Argonne NATIONAL LABORATORY

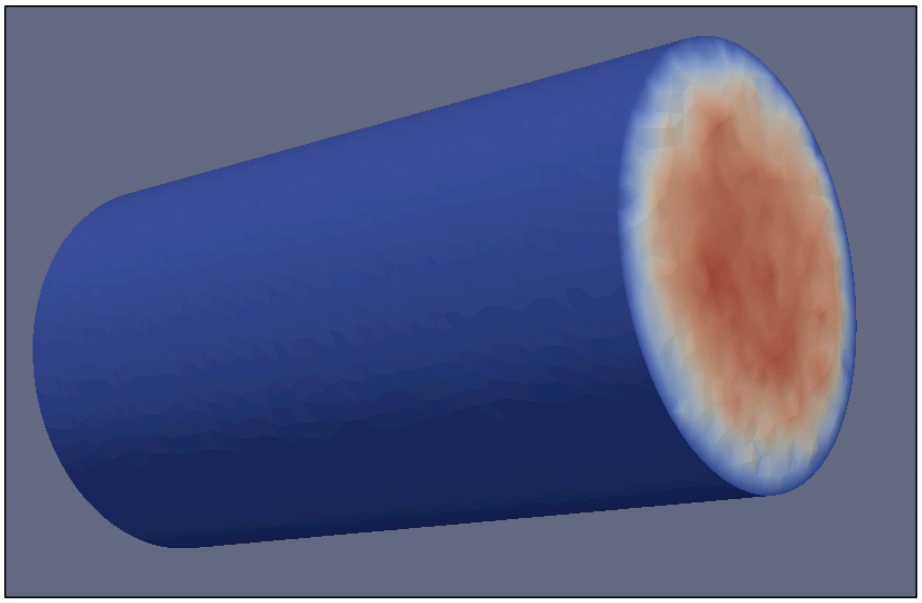
ParaView

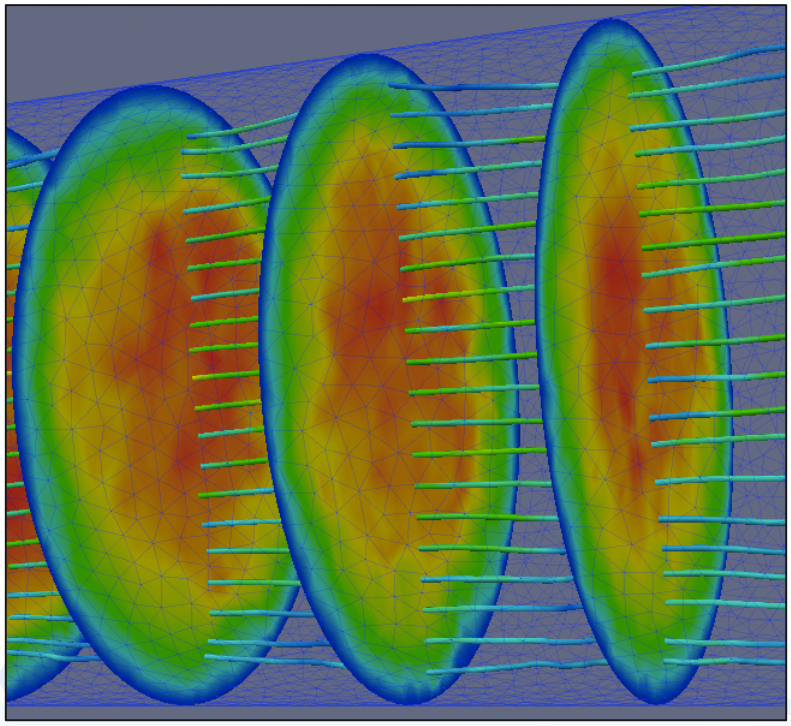
The Red Blood Cell Tutorial

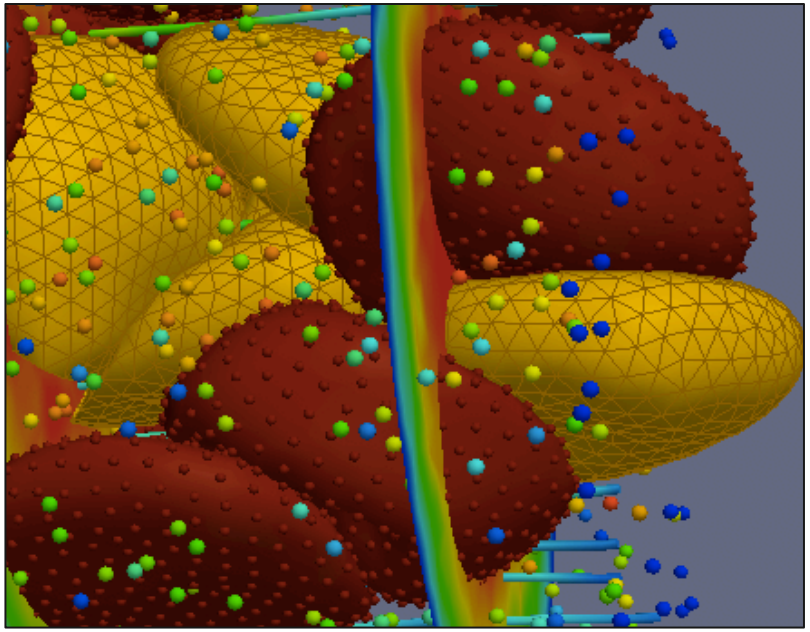
U.S. DEPARTMENT OF ENERGY

Goals

- Tour of ParaView
- Show range of visualization methods
- Feel for ParaView “way”





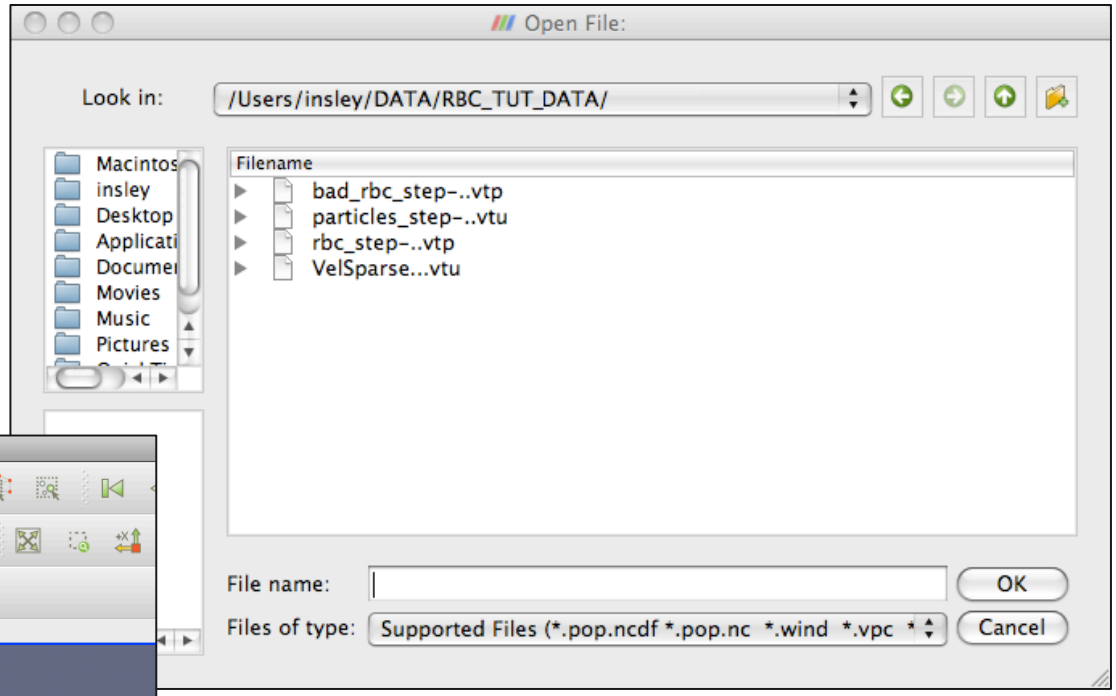


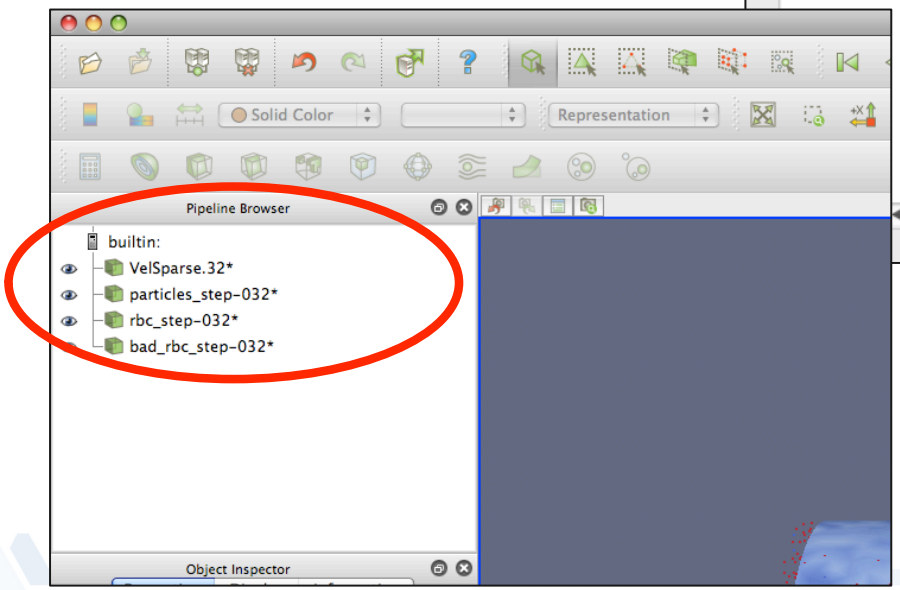
Data

- Blood flow simulation data
- Multiple data types
  - Continuum data field (unstructured mesh, hexahedral)
  - Particle data (unstructured points)
  - Red Blood Cells (RBC, unstructured mesh, triangle)
- Generated using NekTar/LAMMPS simulation code
- Courtesy of George Karniadakis and Leopold Grinberg of Brown University

Load Multi-component Dataset

- From the File menu:
  - VelSparse...vtu
  - particles_step-...vtu
  - rbc_step...vtu
  - bad_rbc_step...vtu

