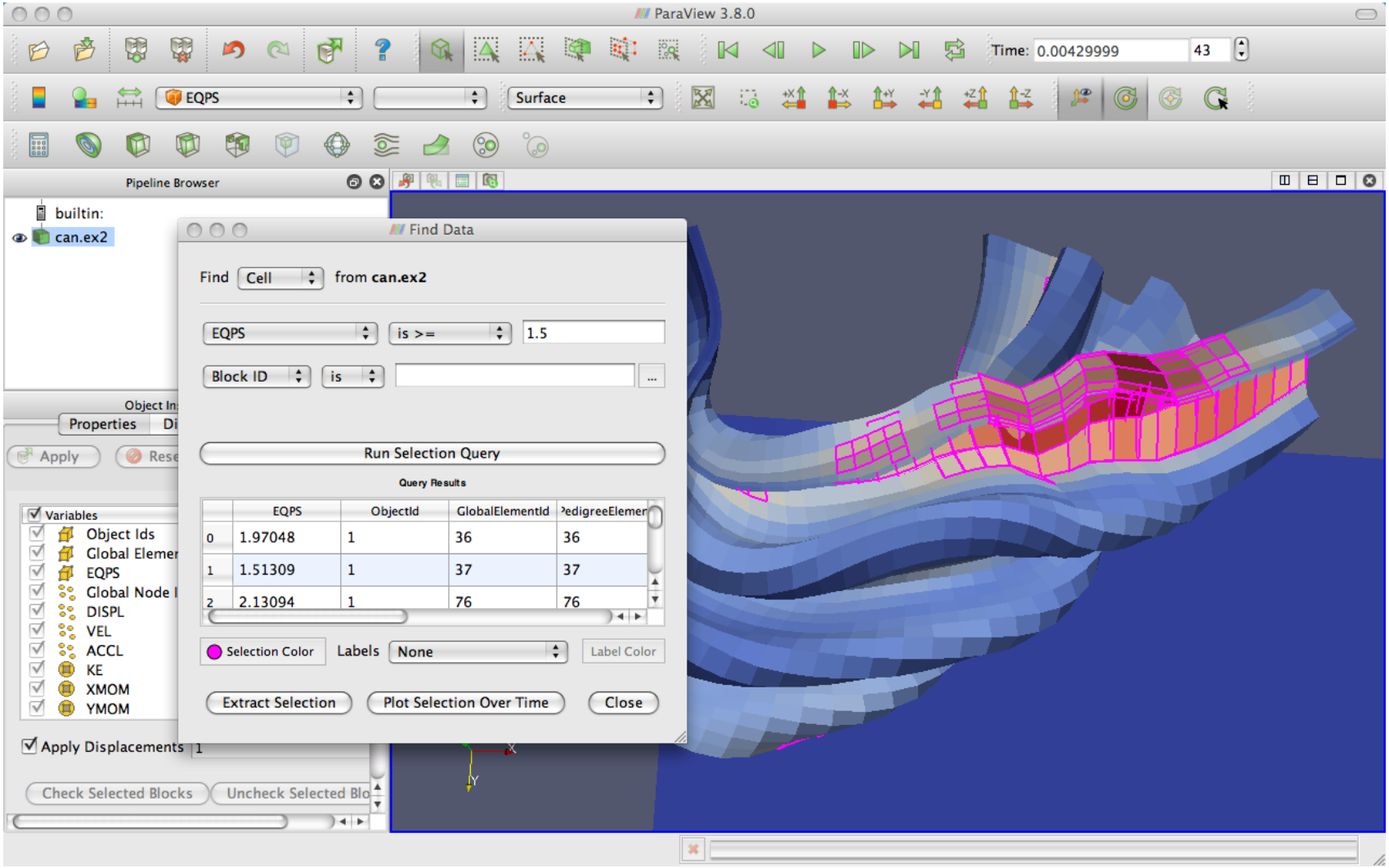


Data Selection

Query-Based Selection

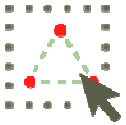
1. Open can.ex2. All variables
2. Go to last time step 
3. Edit → Find Data 
4. Top combo box: find Cells
5. Next row: EQPS, is >=, and 1.5
6. Click Run Selection Query

Query-Based Selection



Brush Selection

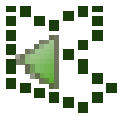

Surface Cell Selection (shortcut: s)

