VisIt Tutorial

Brandt Westing

Background

- https://wci.llnl.gov/codes/visit/
- Open Source, Multiplatform, interactive parallel visualization and graphical analysis tool
- Developed by the Department of Energy (DOE) Advanced Simulation and Computing Initiative (ASCI)
- Although VisIt was developed for visualizing terascale data, it is also well suited typical desktop simulations

Data Types

- Supports a wide variety of data types
  - Structured grids
    - uniform rectilinear, non-uniform rectilinear, and curvilinear
  - Unstructured grids
  - Polygonal data
  - Images
  - Multi-block
  - AMR
- Time series support

Visualization Algorithms

- VisIt's visualization capabilities are grouped into two categories:
  - Plots are used to visualize data and include boundary, contour, label, mesh, pseudocolor, scatter, streamline, and others
  - Operators consist of operations that can be performed on the data prior to visualization. (Examples include slice, isosurface, threshold among others)

Special Features

- Supports derived fields
  - New fields to be calculated using existing fields.
- Supports multiple mesh types (rectilinear, curvilinear, and unstructured meshes)
- Employs parallel and distributed architecture to handle extremely large data sets interactively

Data Formats

- Supports over 5 dozen different file formats
  - Silo
    https://wci.llnl.gov/codes/visit/1.5.4/GettingDataIntoVisIt1.5.4.pdf
  - VTK (http://www.vtk.org/VTK/img/file-formats.pdf)
  - And many more!
    https://wci.llnl.gov/codes/visit/FAQ.html#12
- Conversion to the VTK format is straightforward

VisIt Test-Drive

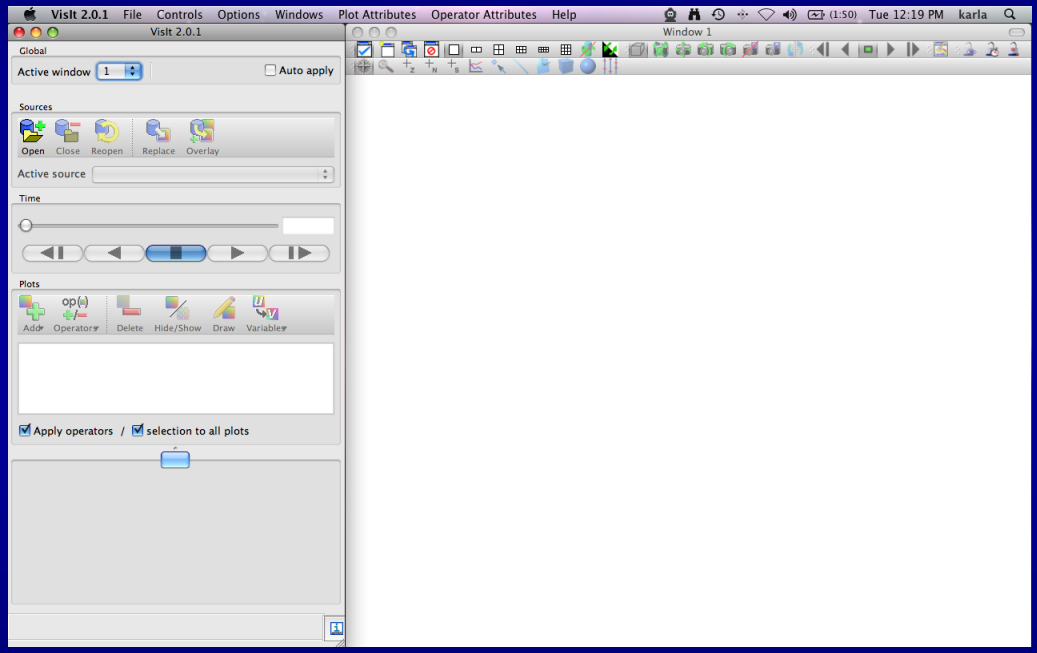
Getting Started

- Download example data file ‘noise.silo’
  - http://portal.longhorn.tacc.utexas.edu/training/
  - Right-click, Save link as…
- Open VisIt

VisIt

Today we will:

- Create contours for a scalar variable
- Create isosurfaces for a scalar variable
- Clip and slice the isosurfaces
- Use glyphs to display a vector field
- Use streamlines to show flow through a vector field
- Edit annotations and background
- Add slices to show variable values over a plane
- Create volume rendering



VisIt

Open the file (and display information)

`Noise.silo`

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- Click `OK`
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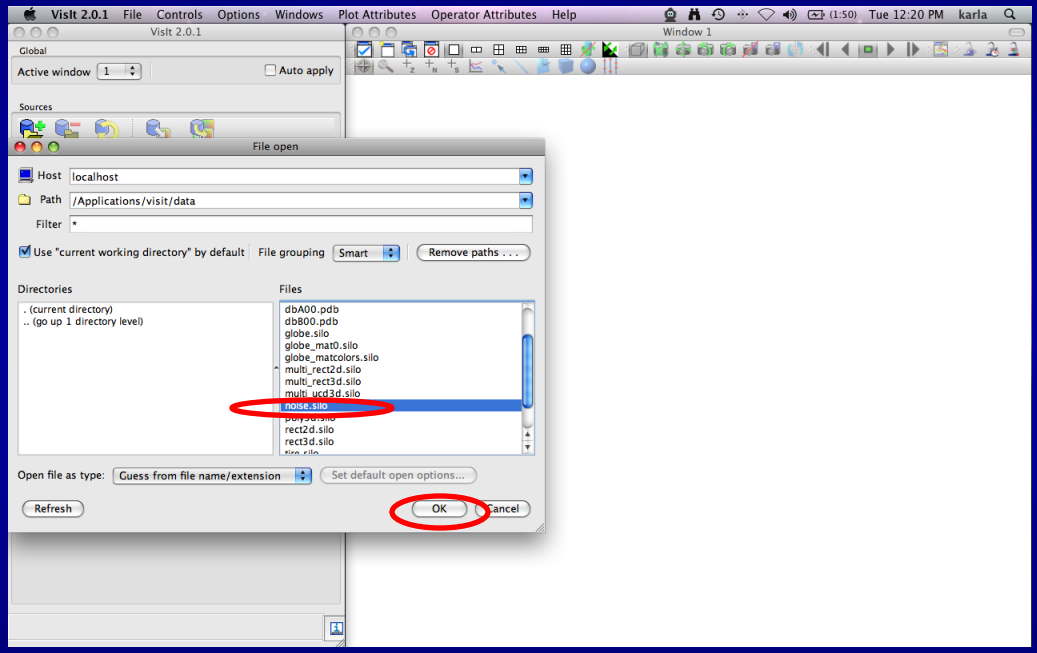

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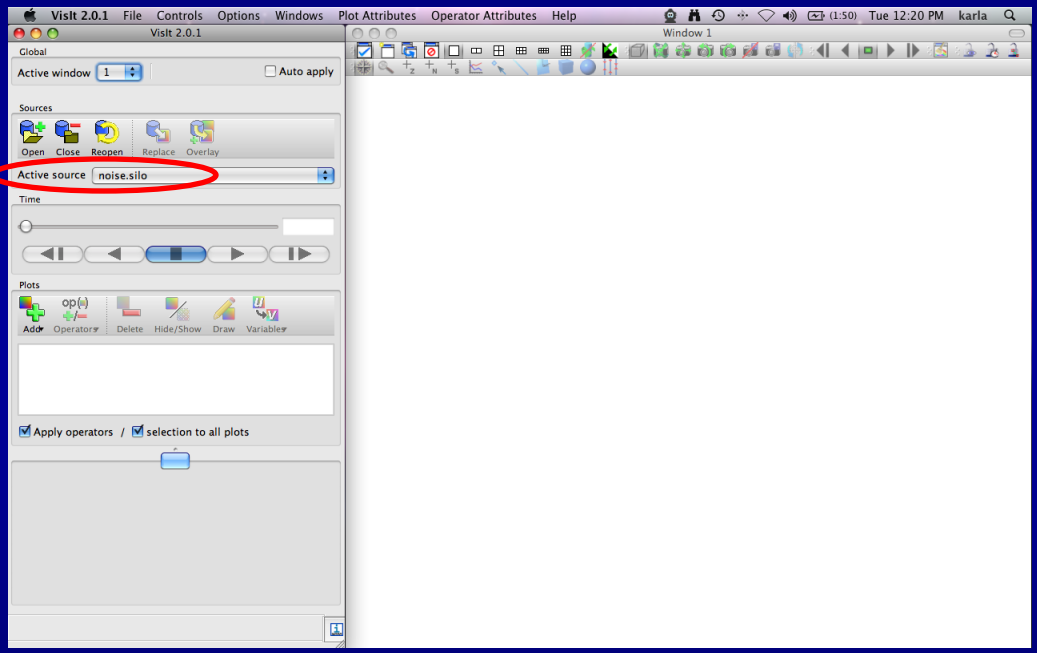

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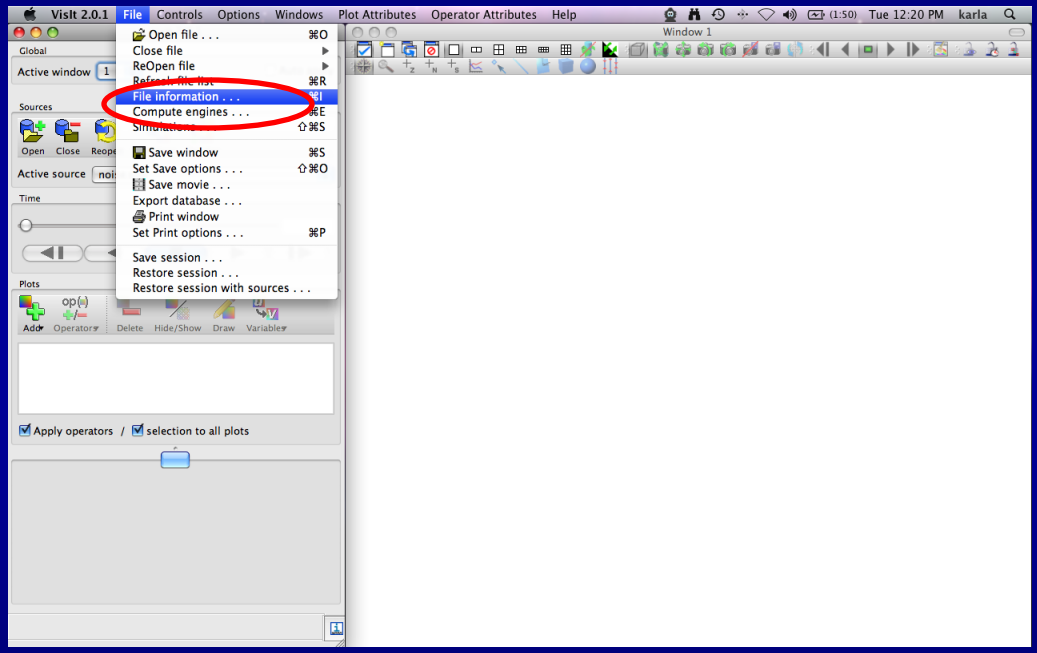

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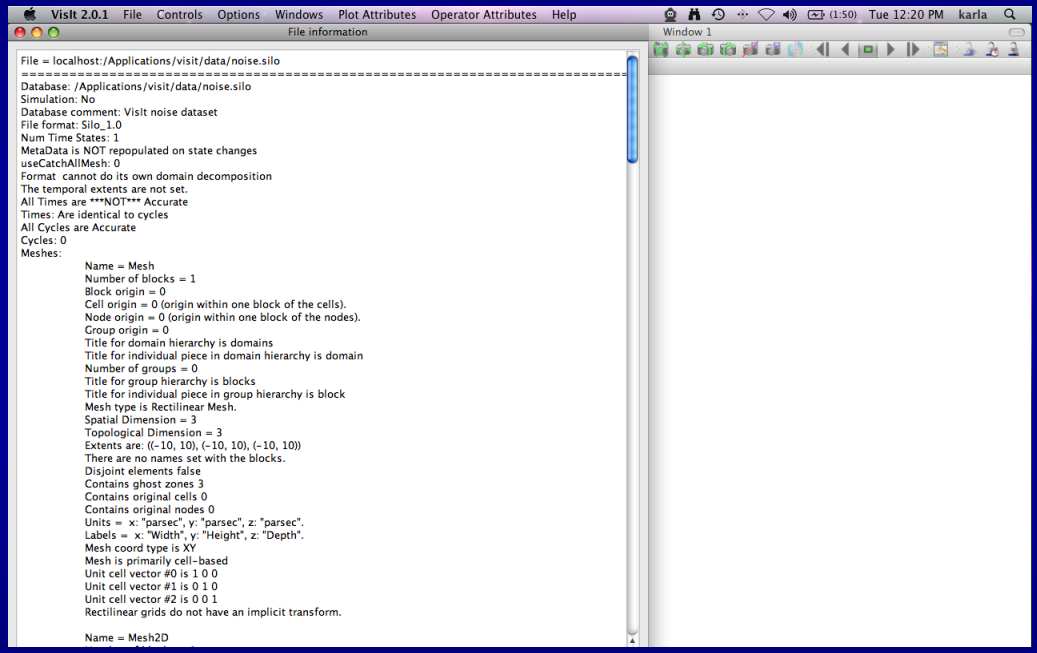