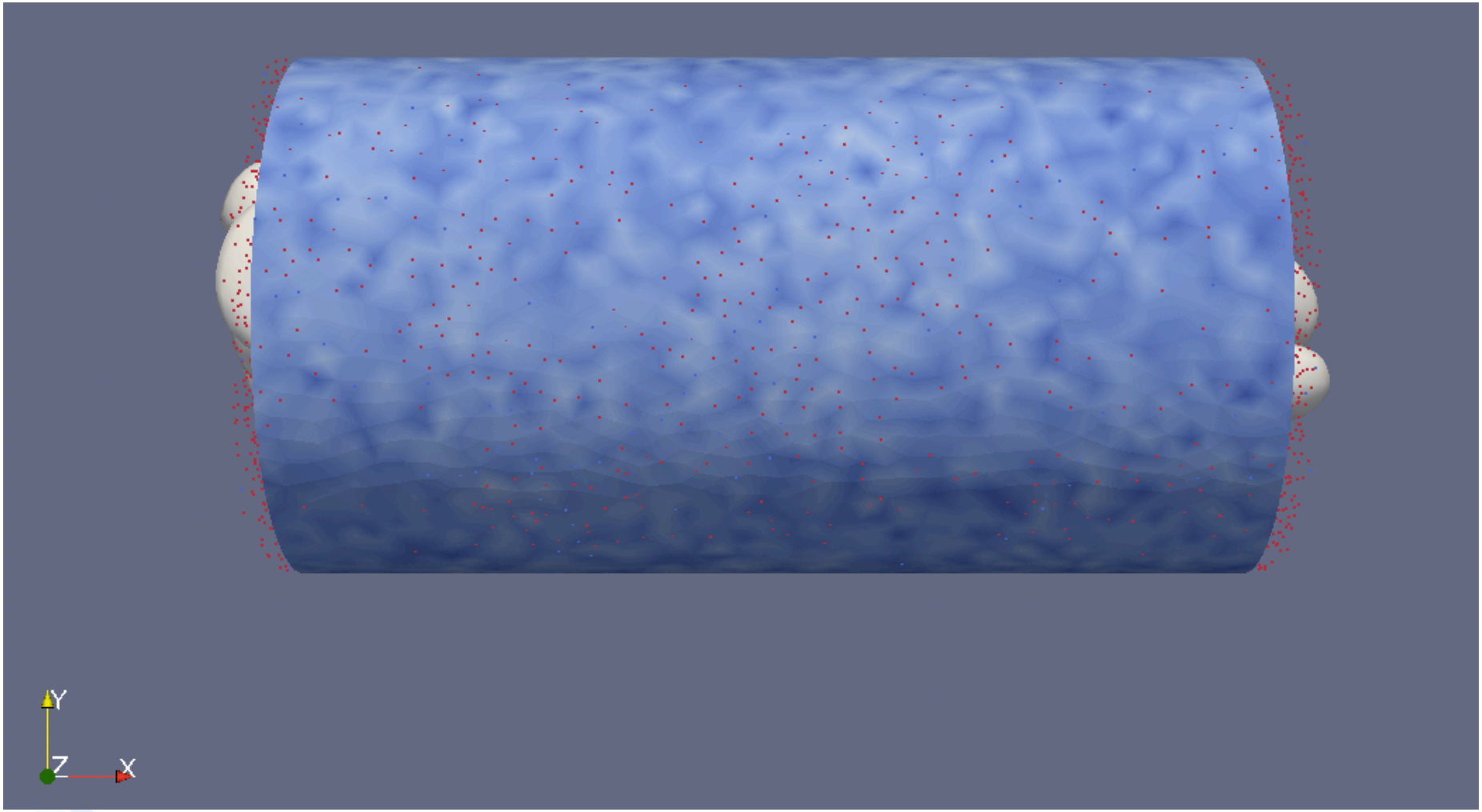




- Pipeline Browser

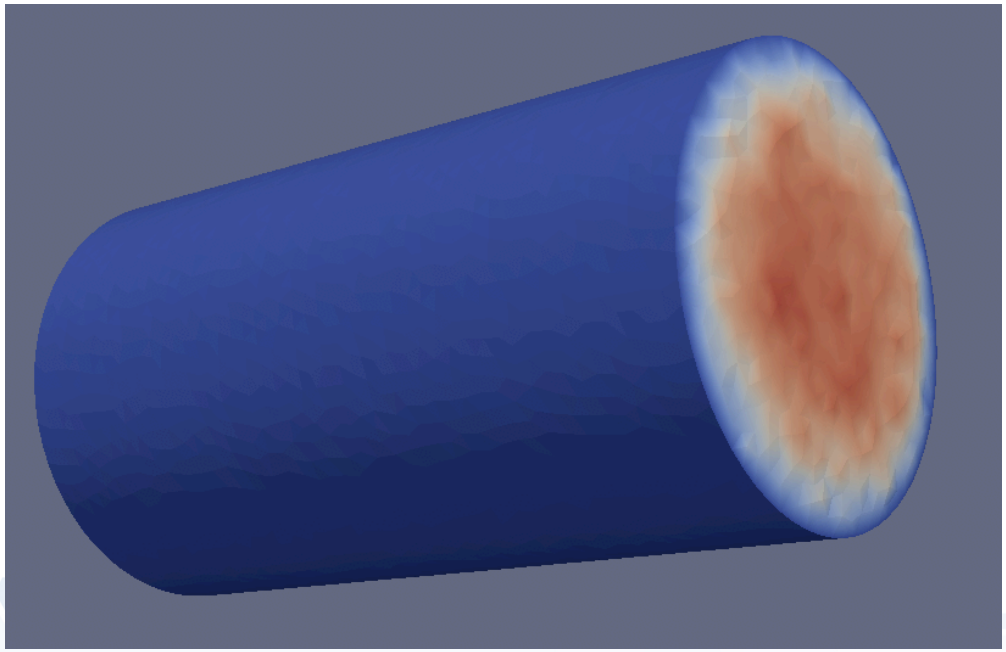
Load Multi-component Dataset

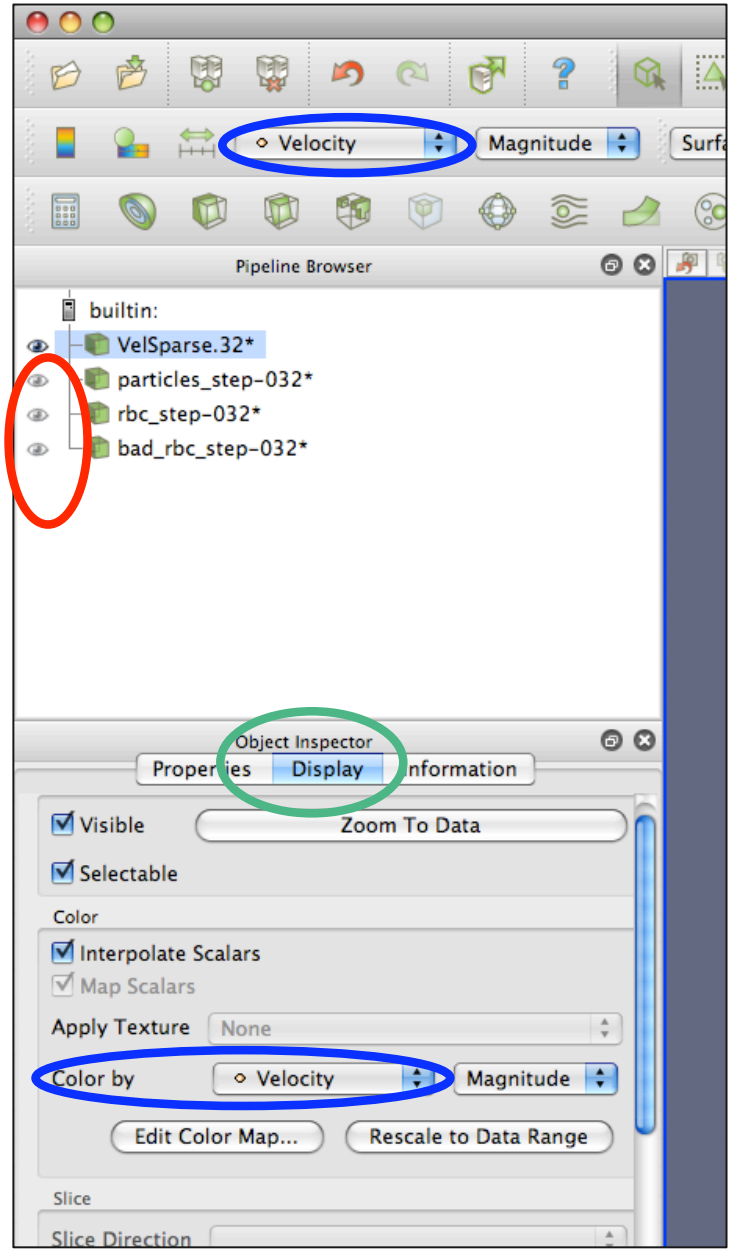
- Default values will result in:



Select which data to view

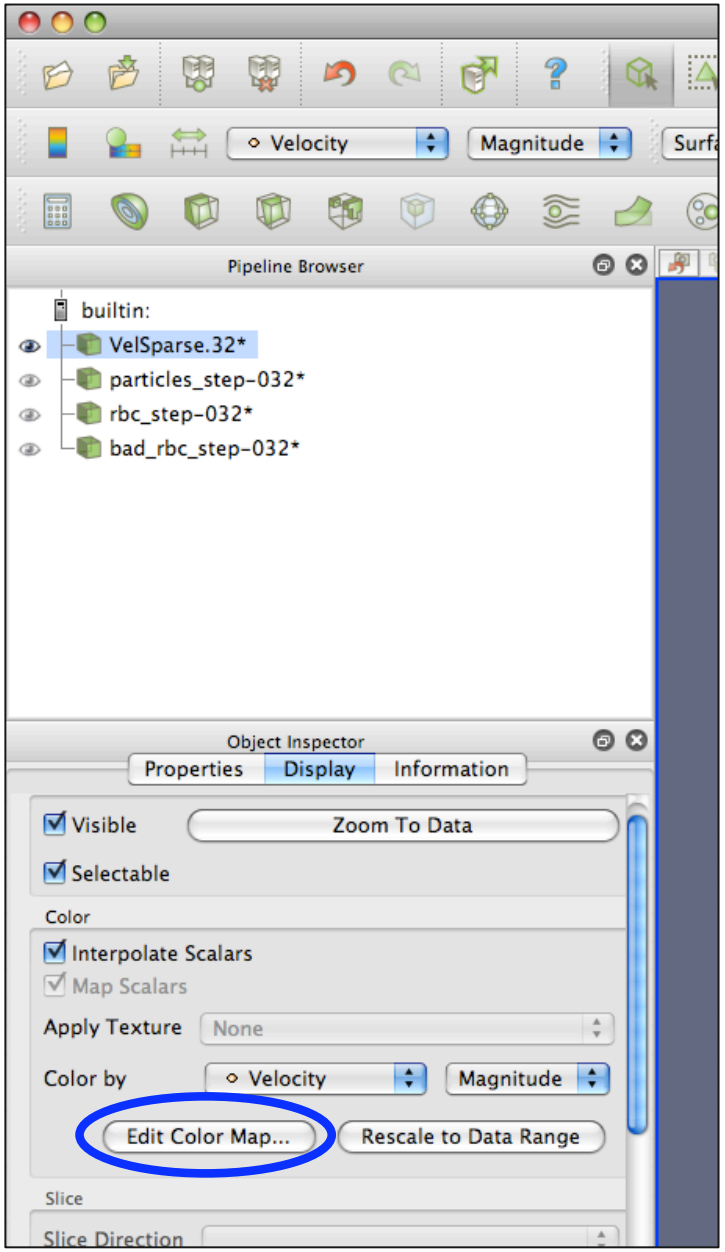
- Hide data sets with Eyeball icon
- VelSparse.32* selected in the Pipeline Browser, switch to Display tab in Object Inspector.
- Under Color by, select Velocity