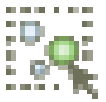

Surface Point Selection


Through Cell Selection

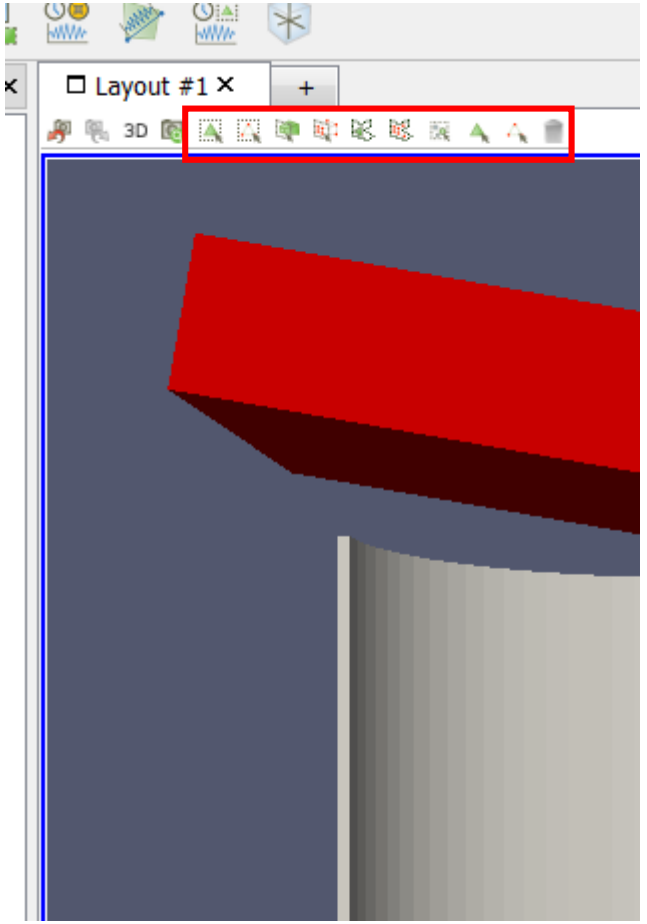

Through Point Selection


Select Points (polygon)


Select Cells (polygon)


Block Selection (shortcut: b)


Interactive Selections



Selections

1. Open Find Data 
2. Make various brush selections
3. Observe results in the Find Data dialog box
4. Play with the Invert Selection and Show Frustum options

Frustum vs. Id Selections

1. Make a Select Cells Through 
2. Turn on Show Frustum in Find Data
3. Play
4. Hit Freeze Selection in Find Data
5. Play

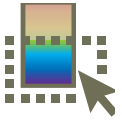
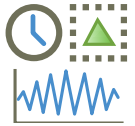
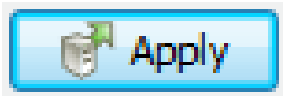
Adding Labels

1. Go to the last time step 
2. Open Find Data 
3. Create query Global ID is min
4. Click Run Selection Query
5. In the Cell Labels chooser, select EQPS

Interactive Selections

1. Go to the last time step 
2. Open Find Data 
3. In the Cell Labels chooser, select EQPS
4. Click Gintractiv Select Cells On
5. Move the mouse around

Plot Selection Over Time

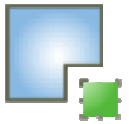
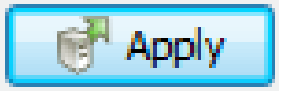
1. Open Find Data 
2. Create query EQPS is max
3. Click Run Selection Query
4. Click Plot Selection Over Time 
5. 

6. In Display controls, turn off all plot series except for max(EQPS)

Selection over Scatterplots

1. Open can.ex2. Load all variables
2. Go to the last time step
3. Apply a Scatter plot filter
4. Set X Array Name to DISPL_X
5. Enable only DISPL_Y
6. Select Points with large negative displacements in both X and Y
7. Click on the 3D view and make Scatterplot1 visible 

Extracting a Selection

1. Open can.ex2. Load all variables
2. Select the can only
   - Use parallel projection
3. Add the extract selection filter 
4. 

5. Create a Scatter plot of can.ex2 and a Scatter plot of the extracted selection and compare them (over time)

Exercises

- Exercise 3
  - Load can.ex2
  - Find the cell with the highest average EQPS
  - Plot its position over time
  - Make a clip plane along the X-axis so that the cell is always visible
  - Add an arrow that always points at the cell
  - Make the camera follow the cell
  - Save the final animation
- Suggested filters: Arrow, Clip, Calculator, Extract Selection, Temporal Statistics, Transform

Exercises

- Exercise 4
  - Load rot_a and rot_b
  - Identify the centers of rotation in both datasets
  - Synchronize the motion of the two centers
  - Resample the dataset in time so that they have the same time domain
  - Study the difference between the fields
  - Identify the extra center of rotation in rot_b, and the related scalar field
- Suggestions: Animation View, Append Attributes, Calculator, Contour, Scatterplot, Temporal Interpolator, Temporal Shift-Scale

Exercises

- Exercise 4 - Bonus
  - Identify the equations used to generate the datasets
  - Resample the datasets on a plane so that the motion is removed
- Suggestions: Animation view, Plane, Plot over line, Plot selection over time