VisIt

Create contour

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- Click `Draw`
- Double click on `Contour` (or Right-click `->Edit plot description`)
- Under select by choose `->N Levels` enter `5`
- Change the opacity levels
- Click `Apply`
- Click `Dismiss`
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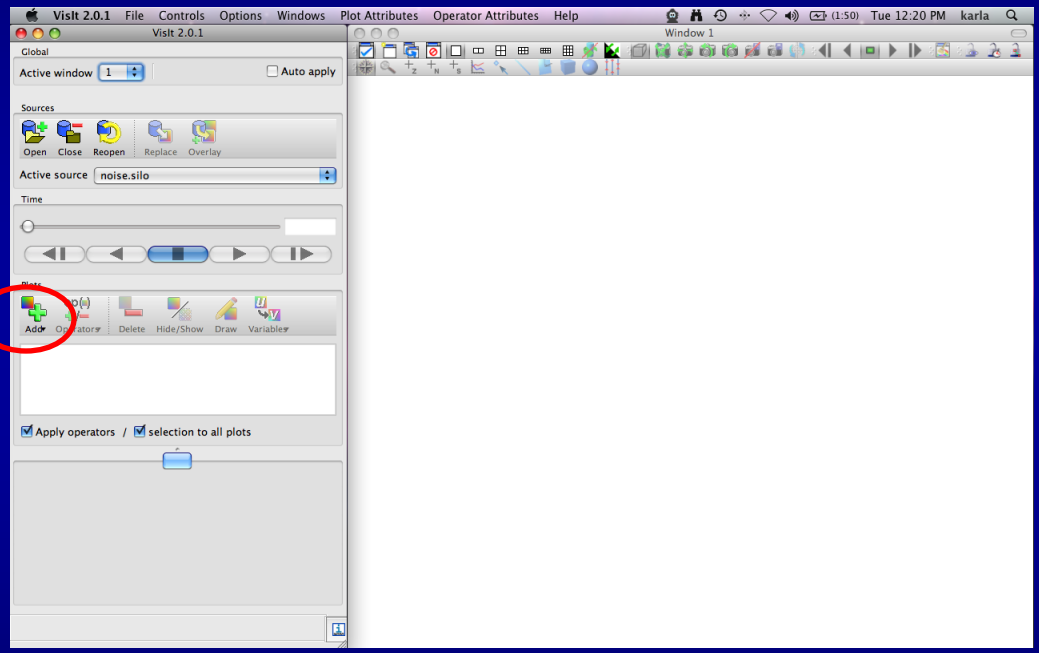

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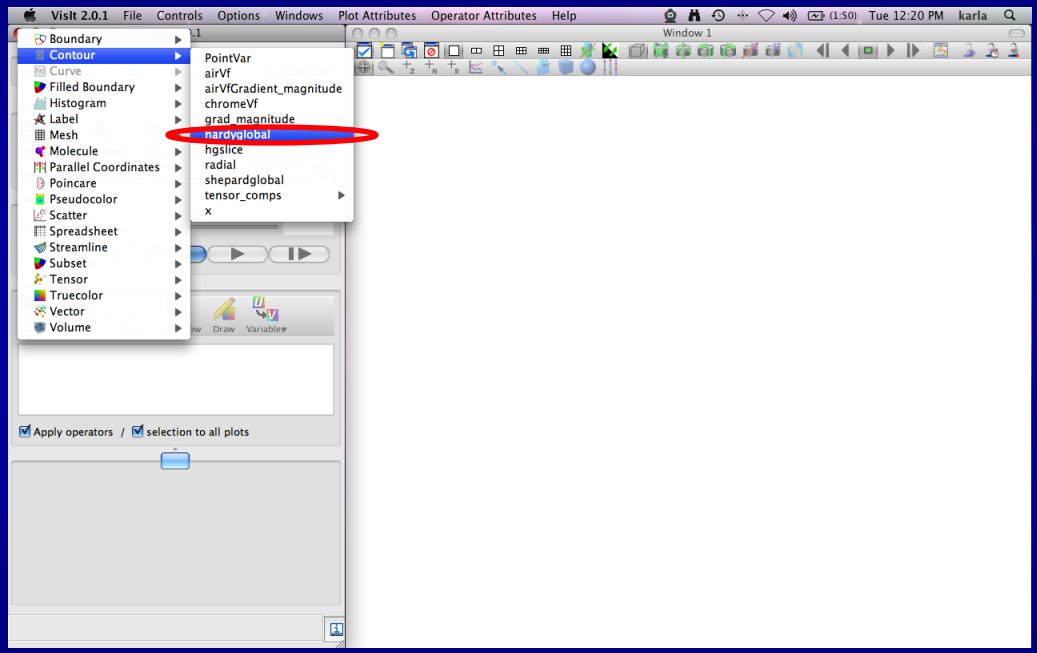

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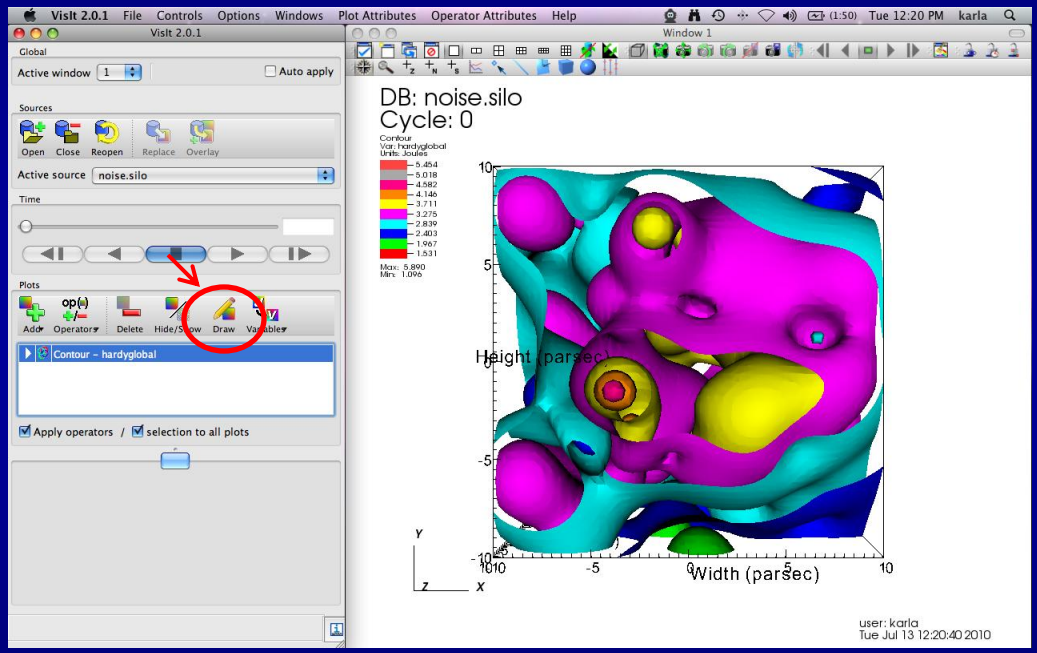

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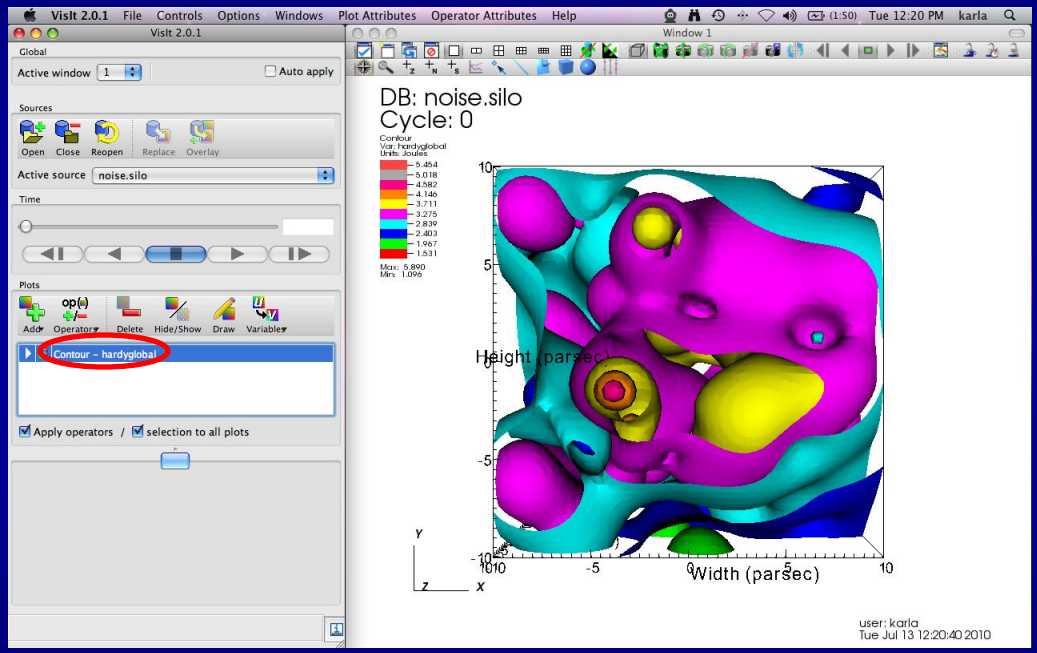

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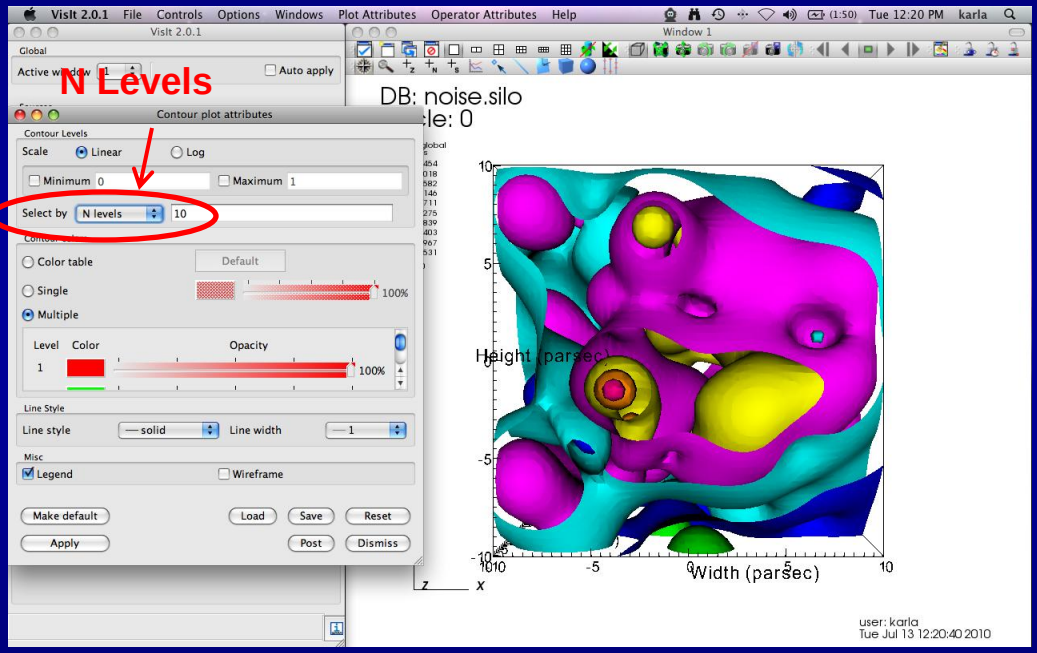

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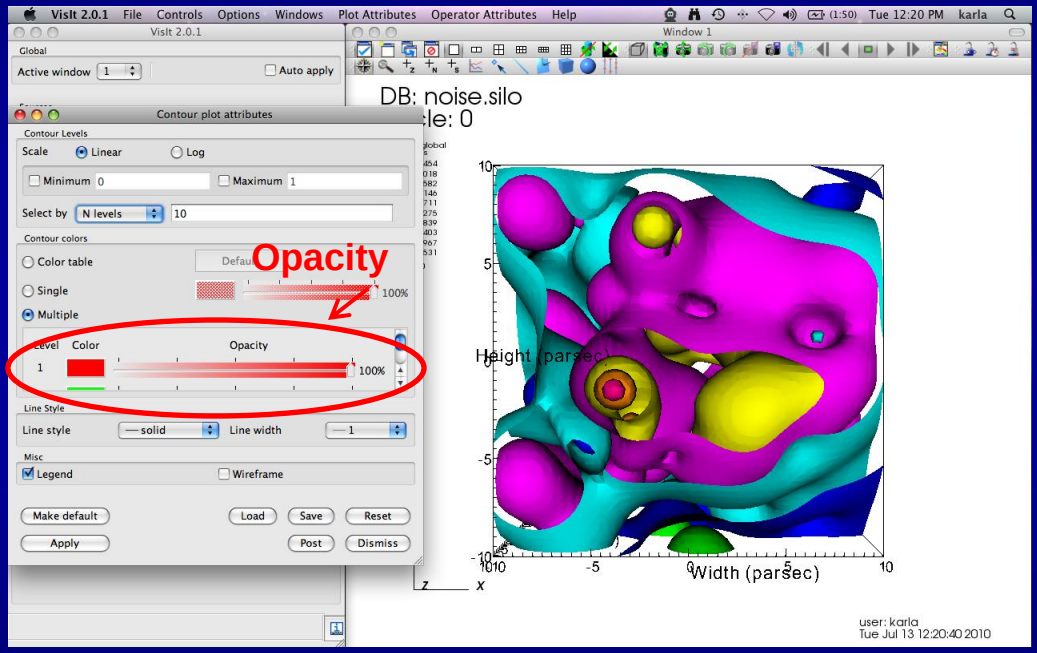

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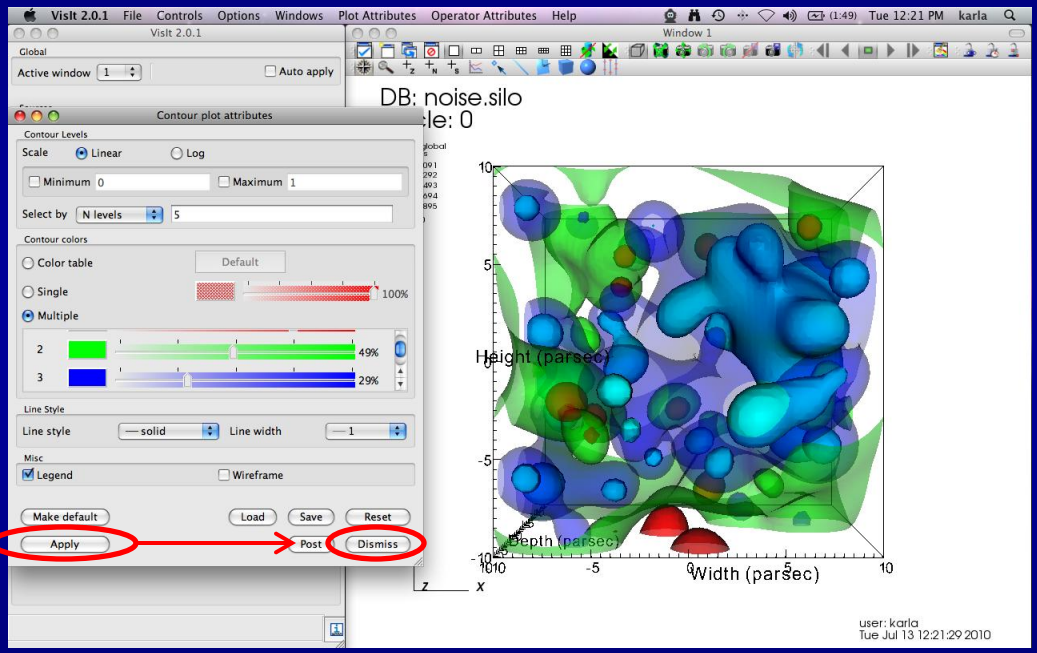