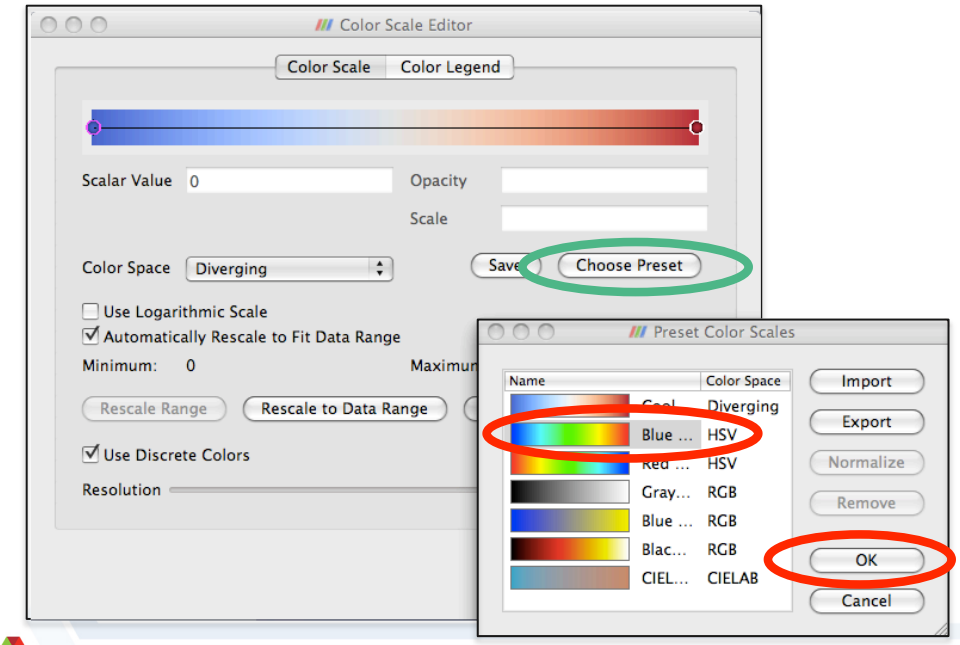




Manipulating the color map

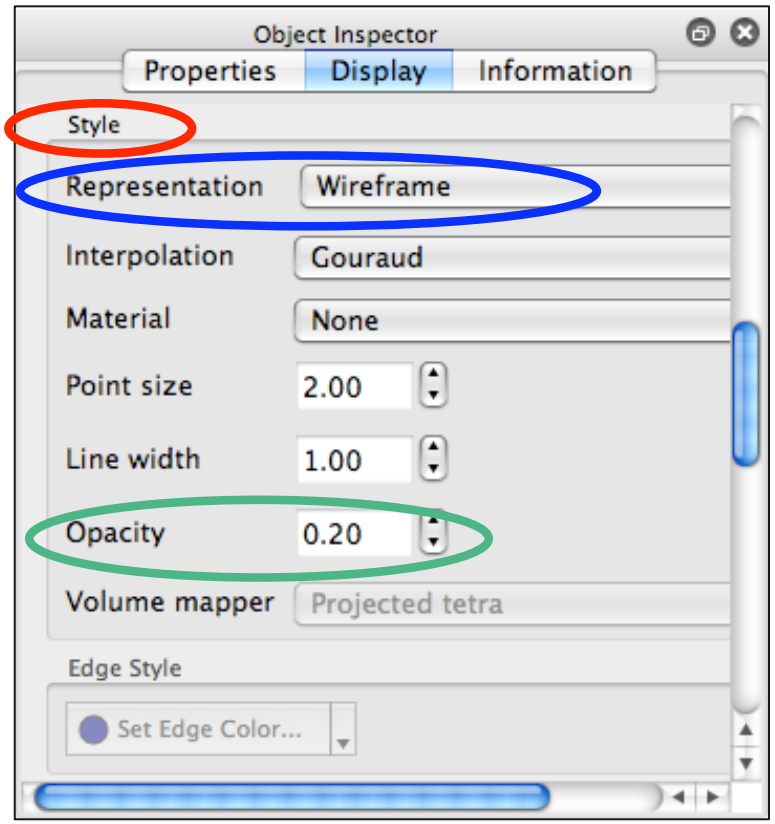
- Under Color by click Edit Color Map…
- Color Scale Editor: Choose Preset
- Preset Color Scales: Blue to Red Rainbow, and OK.

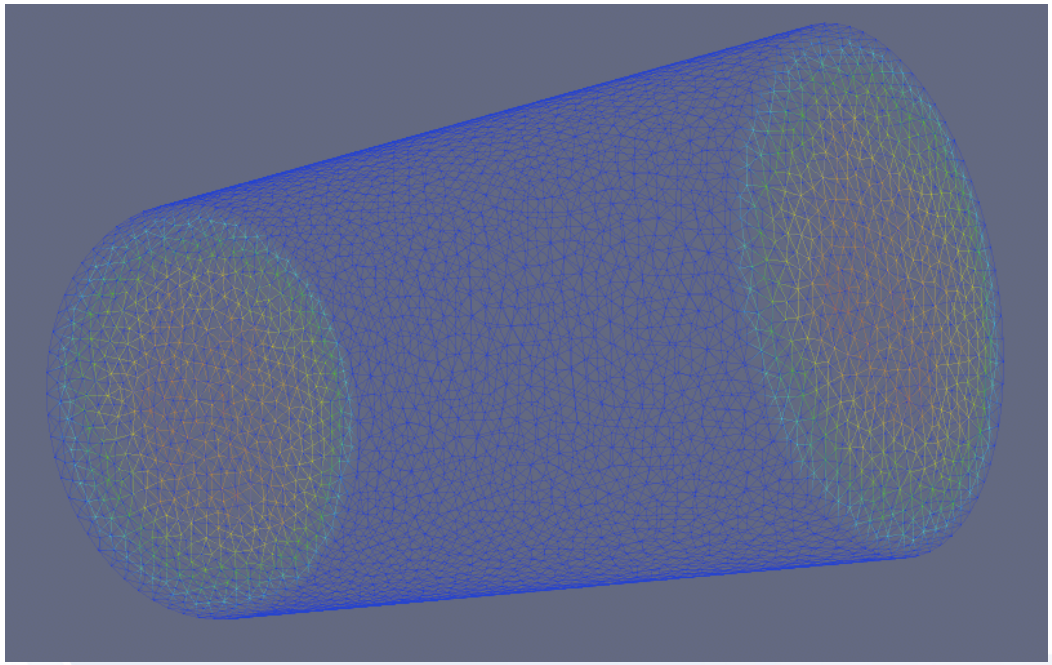




Data representation

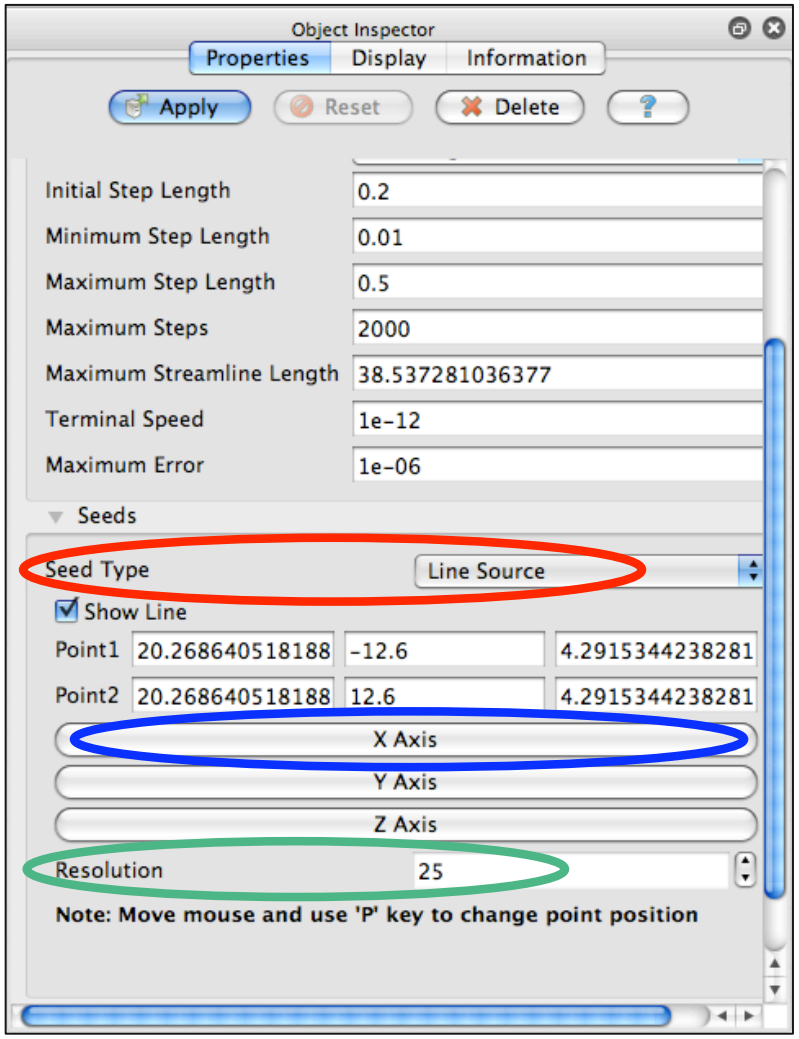
- Object Inspector view: controls labeled Style.
- In Representation dropdown, select Wireframe
- Opacity: 0.2