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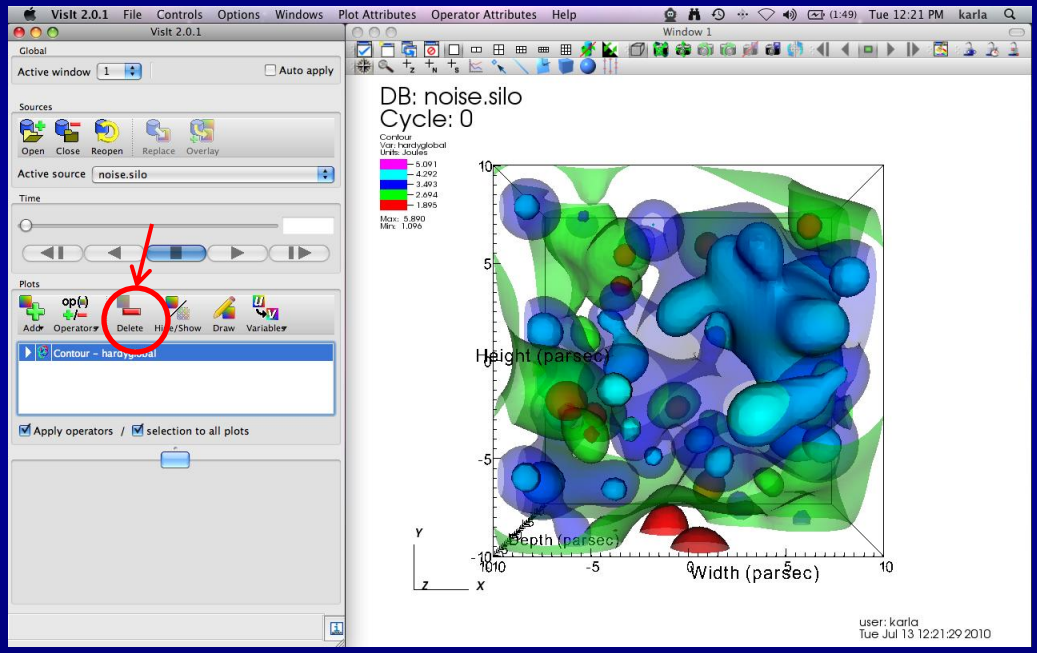

VisIt

Create Pseudocolor and isosurfaces

- Click `Add -> Pseudocolor -> hardyglobal`
- Click `Draw`
- Click `Operator -> Slicing -> Isosurface`
- Click `Draw`
- Click `Arrow to expand`
- Double-Click `Isosurface`
- Under select by choose – `>Percent(s)` enter `50`
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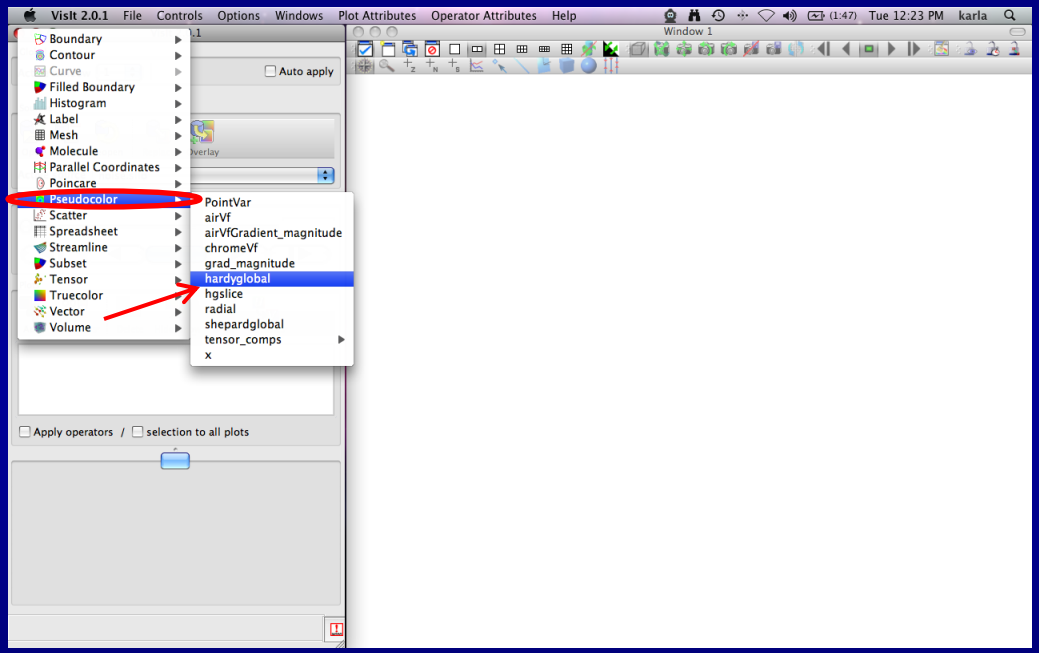

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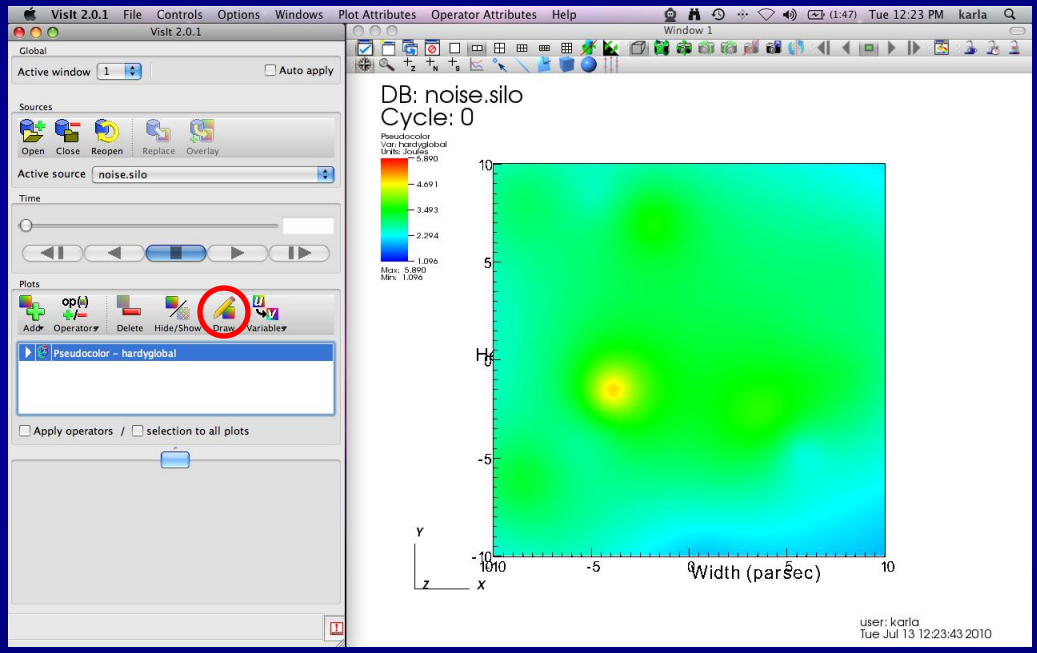

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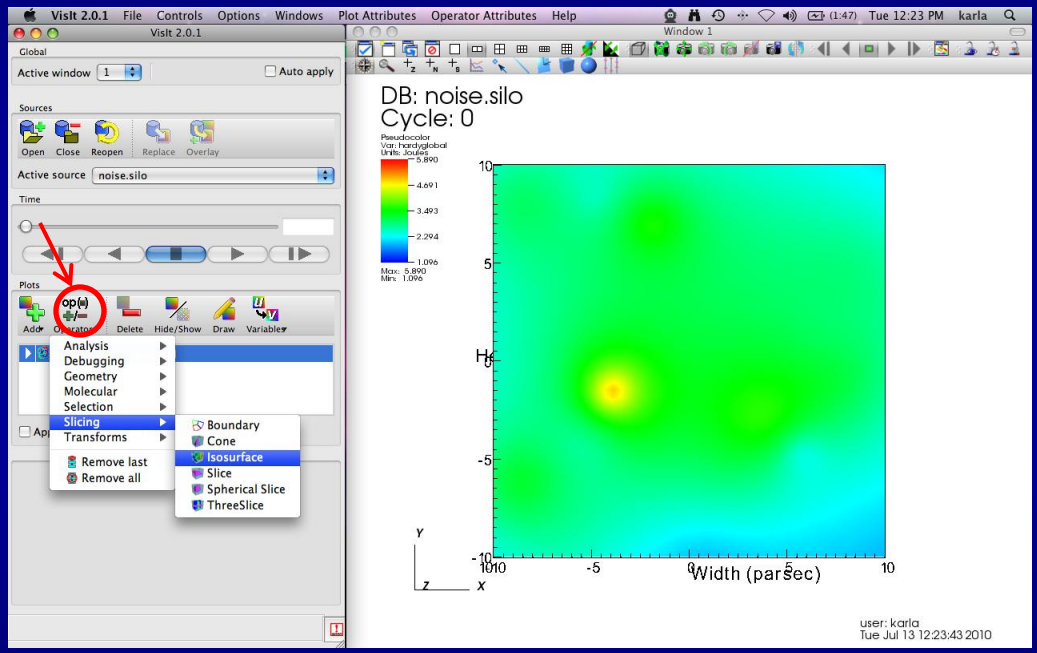

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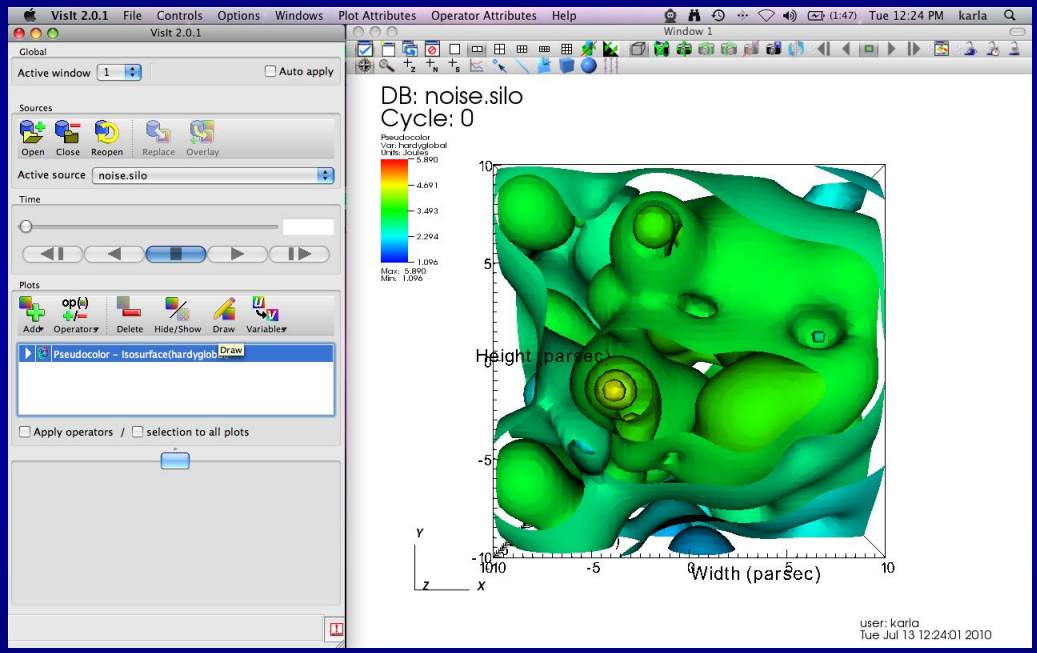

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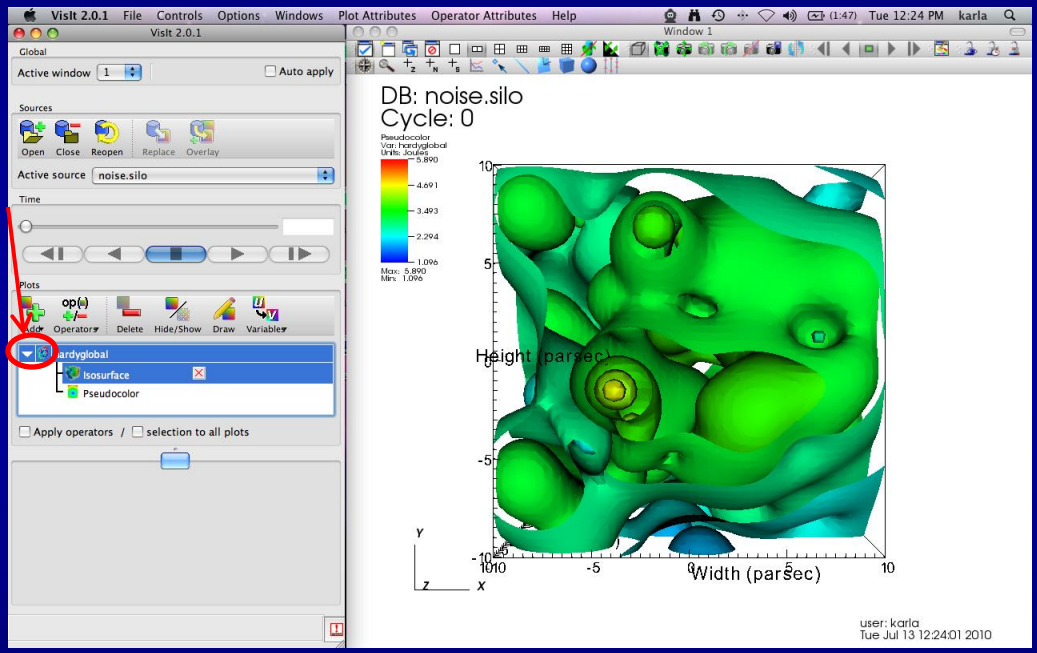