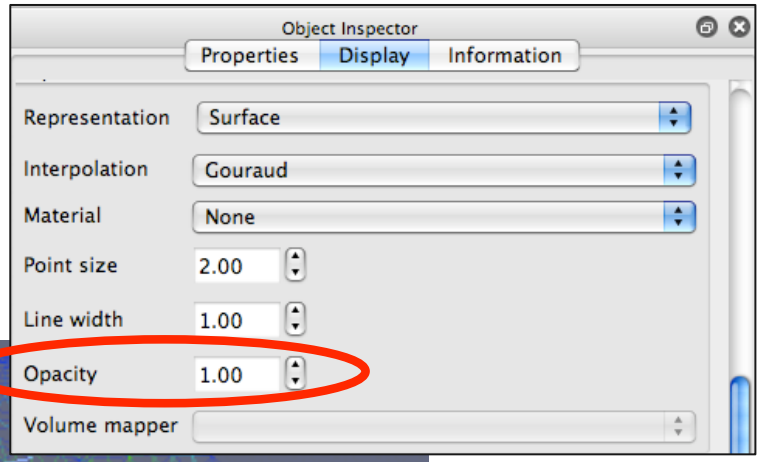
Generate Streamlines

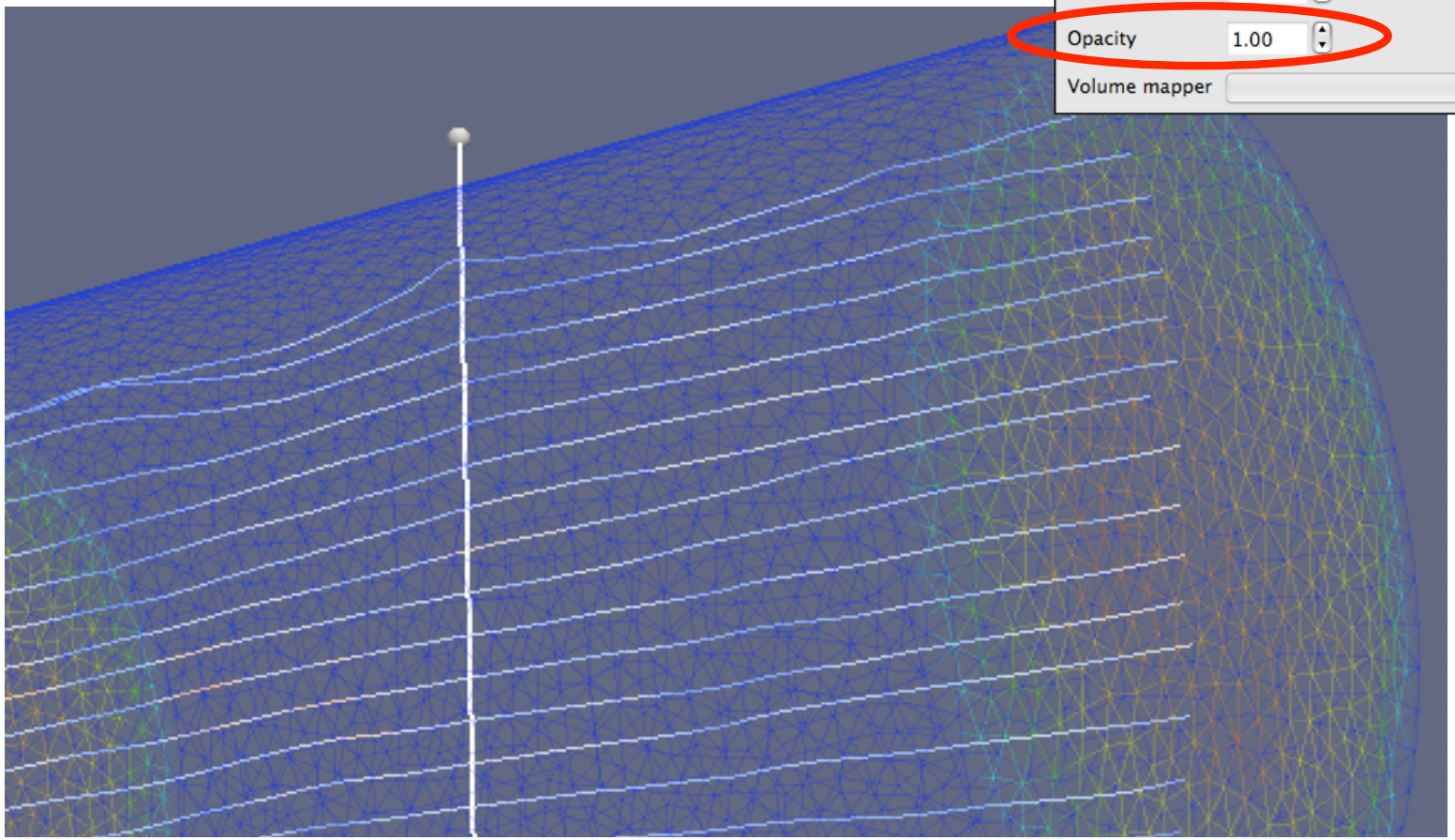
- Main menu: Filters-> Alphabetical->Stream Tracer
- Seeds: Seed Type to Line Source.
- Click the Y Axis button
- Resolution: 25.
- Apply



Generate Streamlines (Continued)

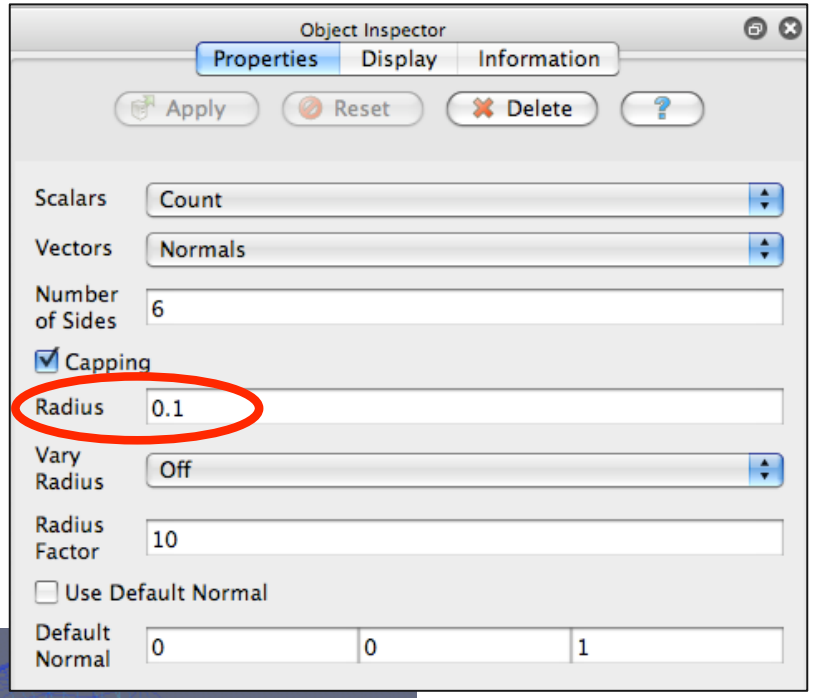
- Object Inspector:
  Display tab
  Opacity: 1.0

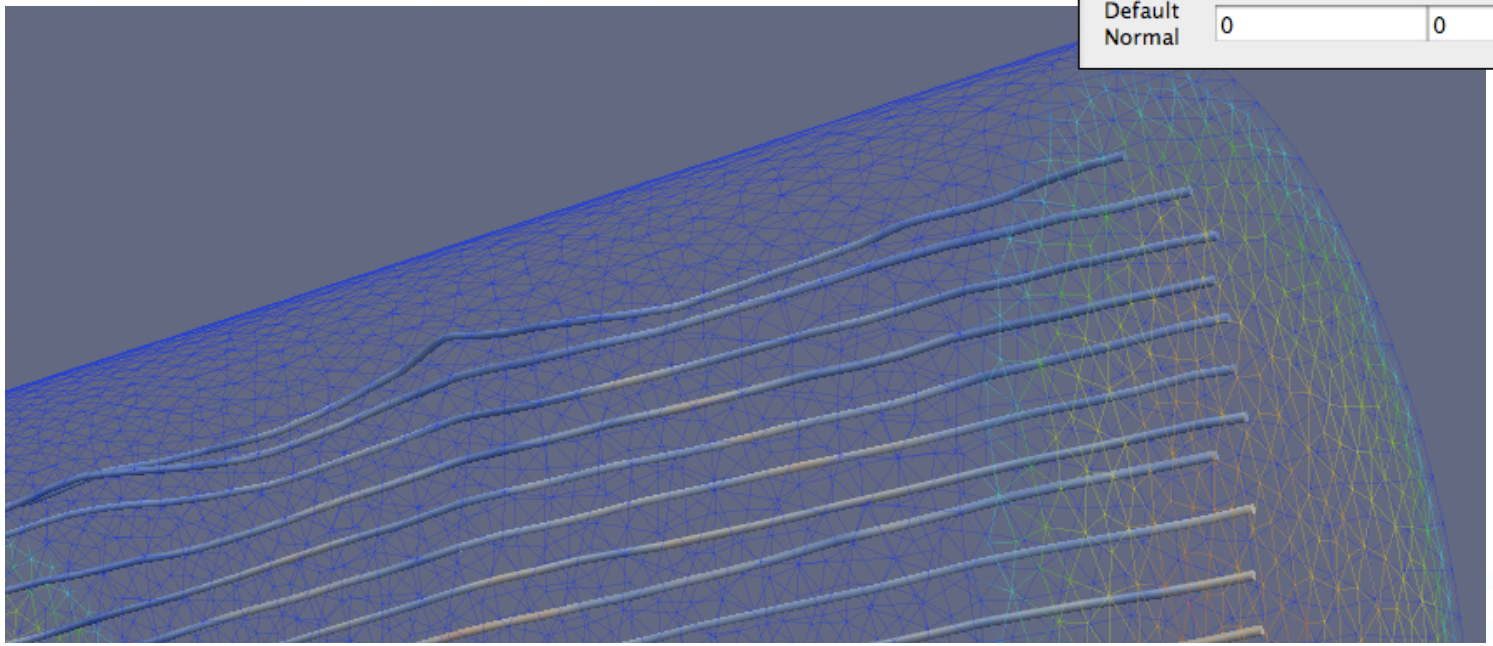




Streamlines as Tubes

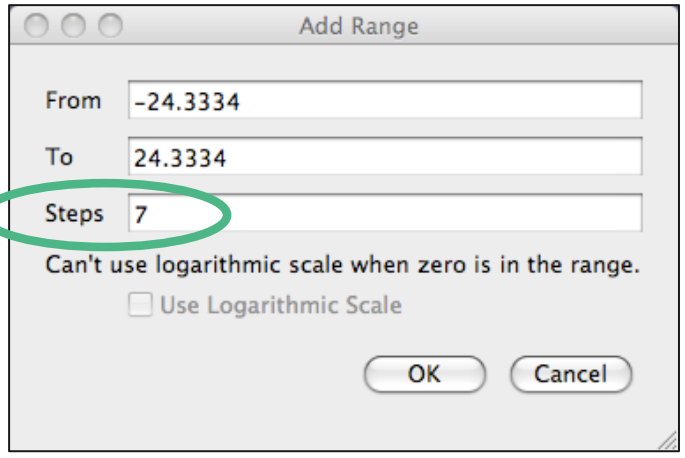
- With StreamTracer1 selected: Filters->Alphabetical->Tube
- Radius: 0.1
- Apply
- Display tab: Color by

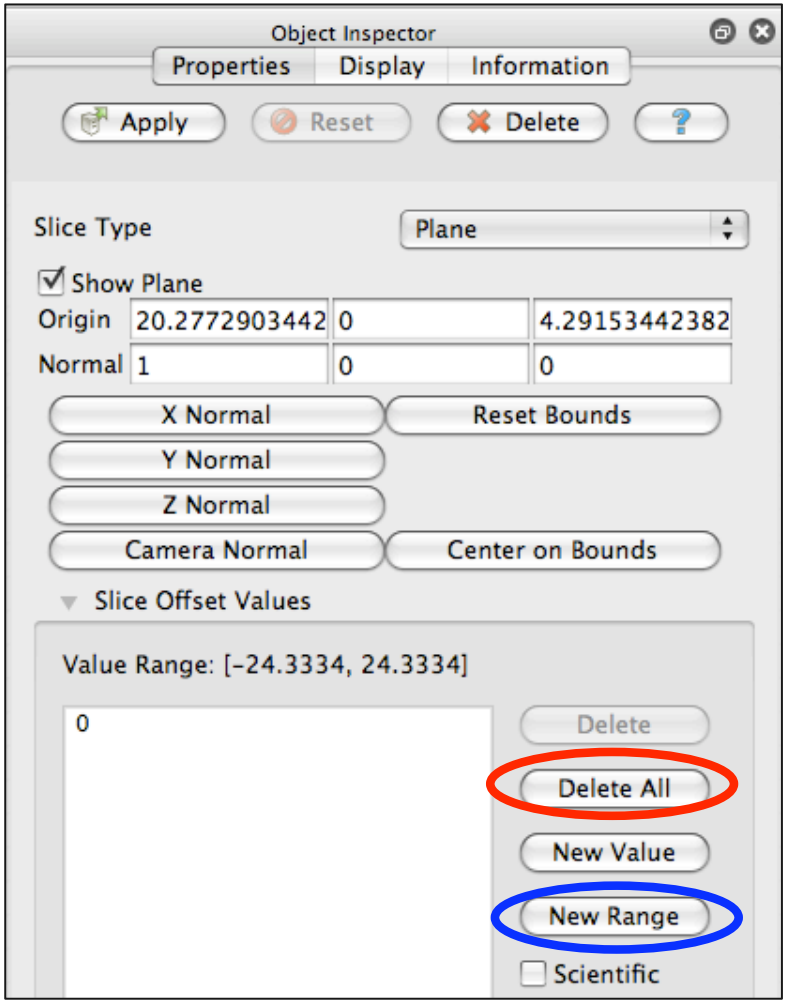




Cutting Planes (Slices)

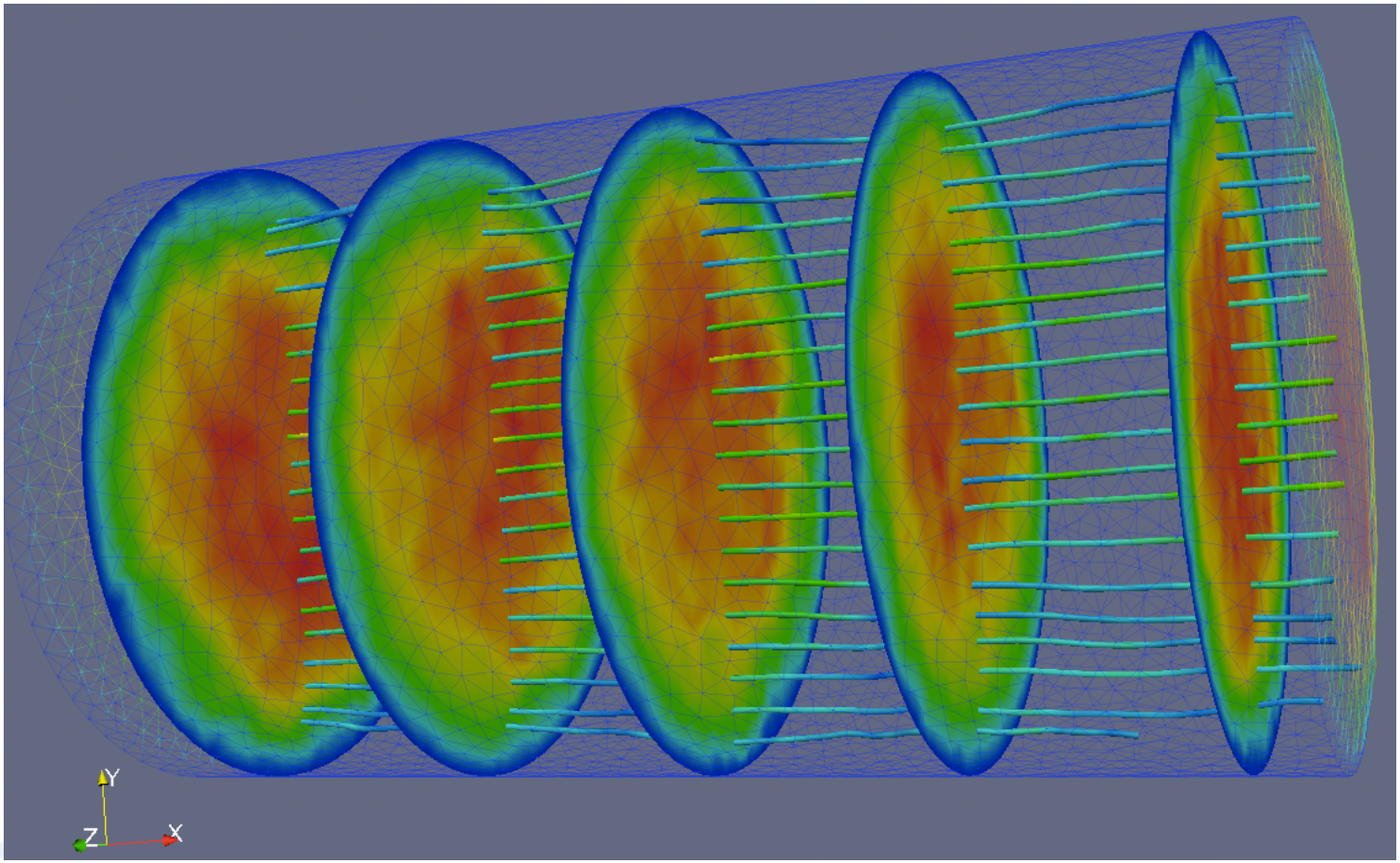
- Filters->Alphabetical->Slice
- Slice Offset Values: Delete All
- New Range
- Steps: 7





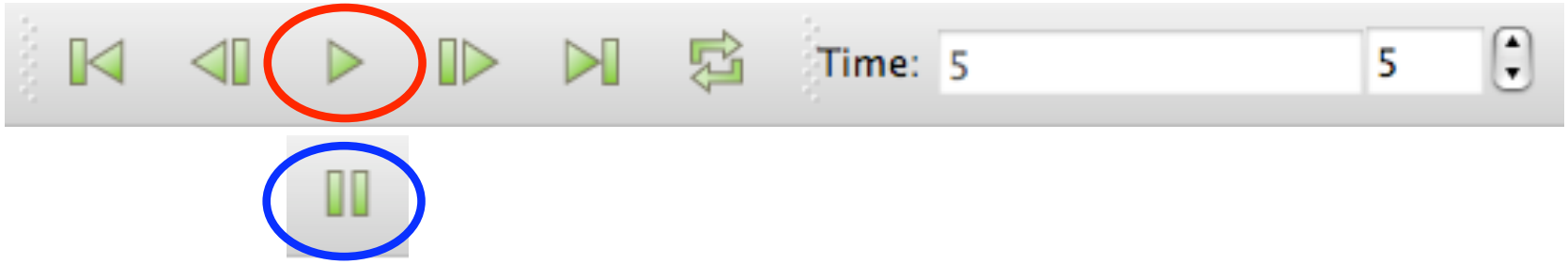
Cutting Planes (Slices)

- Display tab: Opacity: 1.0
- Color by: Velocity.



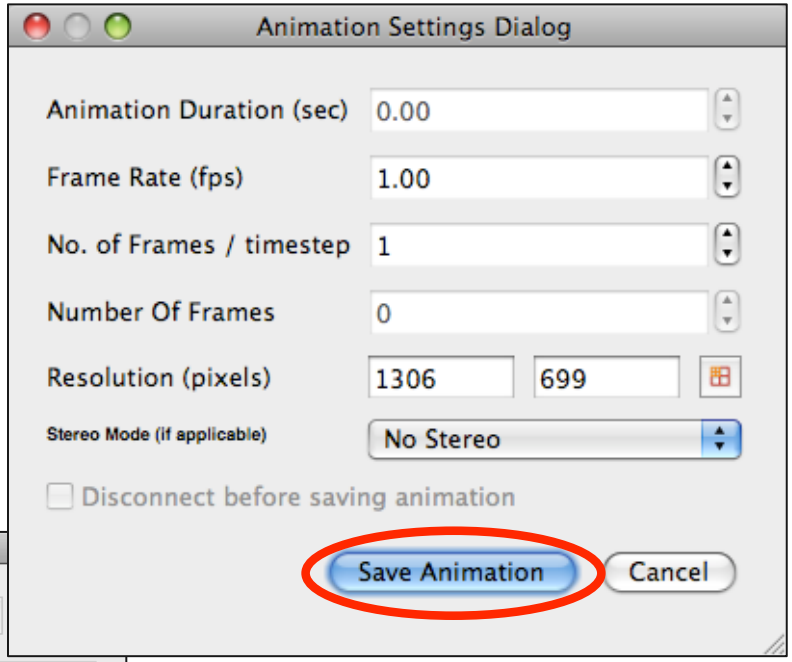
Animating Simulation Data

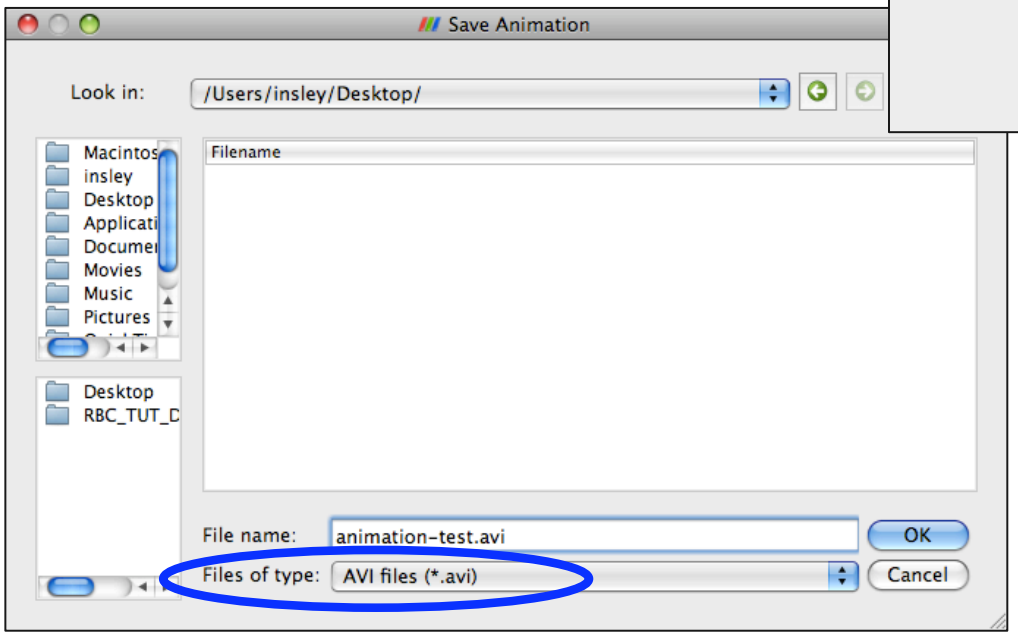
- Play button on the animation bar at the top of the GUI
- Pause to stop



Saving Animations

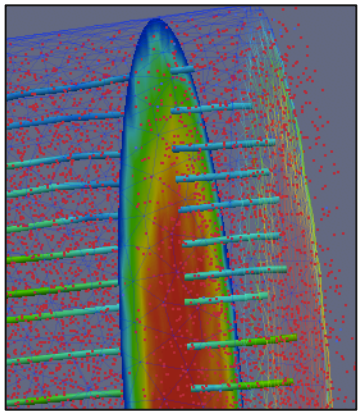
- File-> Save Animation
- Animation Settings Dialog: Save Animation
- Files of type: AVI