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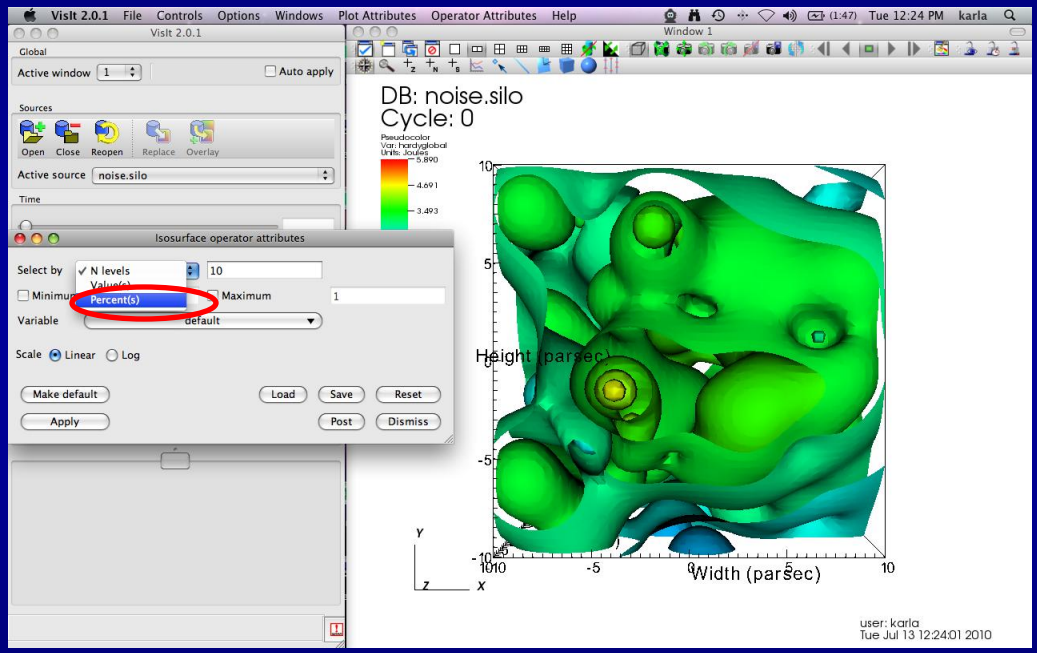

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- Change `Opacity`
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- Click `Operator -> Slicing -> Isosurface`
- Click `Arrow to expand`
- Double-Click `Isosurface`
- Under select by choose – `>Percent(s)` enter `80`
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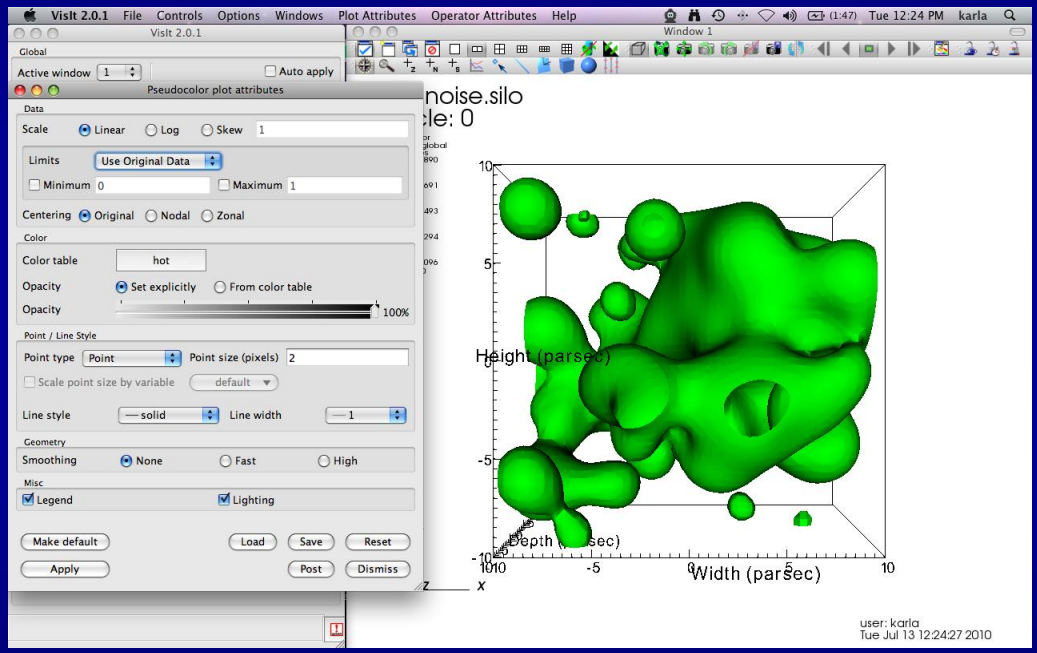

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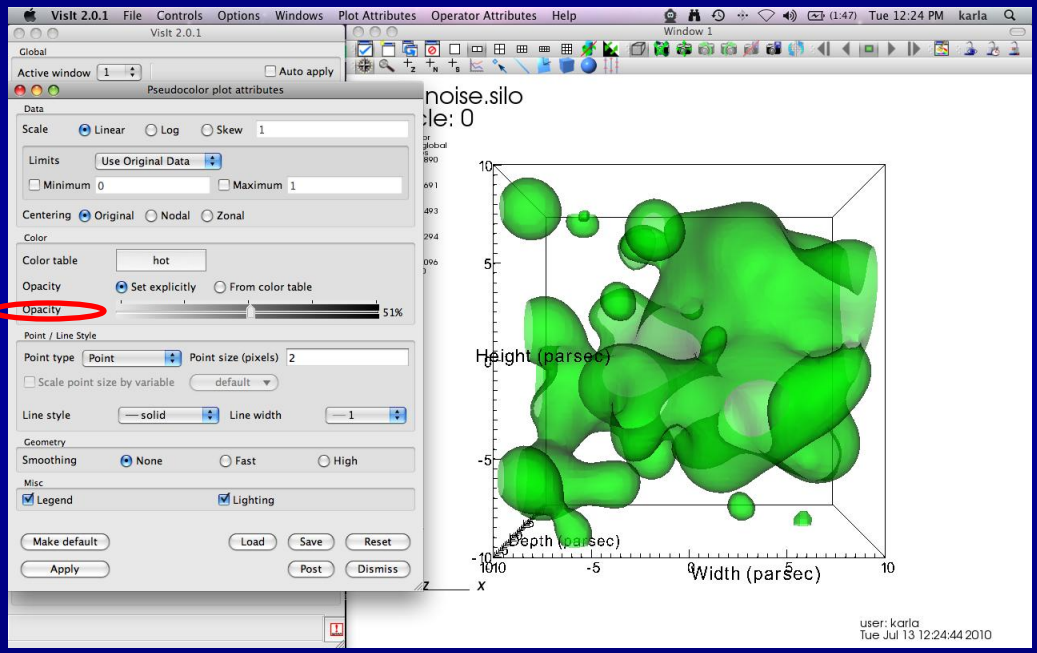

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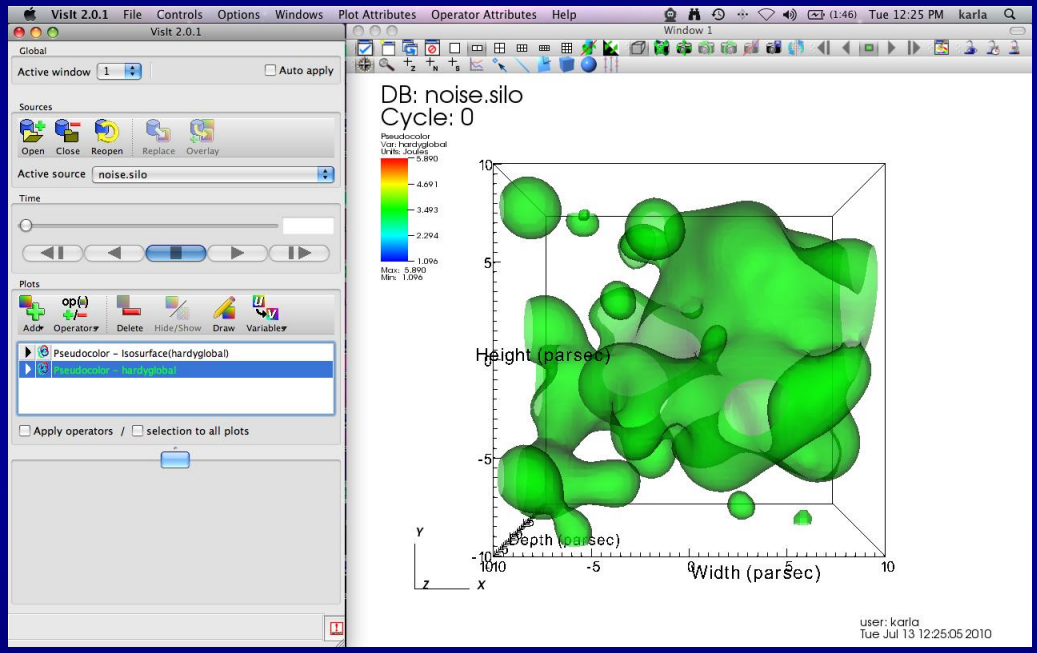

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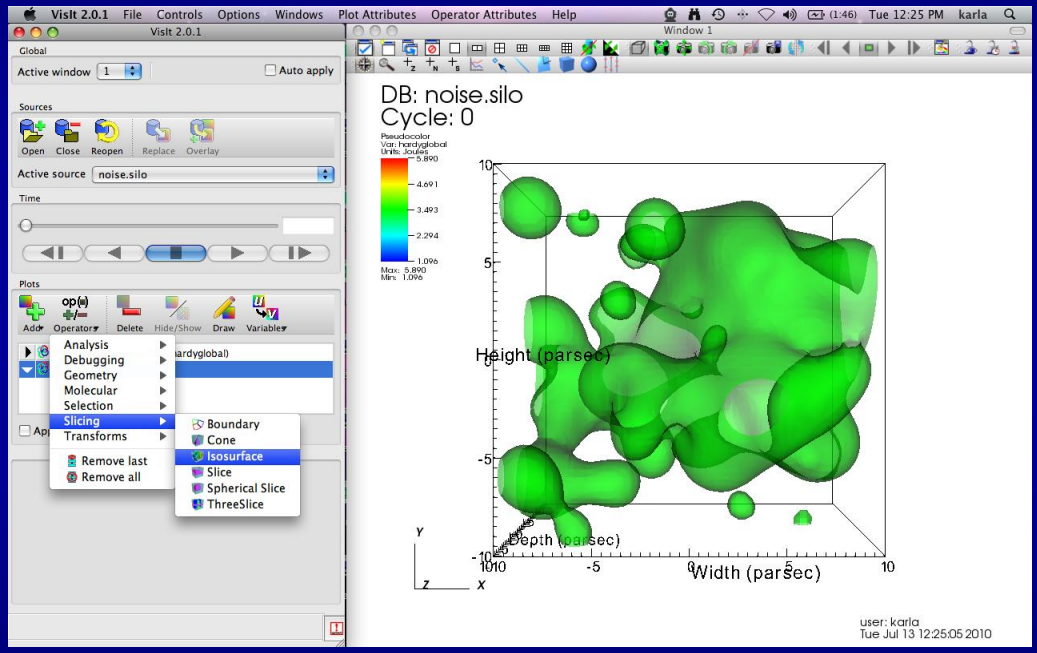

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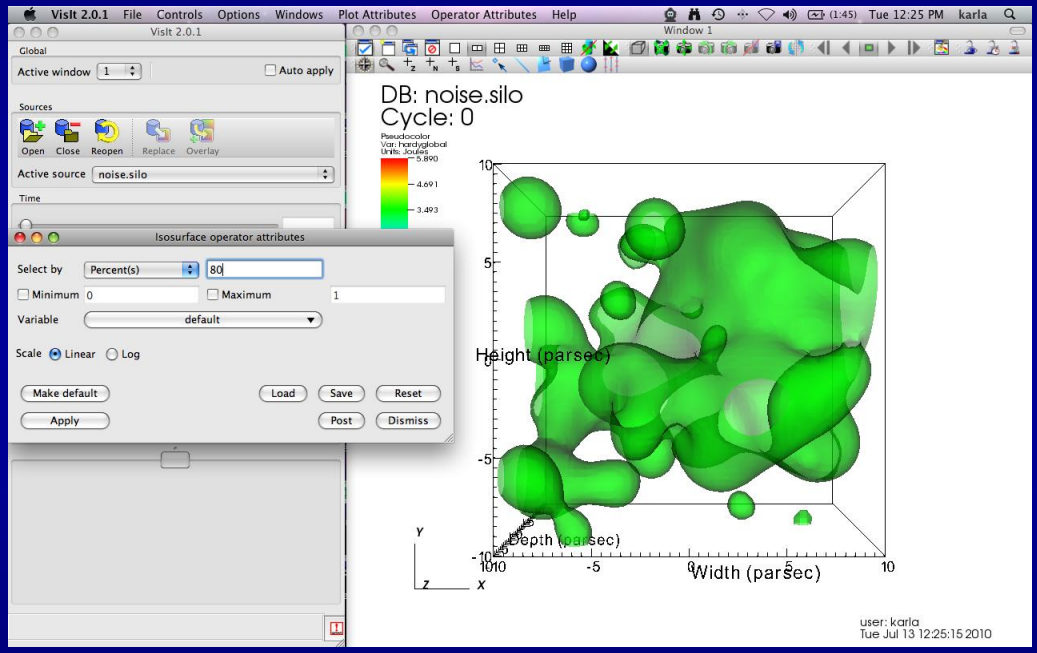