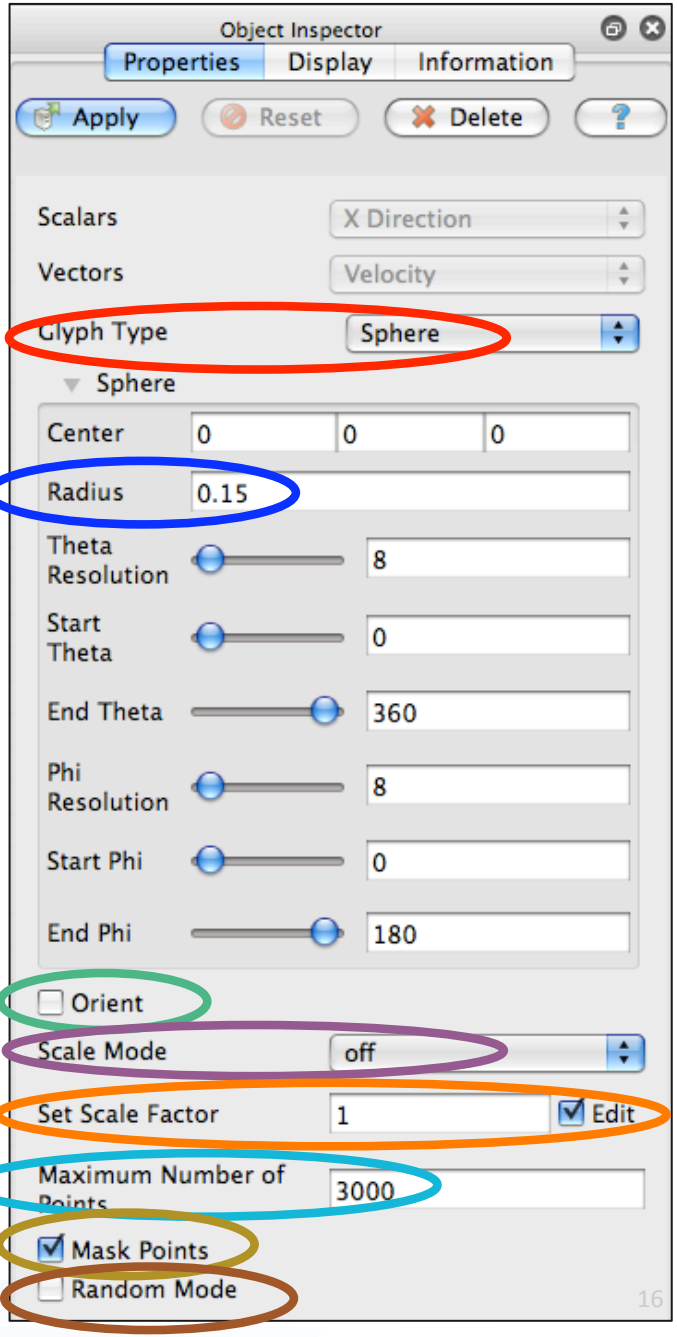




Particles as Glyphs

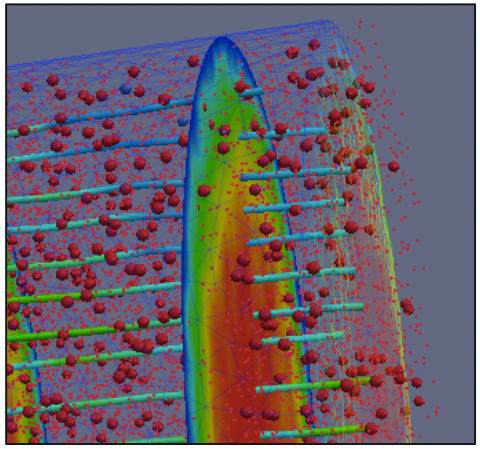
- Unhide particles_step-032* data: click Eye icon in Pipeline Browser.
- Filters->Alphabetical->Glyph
- Glyph Type: Sphere
- Radius:. 0.15
- Orient: Unchecked
- Scale Mode: off
- Set Scale Factor: 1 Edit: Checked
- Maximum Number of Points: 3000
- Mask Points: Checked
- Random Mode: Unchecked

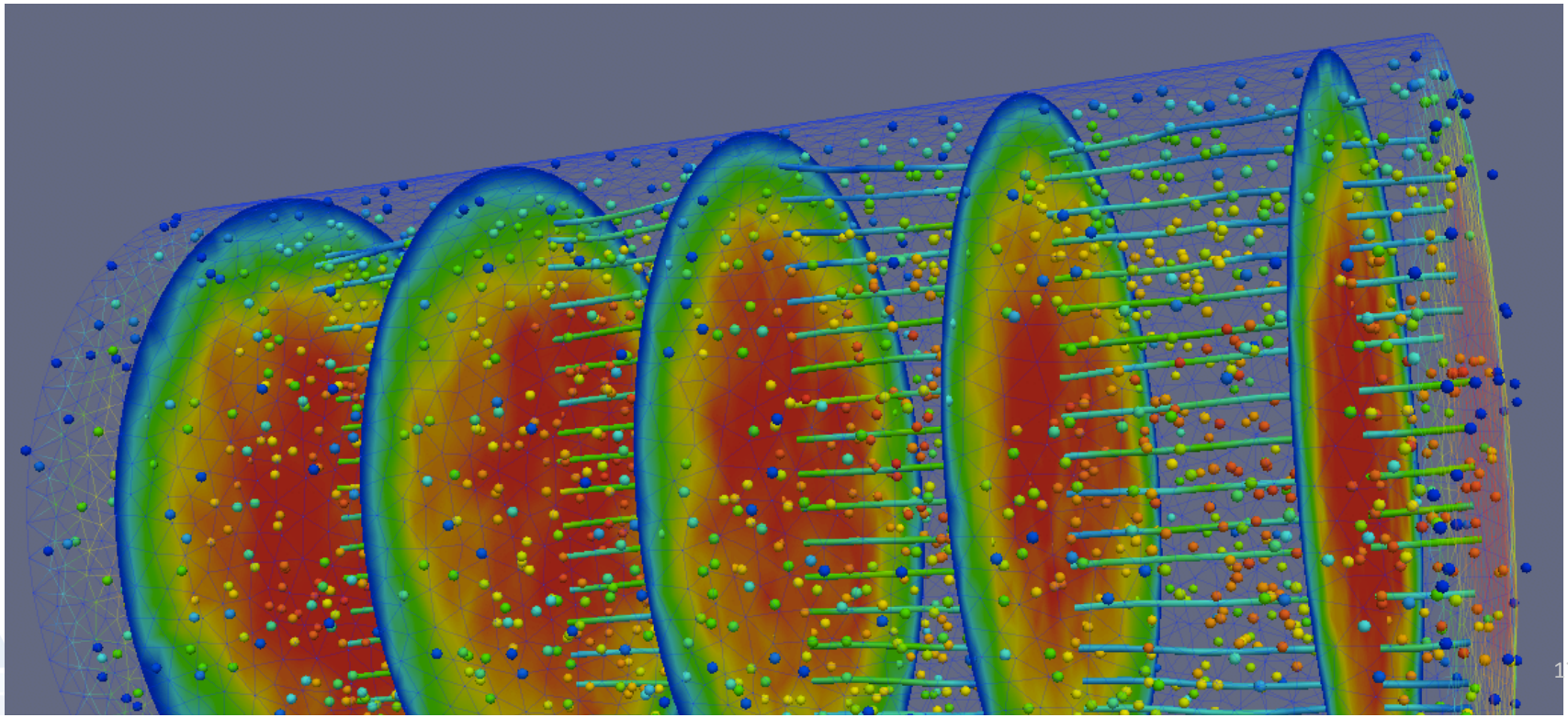




Finalizing Glyphs

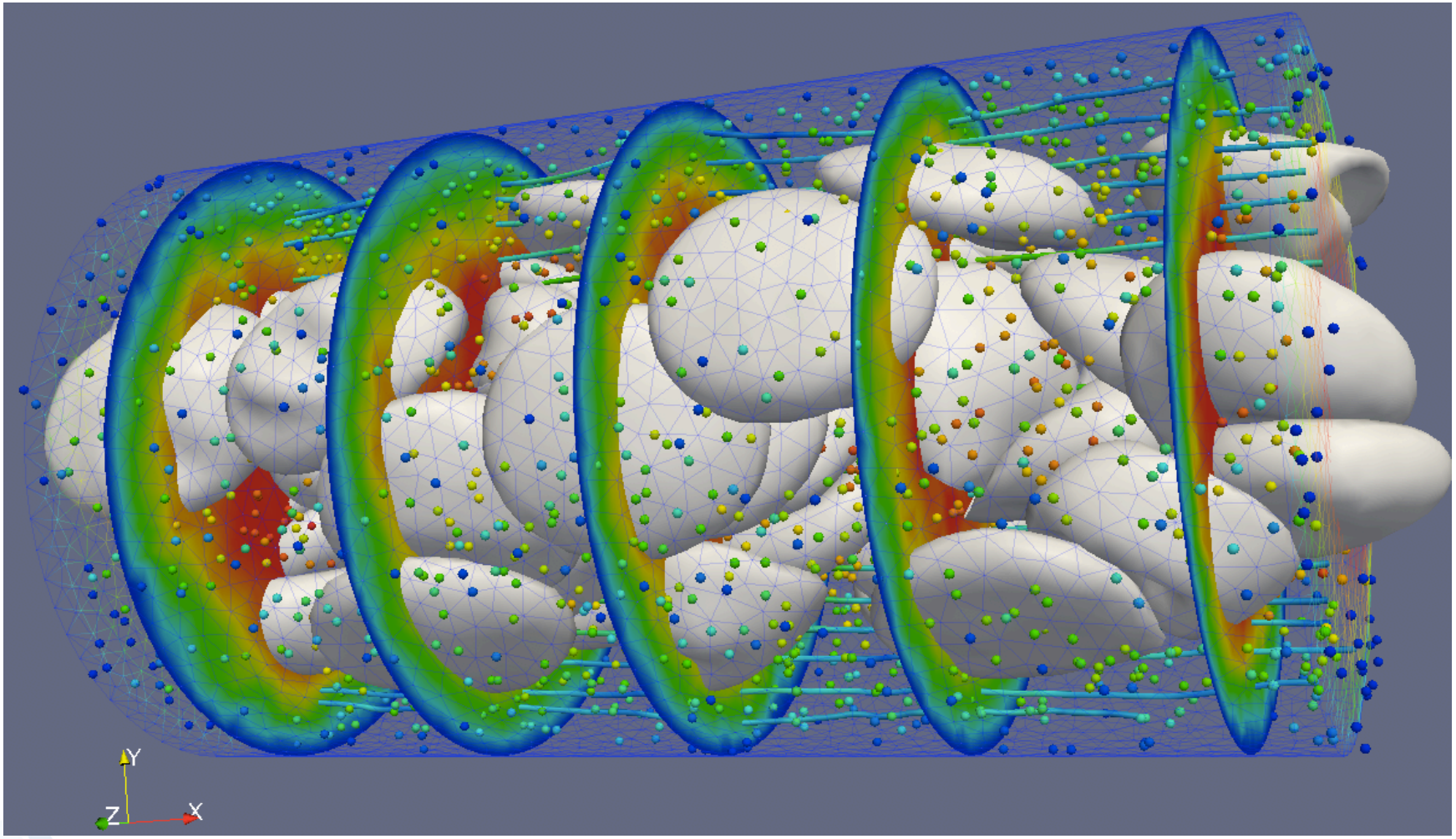
- Hide the particles_step-032*: Eye icon in Pipeline Browser
- Color by: GlyphVector
- Edit Color Map... Blue to Red Rainbow