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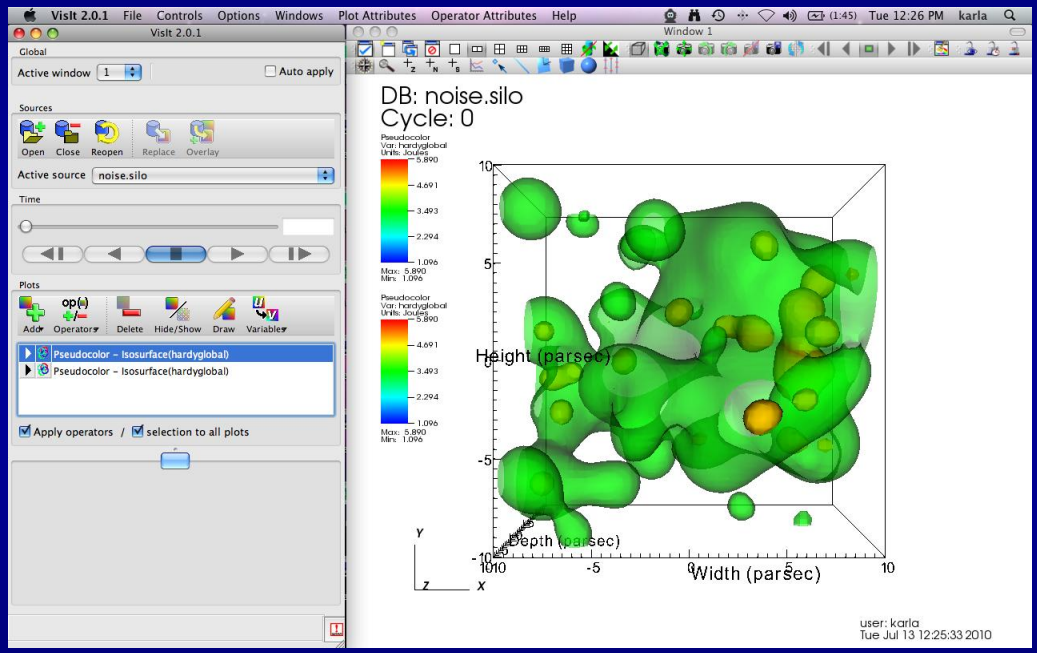
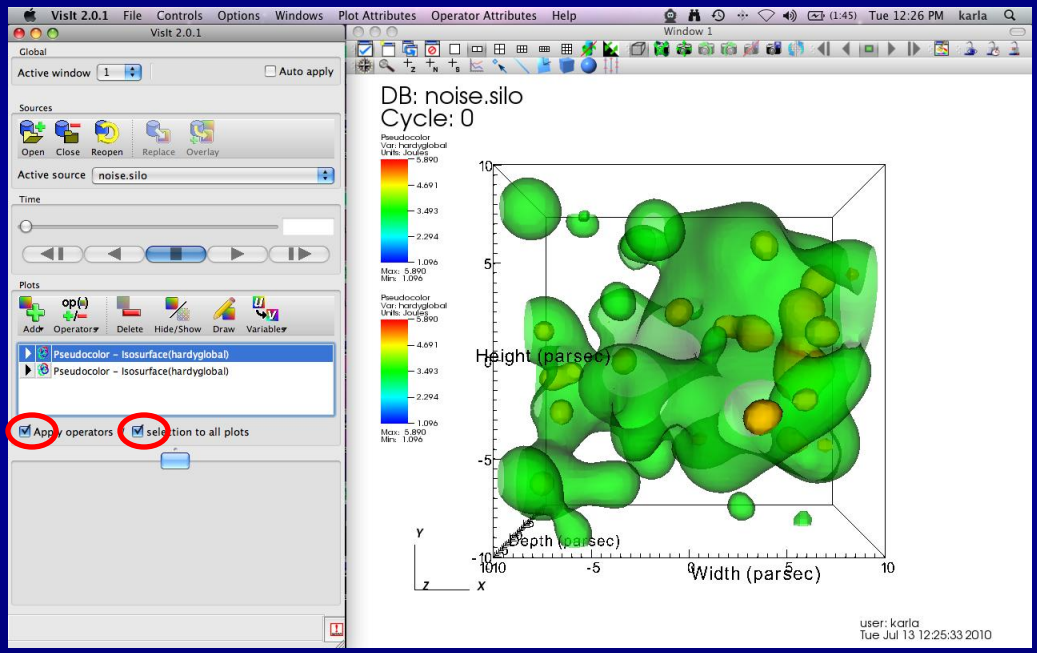


VisIt

Clip Isosurfaces

- Click -> `apply operators and selection to all plots`
- Click `Operators -> Selection -> Clip`
- Click `Draw`
- Double-Click `-> Clip`
- Click `Plane 2`
- Click `Apply & Dismiss`
- Click `x (to delete)`
- Click `Draw`



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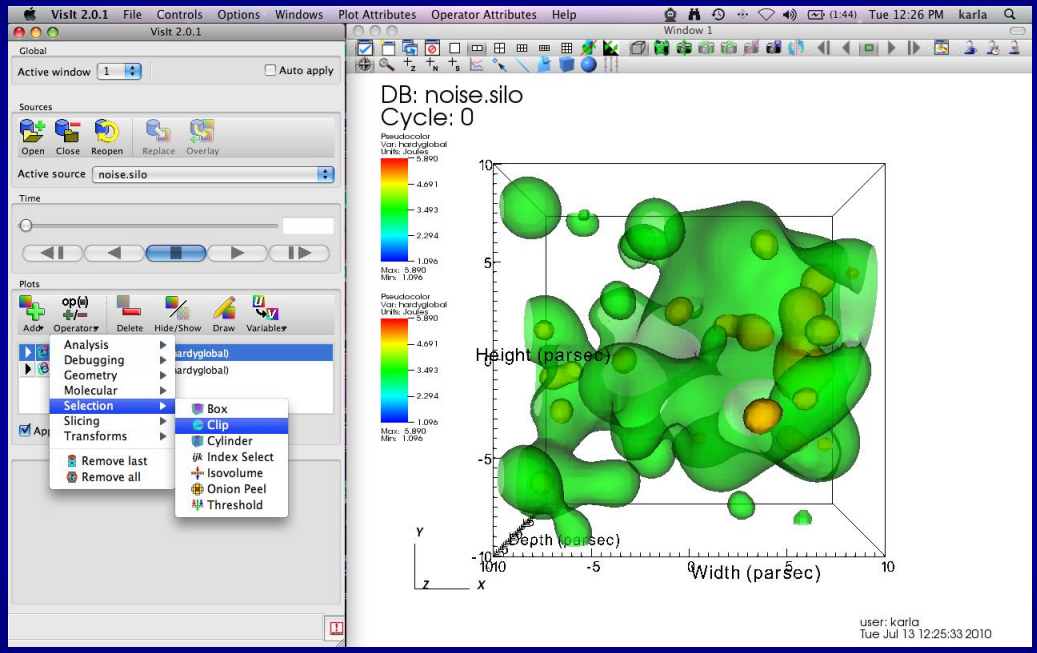

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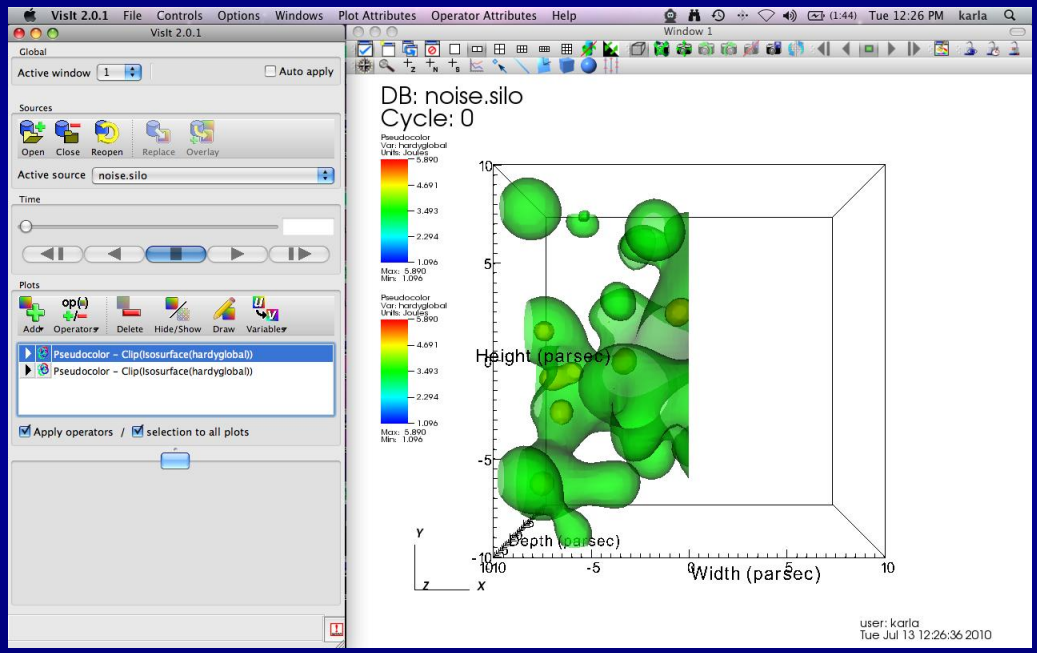

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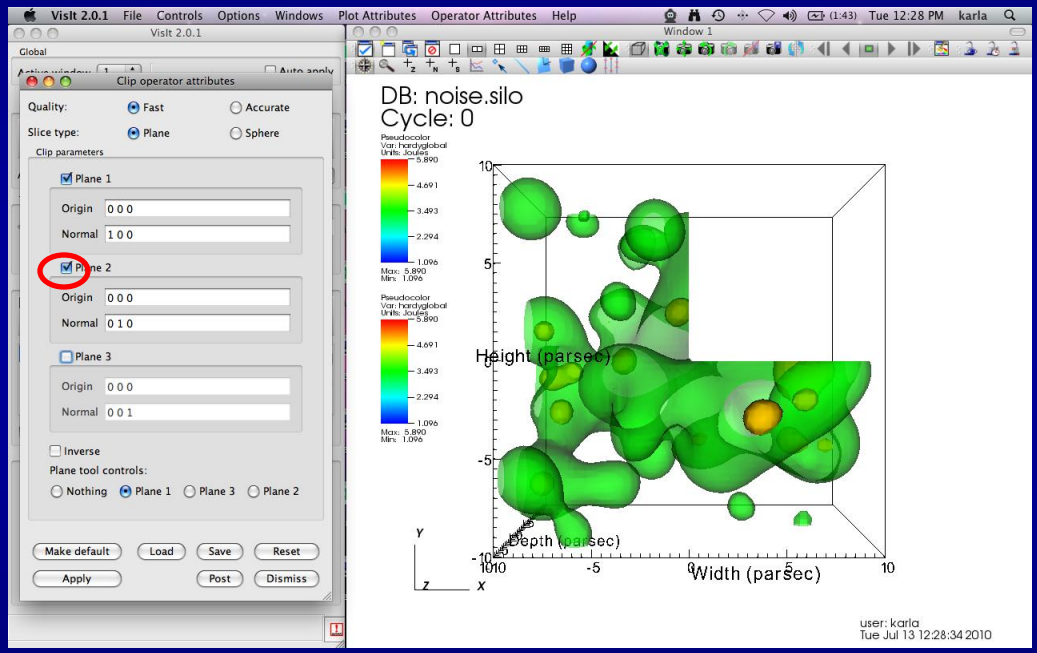

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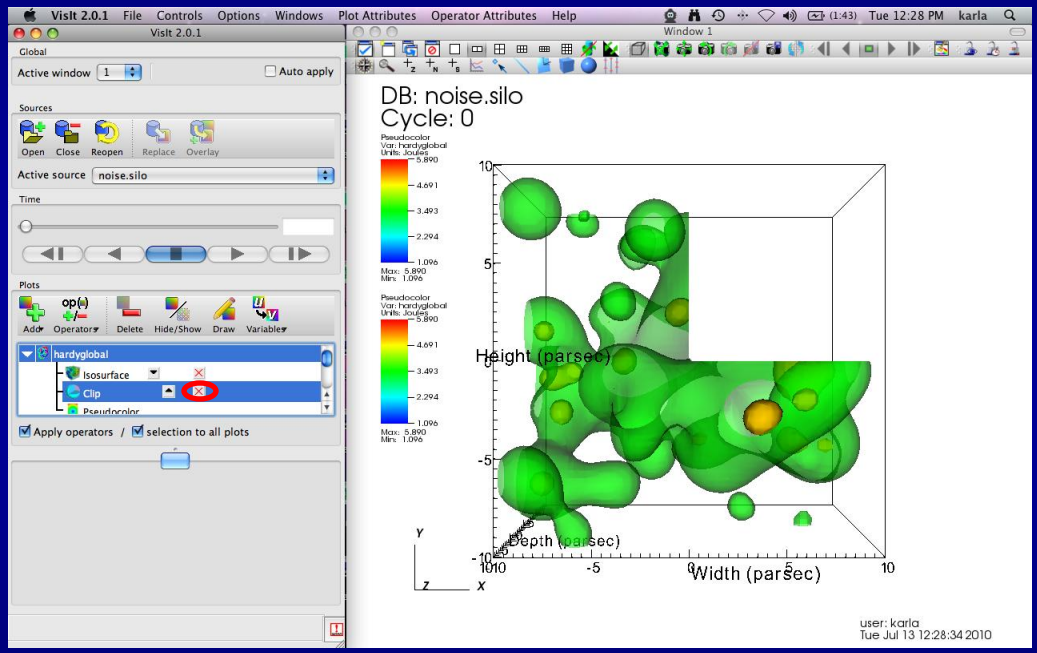