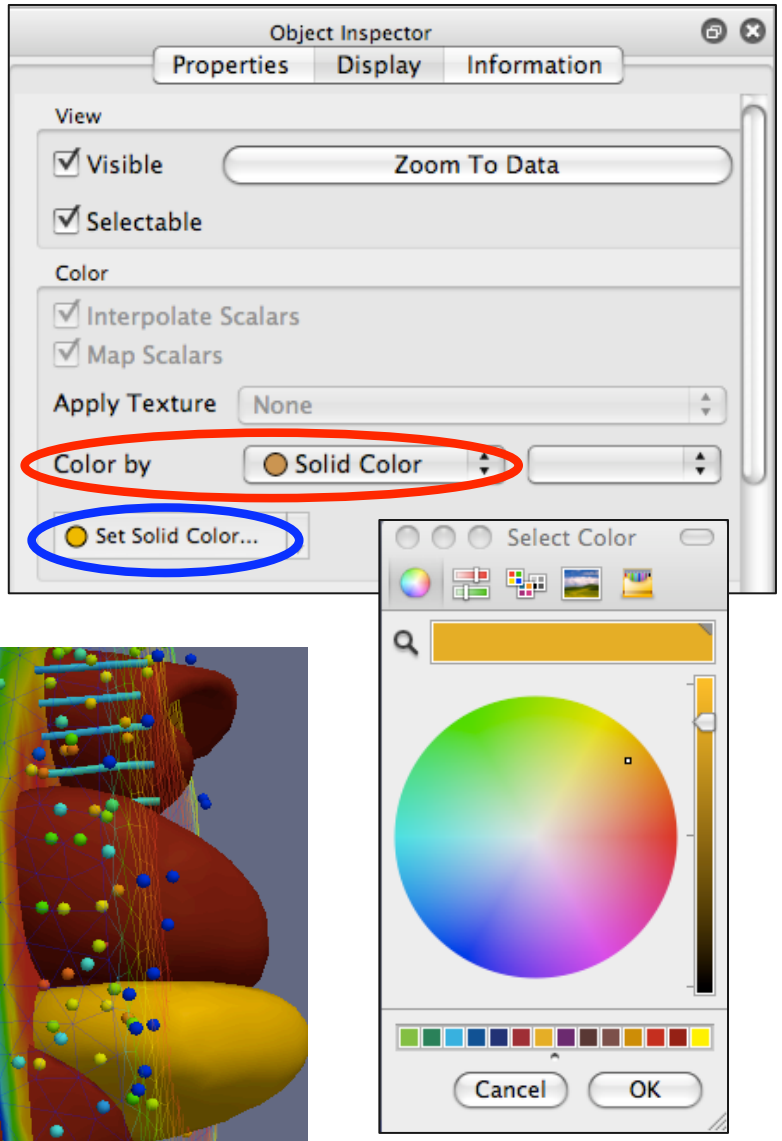
Enter: Red Blood Cells

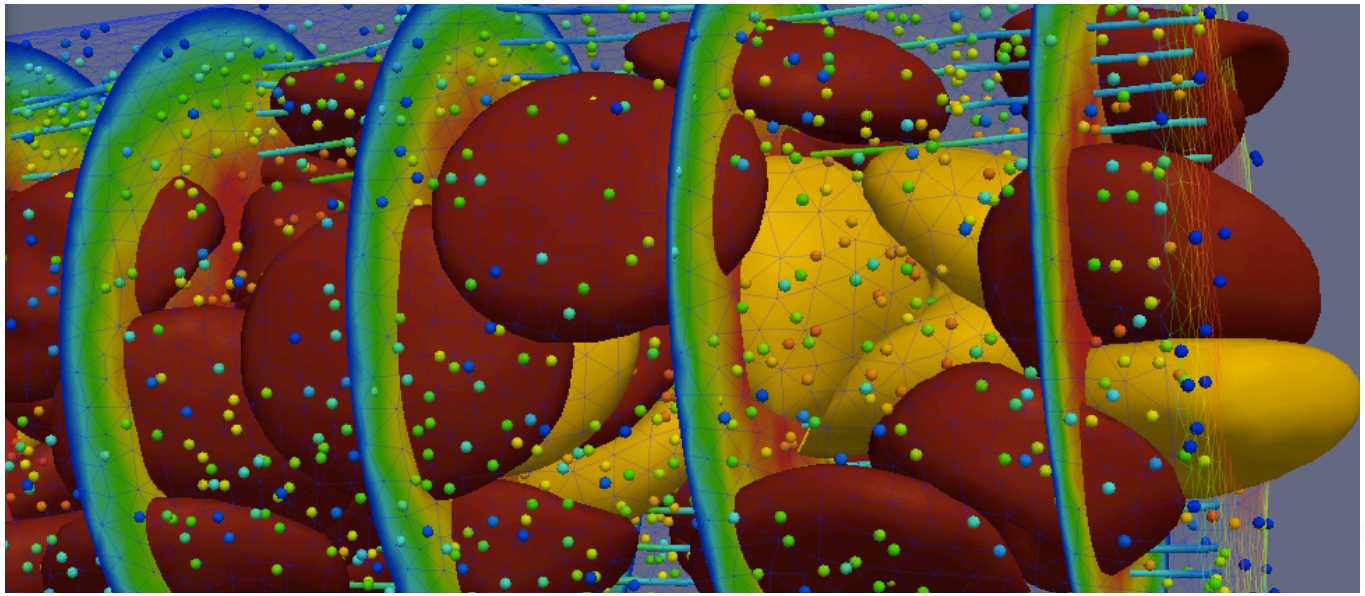
- Unhide rbc_step-032* and bad_rbc_step-032*



Using color to differentiate data

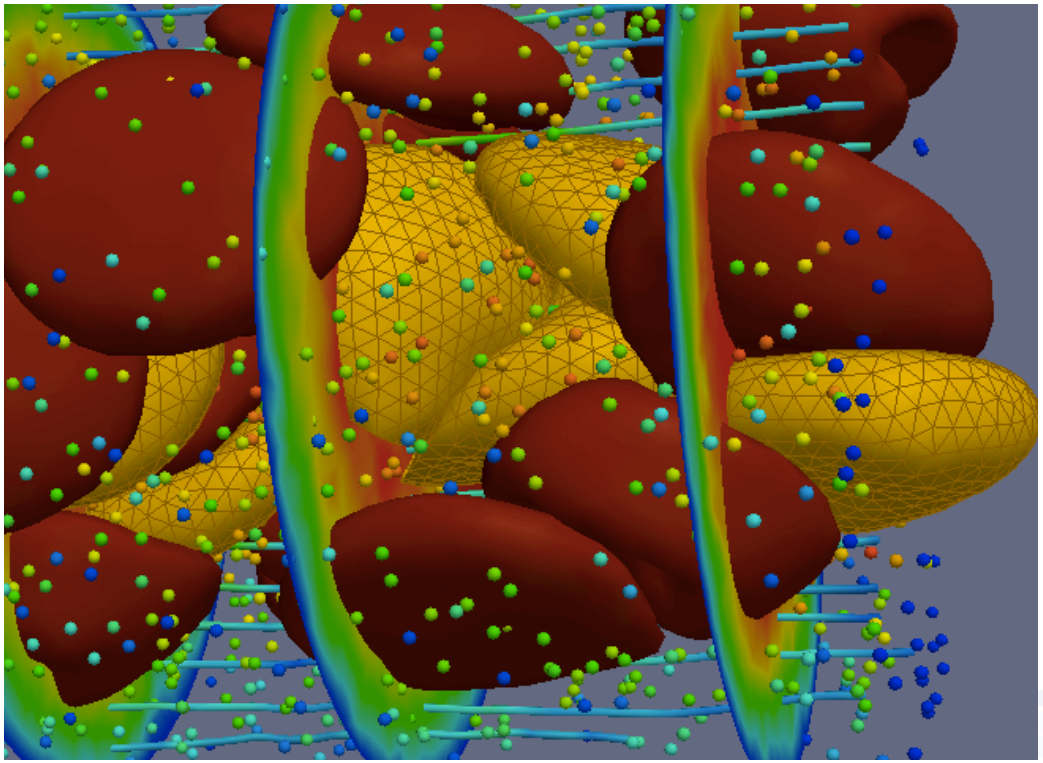
- Select one of the rbc data sets in the Pipeline Browser
- Color by: Solid Color
- Set Solid Color…
- Pick different colors for the two data sets

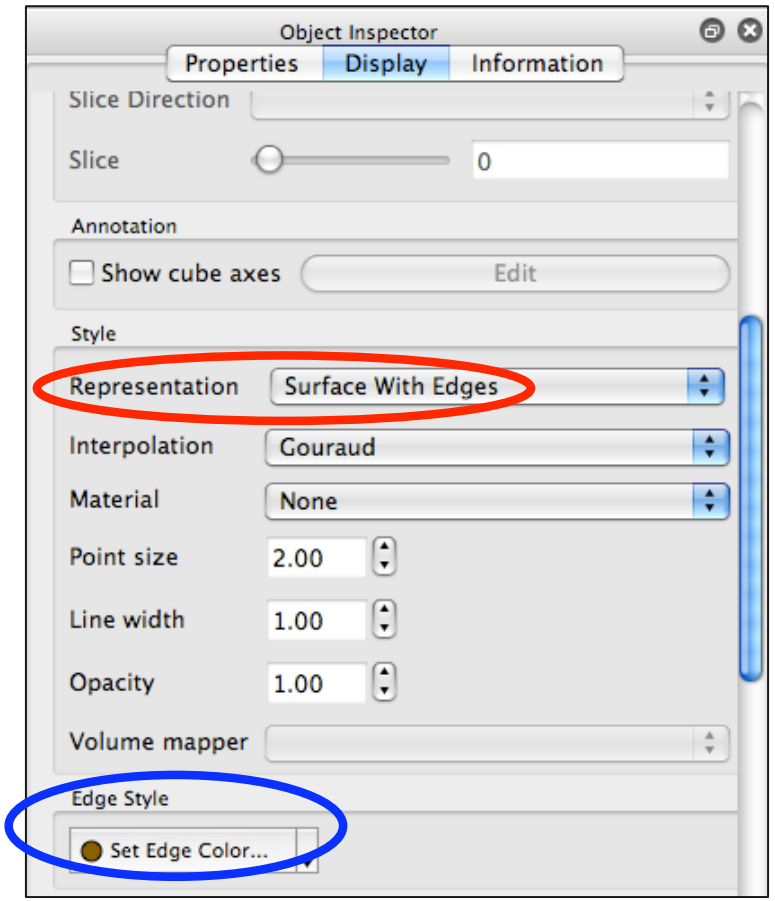




Further Exploration: Highlight the Mesh

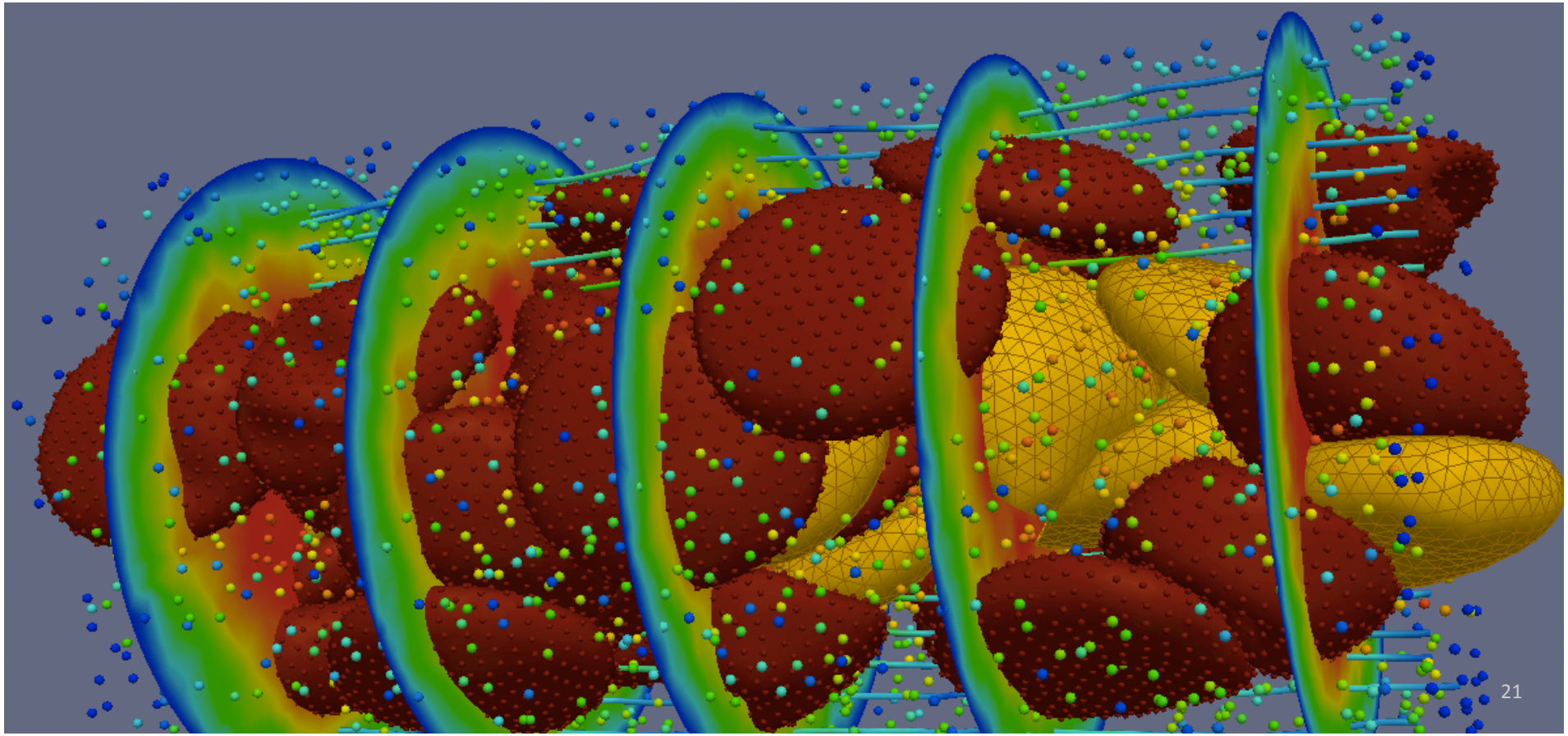
- Object Inspector: Display tab
- Representation: Surface With Edges
- Edge Style: Set Edge Color…