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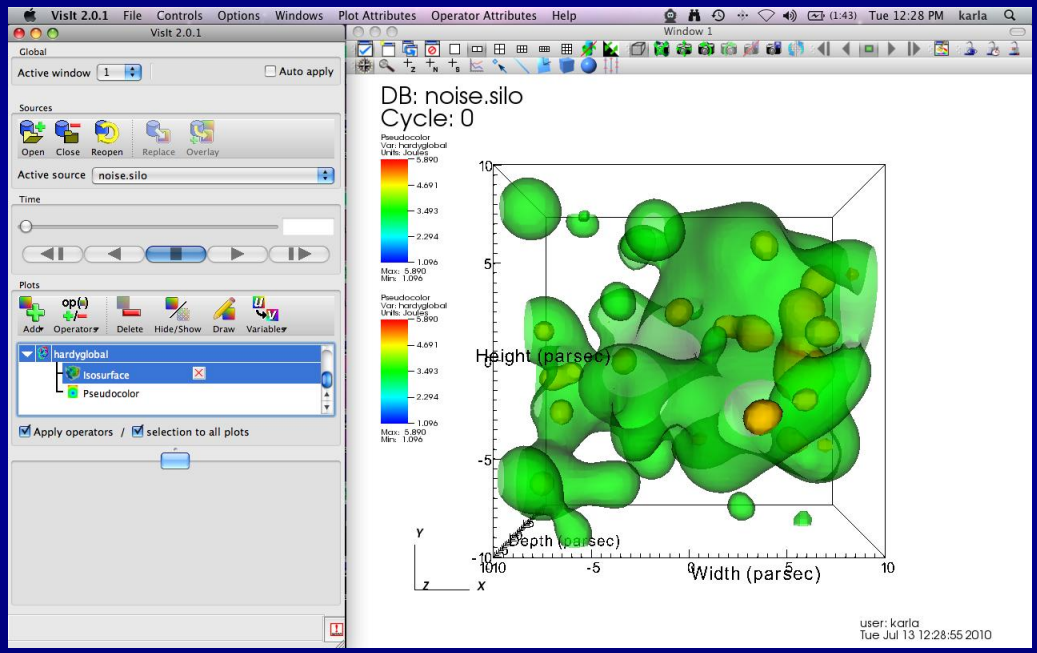
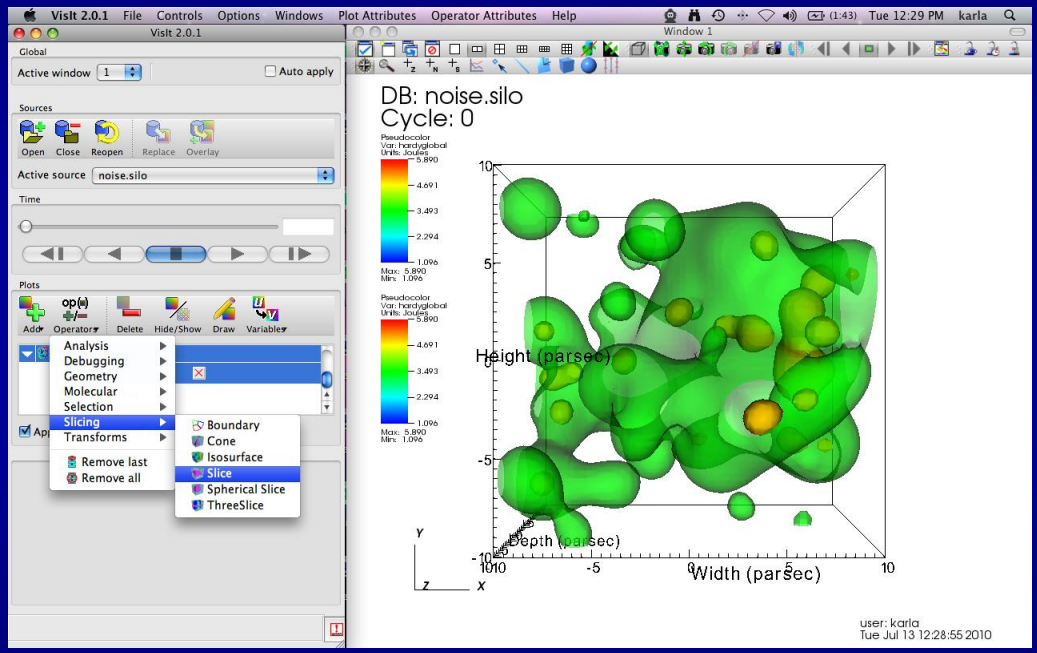


TACC

VisIt

Slice Isosurfaces

- Click `Operators -> Slicing -> Slice`
- Click `Draw`
- Double-Click -> `Slice`
- Click `Z-Axis & Project to 2D`
- Click `Apply`
- Click `Dismiss`



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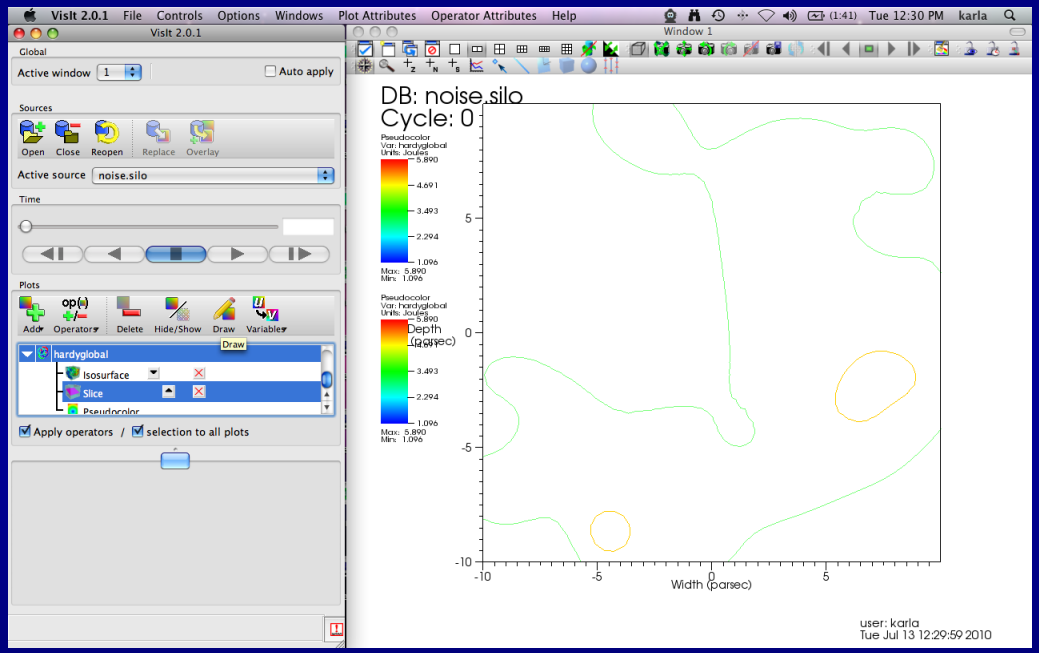

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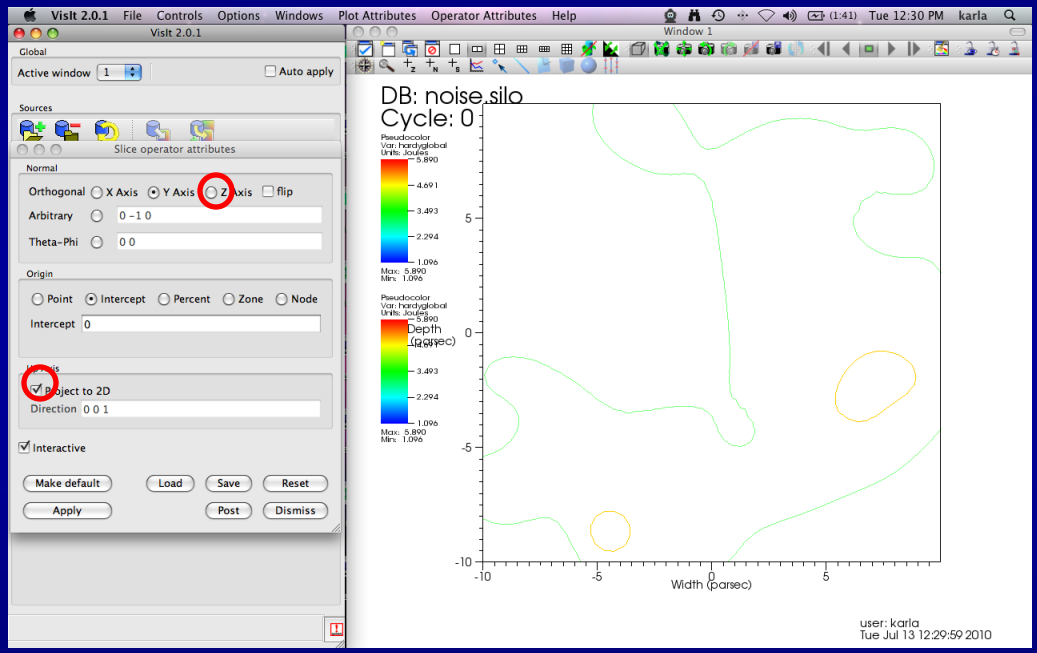
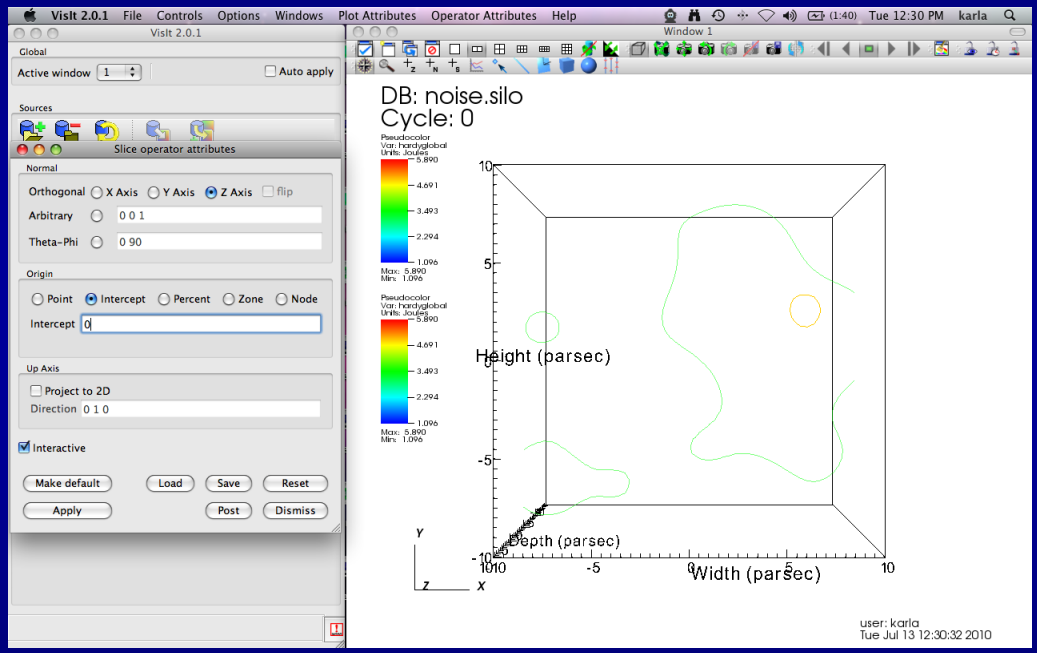


VisIt

Slice Isosurfaces

- Click `Operators -> Slicing -> Slice`
- Click `Draw`
- Double-Click -> `Slice`
- Click `Z-Axis & Project to 2D`
- Click `Apply`
- Click `Dismiss`



VisIt

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- Click `Operators -> Slicing -> Slice`
- Click `Draw`
- Double-Click -> `Slice`
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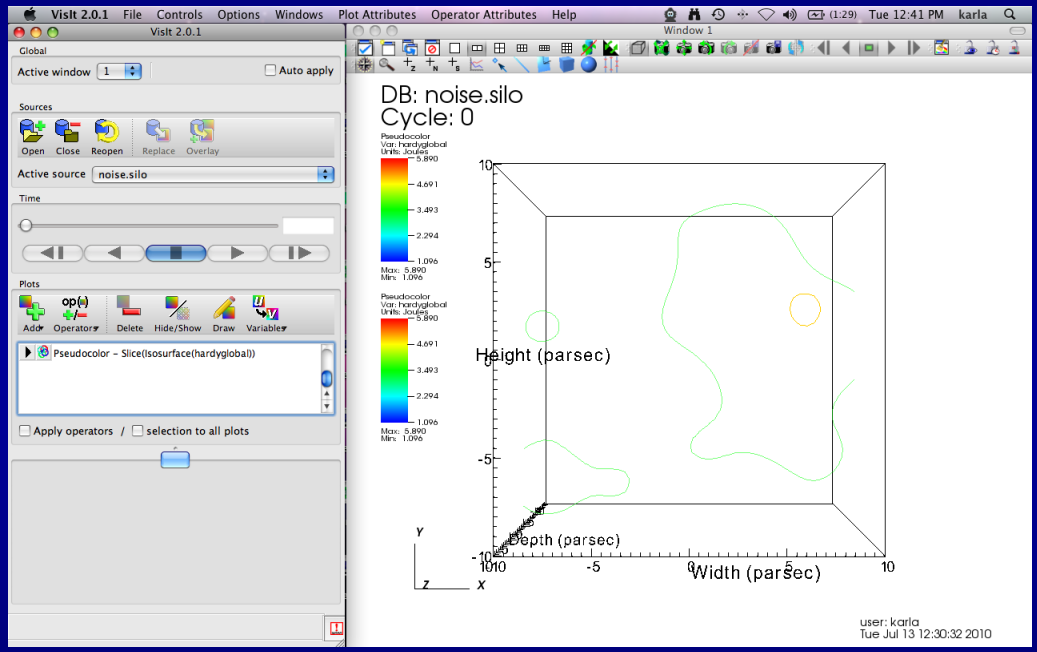
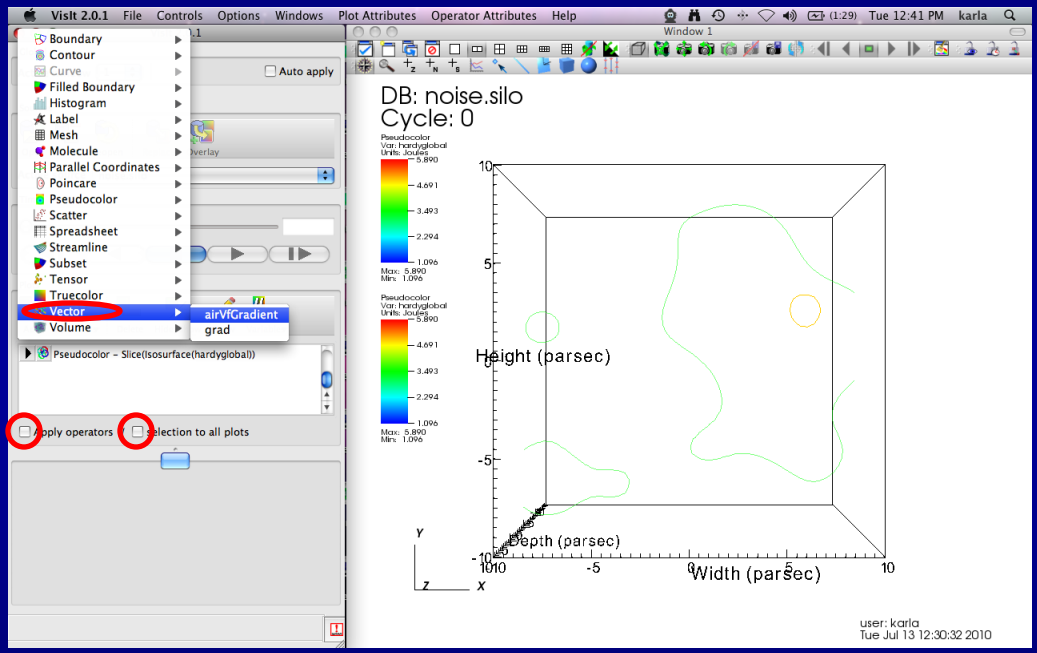


VisIt

Create Glyph of Vector

- Unselect `Apply operators/ selection to all plots`
- Click `Add -> Vector -> airVfGradient`
- Click `Draw`
- Double click on `Vector`
- Under N vectors enter `1000`
- Click `Apply`
- Click `Dismiss`
- Click `Hide/Show`



VisIt

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- Click `Add -> Vector -> airVfGradient`
- Click `Draw`
- Double click on `Vector`
- Under N vectors enter `1000`
- Click `Apply`
- Click `Dismiss`
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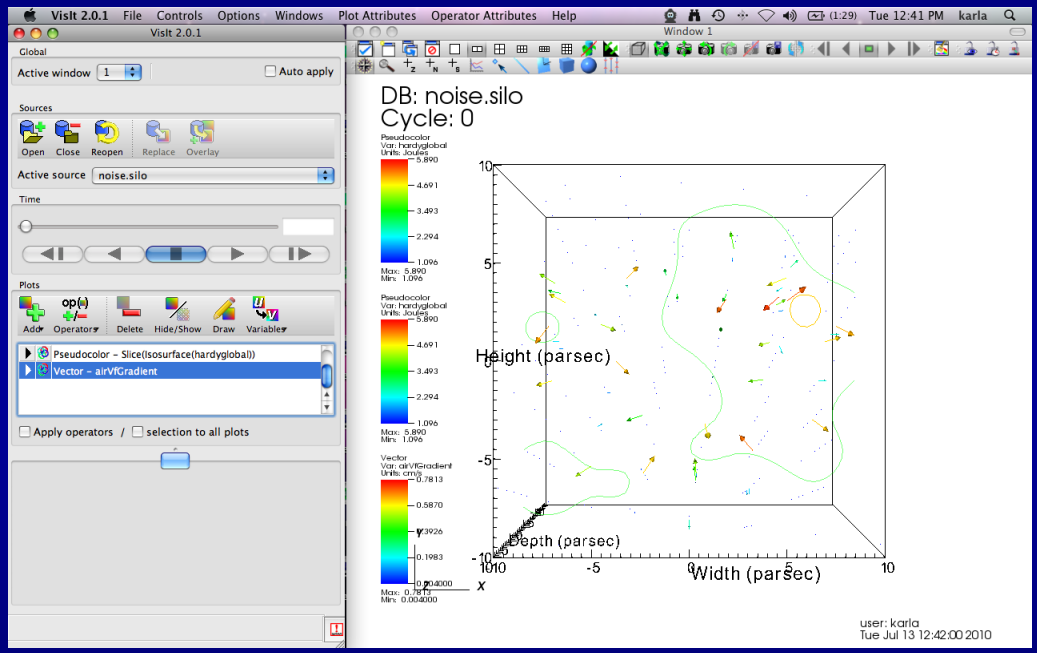

VisIt

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- Click `Add -> Vector -> airVfGradient`
- Click `Draw`
- Double click on `Vector`
- Under N vectors enter `1000`
- Click `Apply`
- Click `Dismiss`
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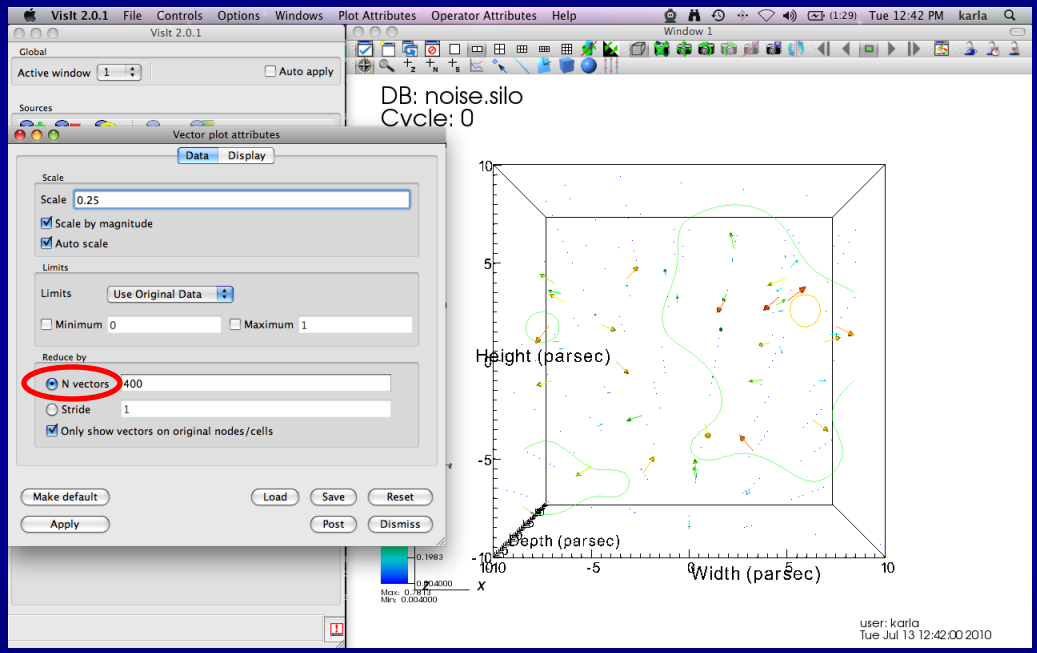

VisIt

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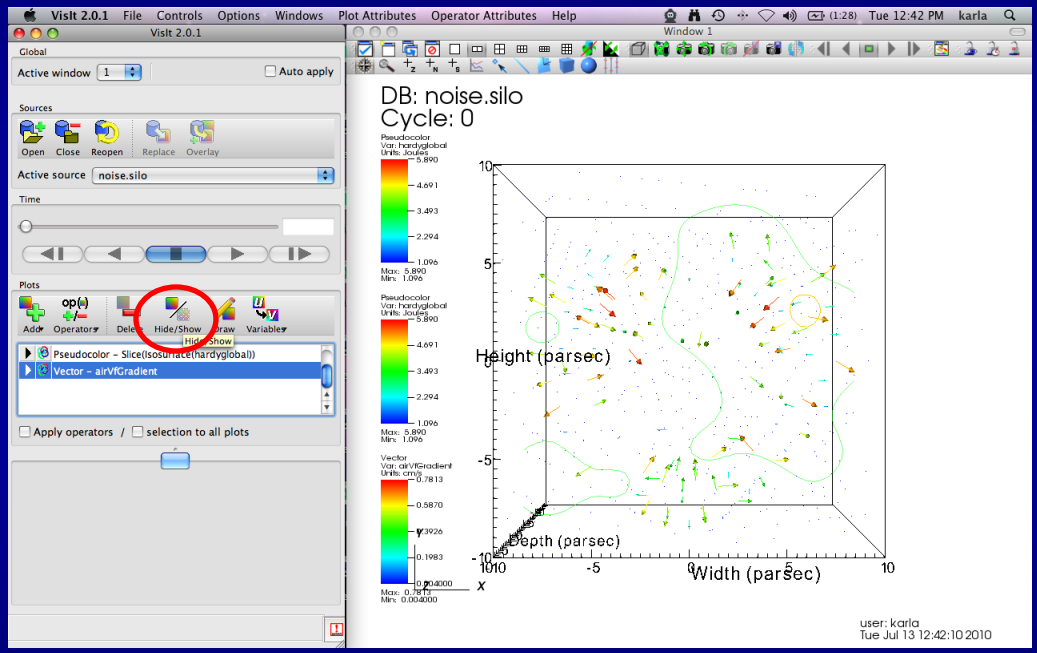

VisIt

Create Glyph of Vector

- Unselect `Apply operators/ selection to all plots`
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- Click `Draw`
- Double click on `Vector`
- Under N vectors enter `1000`
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- Click `Dismiss`
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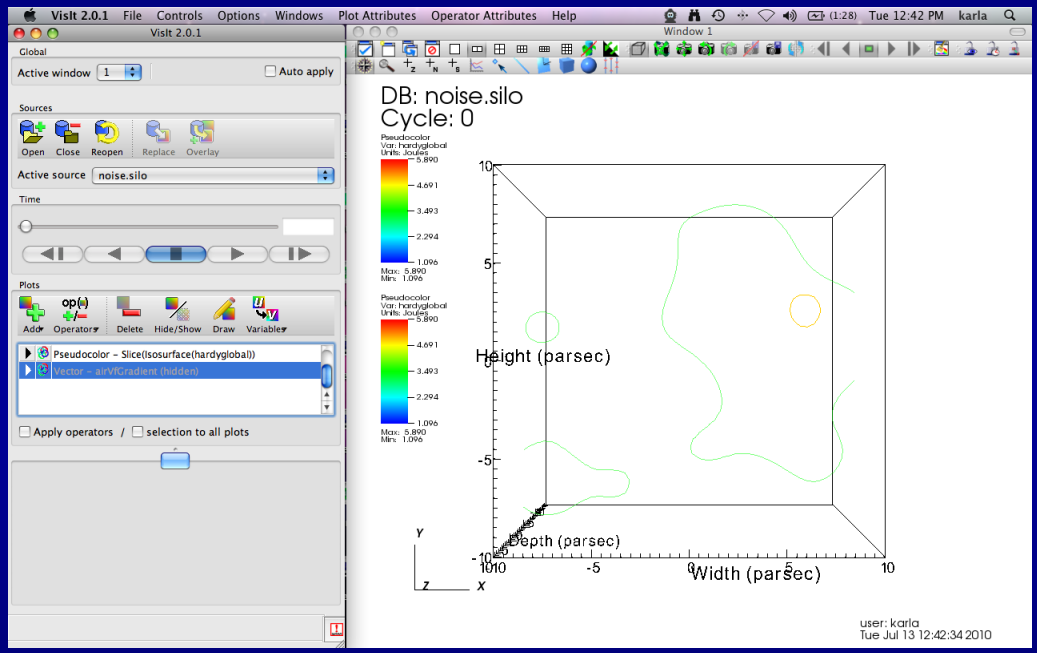
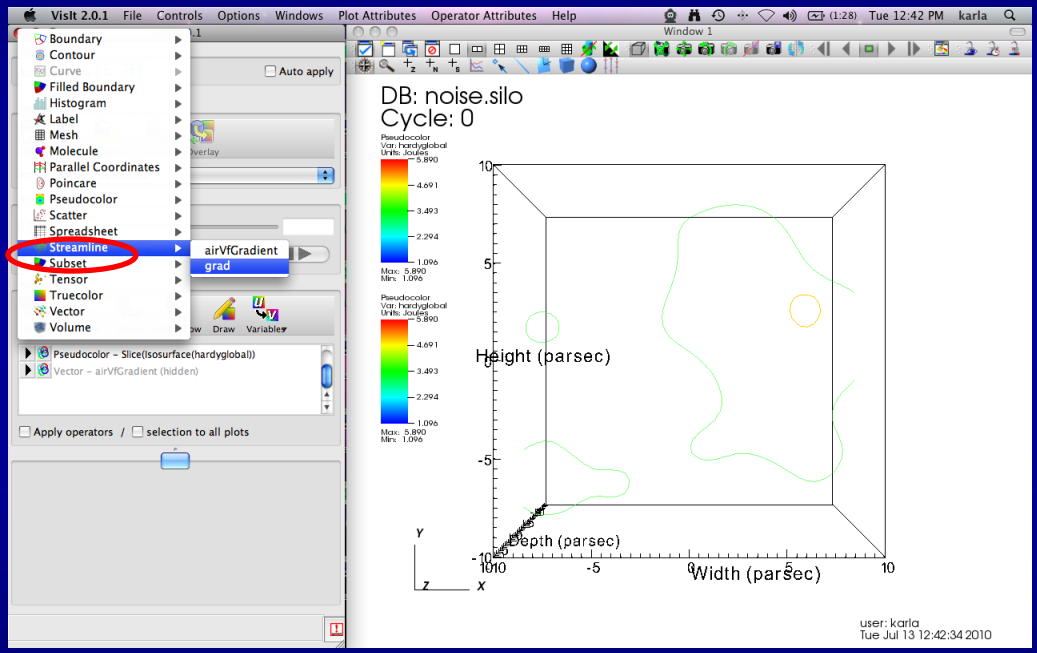


VisIt

Create Streamlines

- Click `Add -> Streamline -> grad`
- Double click on `Streamline`
- Under Source Type Select `Plane`
- Enter:
  - Point Density `8`
  - Radius `10`
  - Streamline Direction `Both`
- Click `Apply`
- Click `Dismiss`
- Click `Draw`
- Double click on `Streamline`



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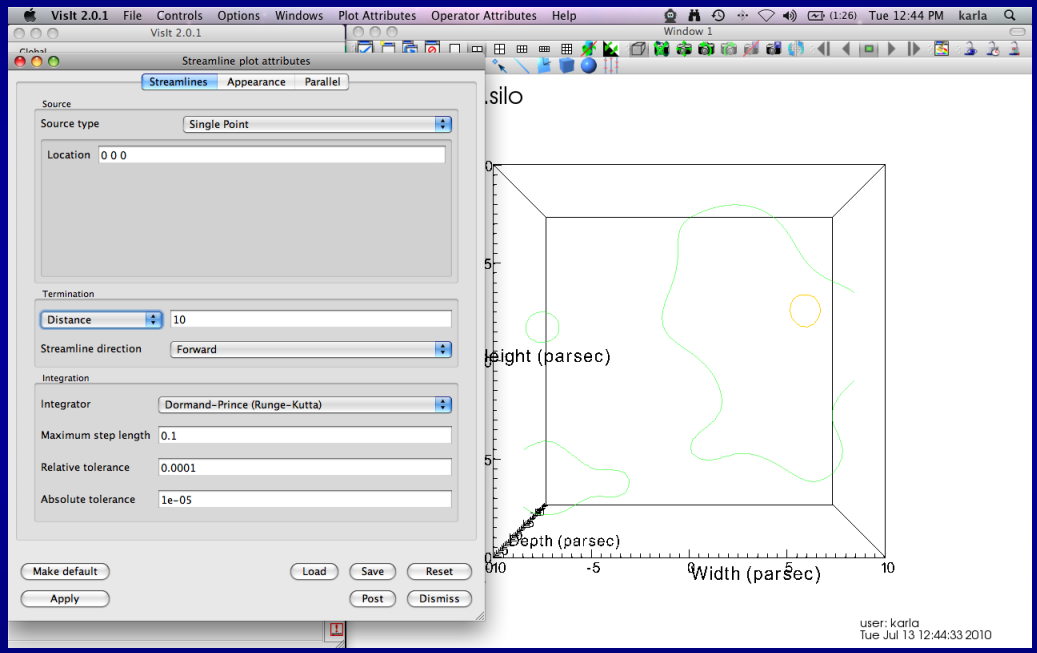