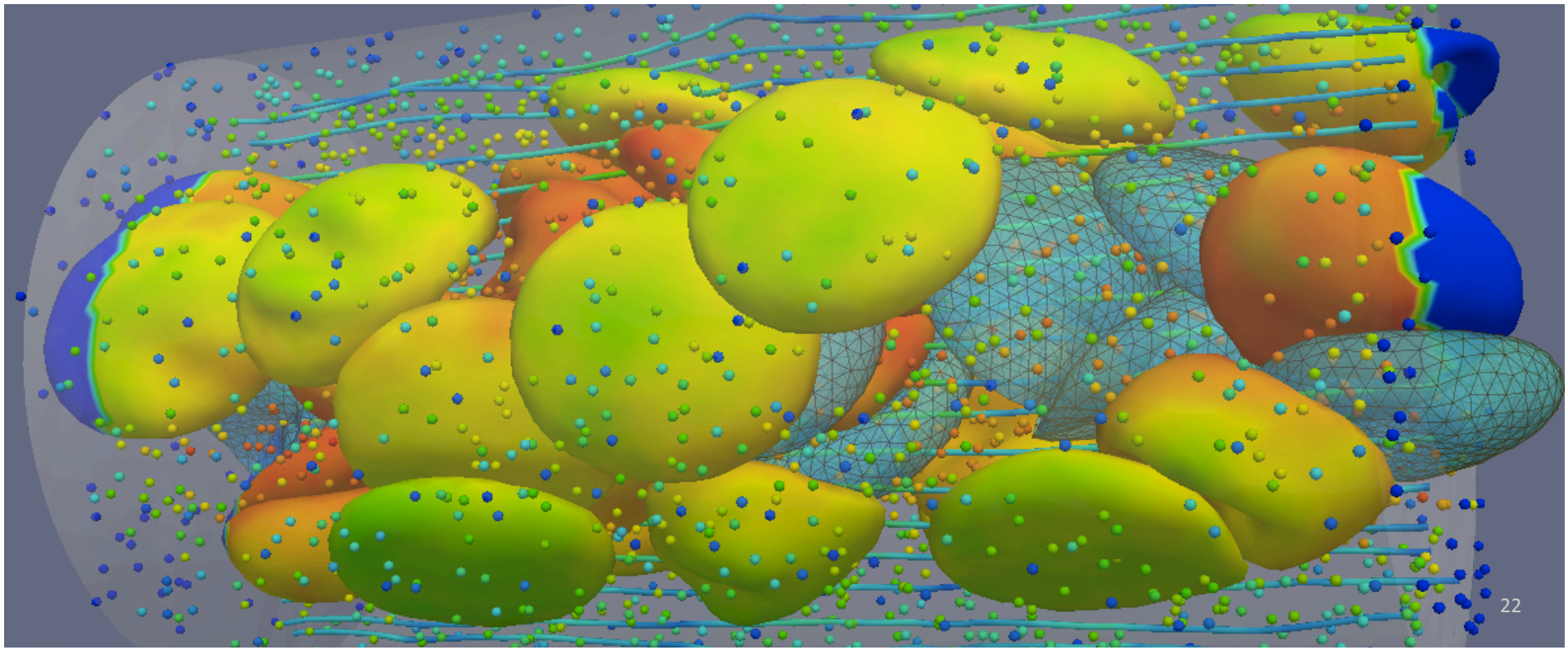
Further Exploration: Highlight the Vertices

- Add glyphs to one of the RBC data sets.
- Filters->Recent->Glyph
- **Uncheck** the *Mask Points* option.



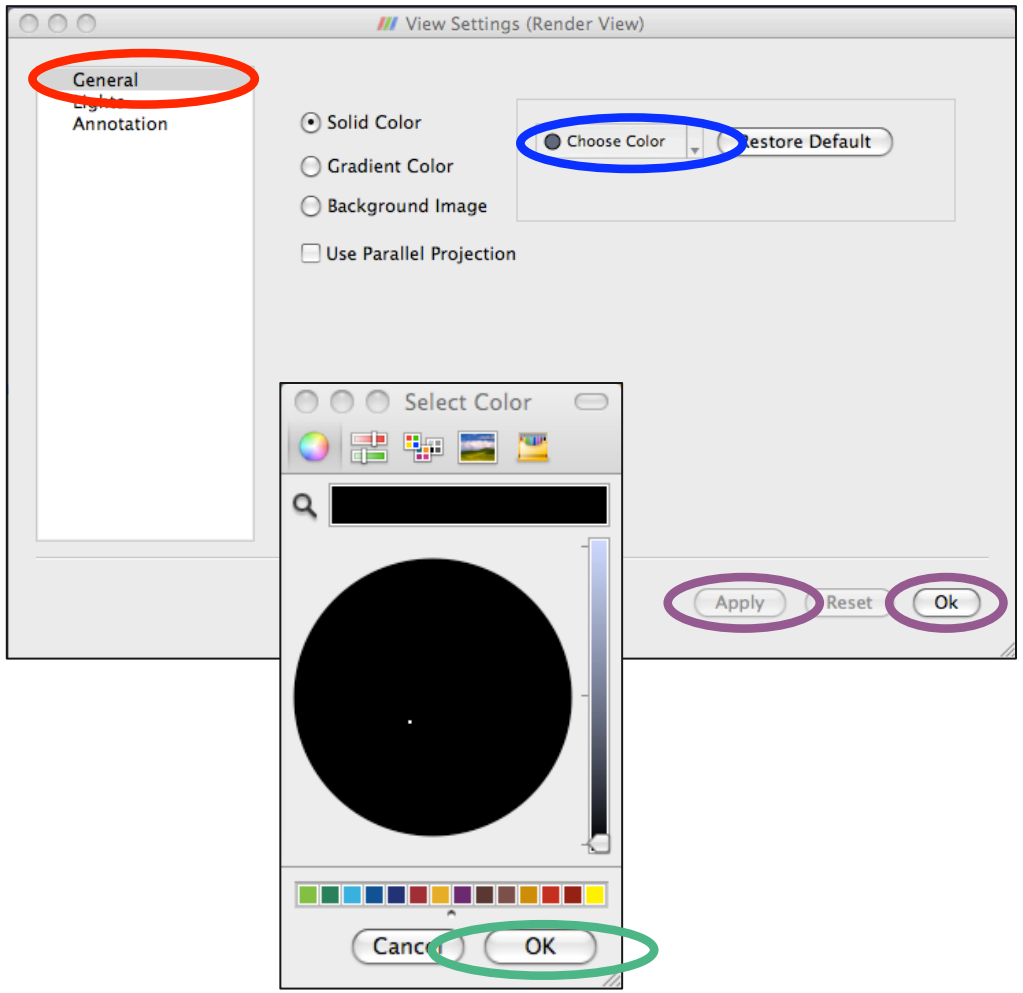
Further Exploration: Color by Variable

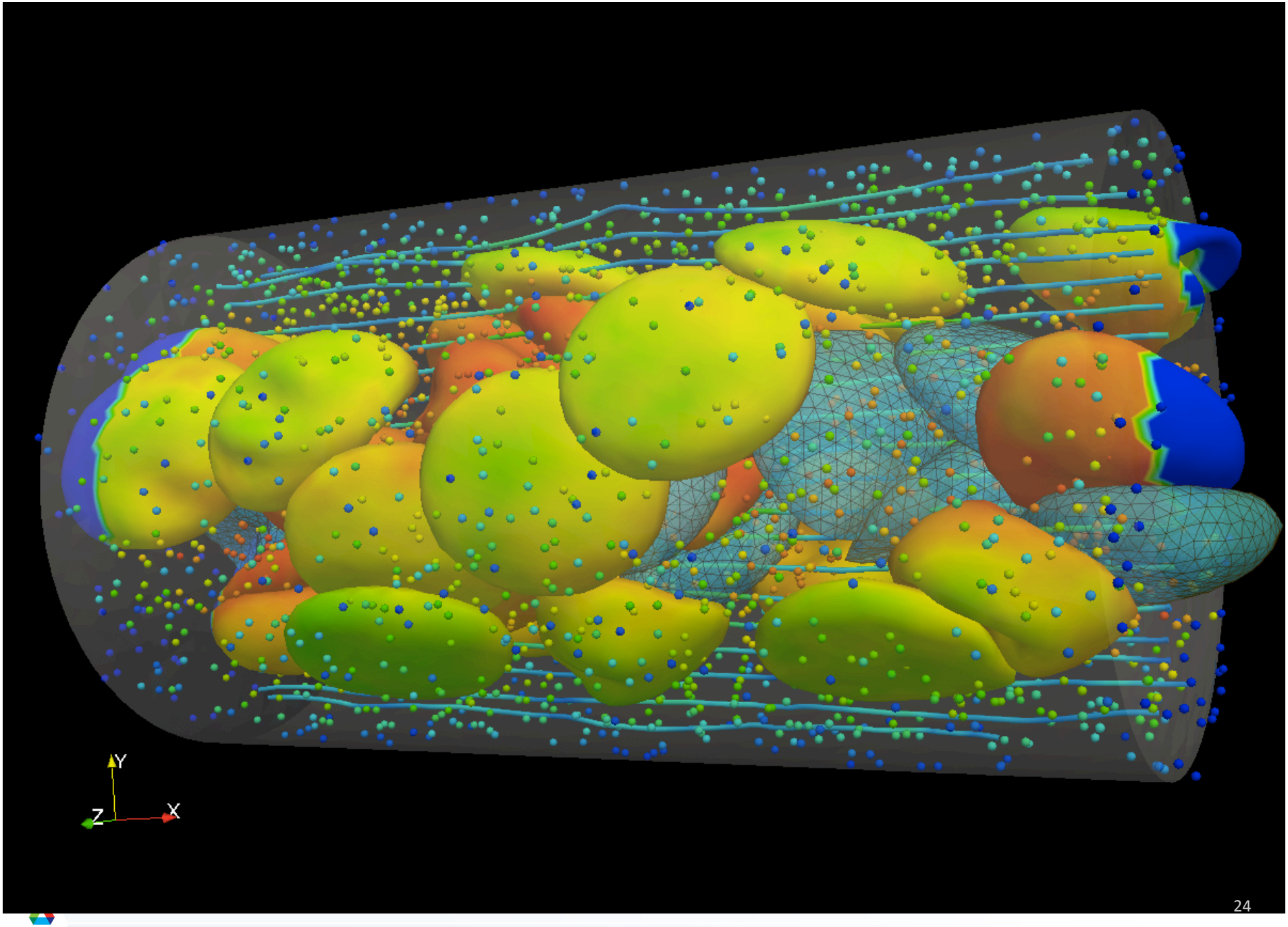
- Color by
- Opacity
- Representation
- etc.



Background Color

- Background color is an important part of final visualization
- Edit->View Settings...
- General: Choose Color
- Select Color: OK
- Apply, then OK.




Y
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