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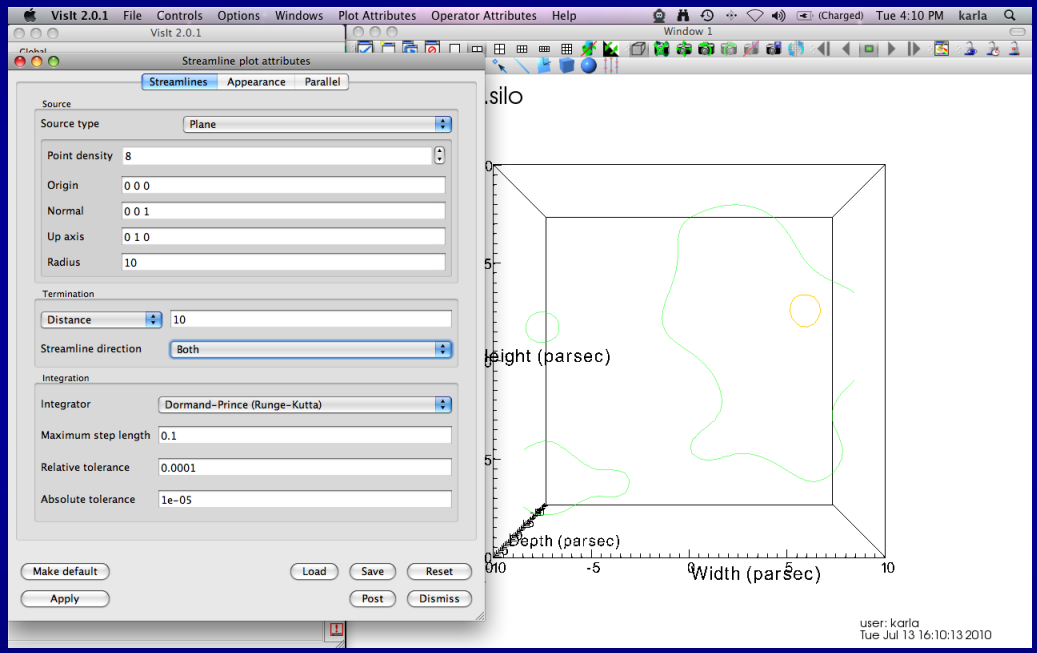

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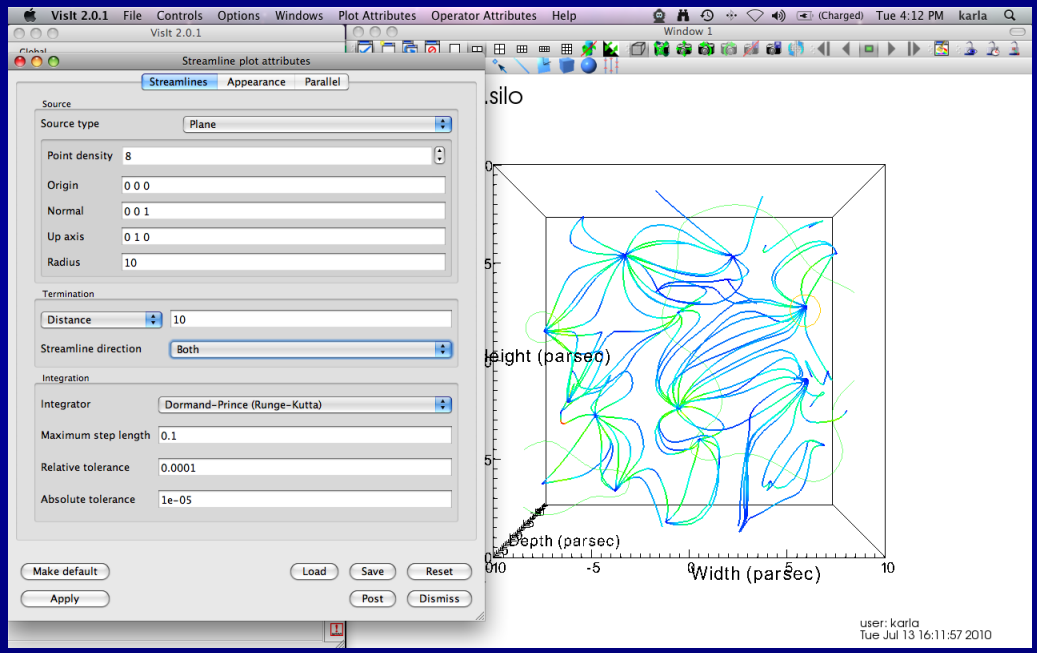
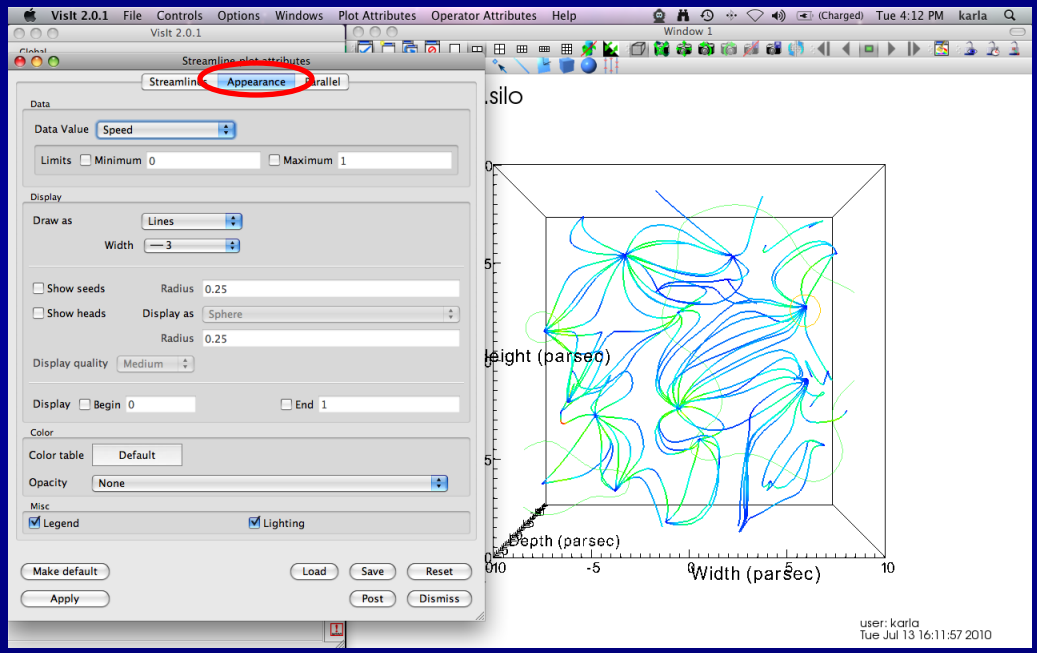


VisIt

Create Streamlines

- Click on `Appearance`
- Under draw as select `Tubes`
- Click `Apply`
- Under Data Value select `Variable`
- Under Variable select `hardyglobal`
- Click `Apply`
- Under Color -> Color table, click `Default` Choose `orangehot`
- Click `Apply & Dismiss`



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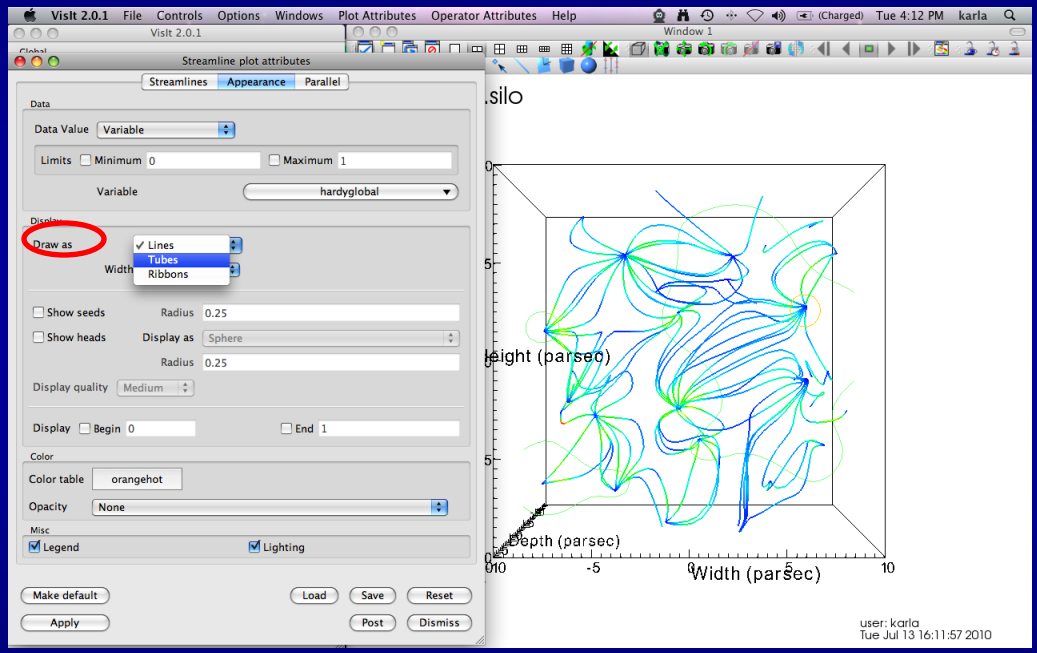

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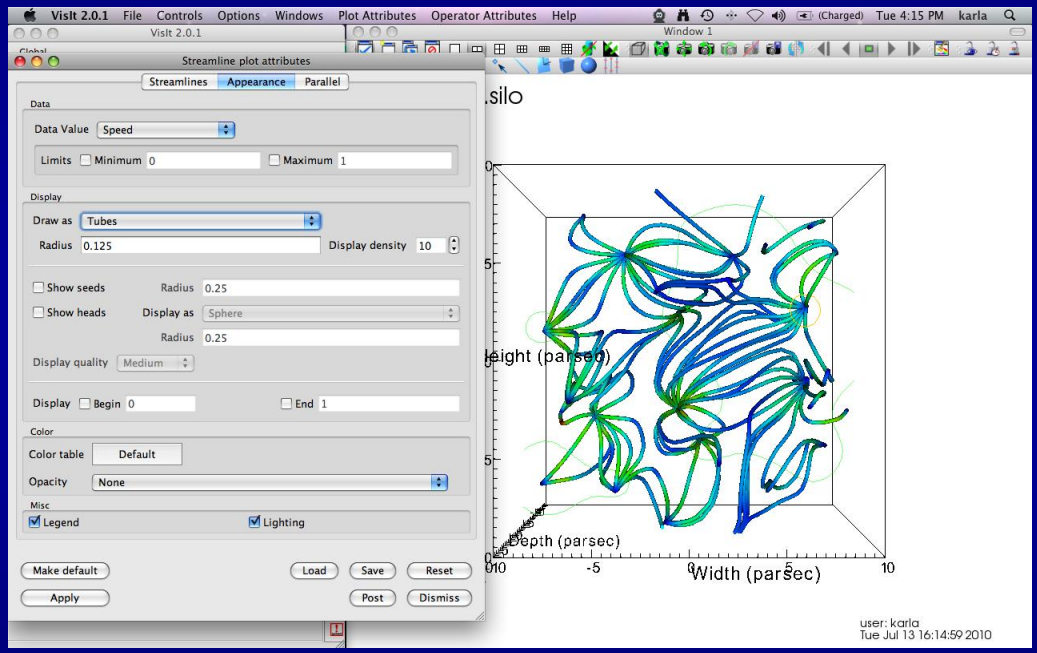

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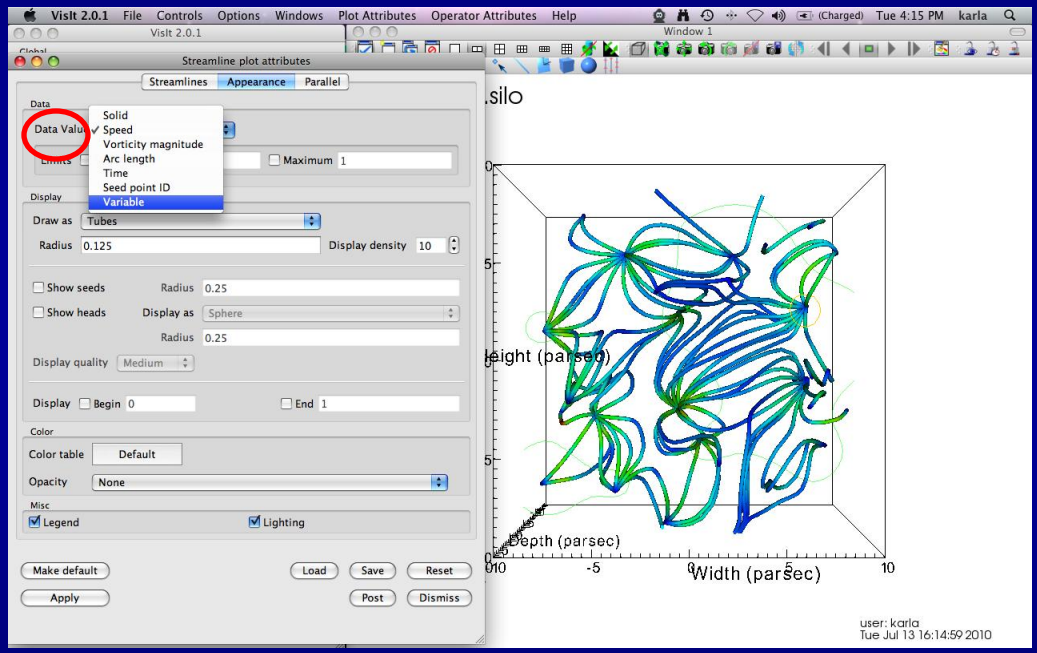

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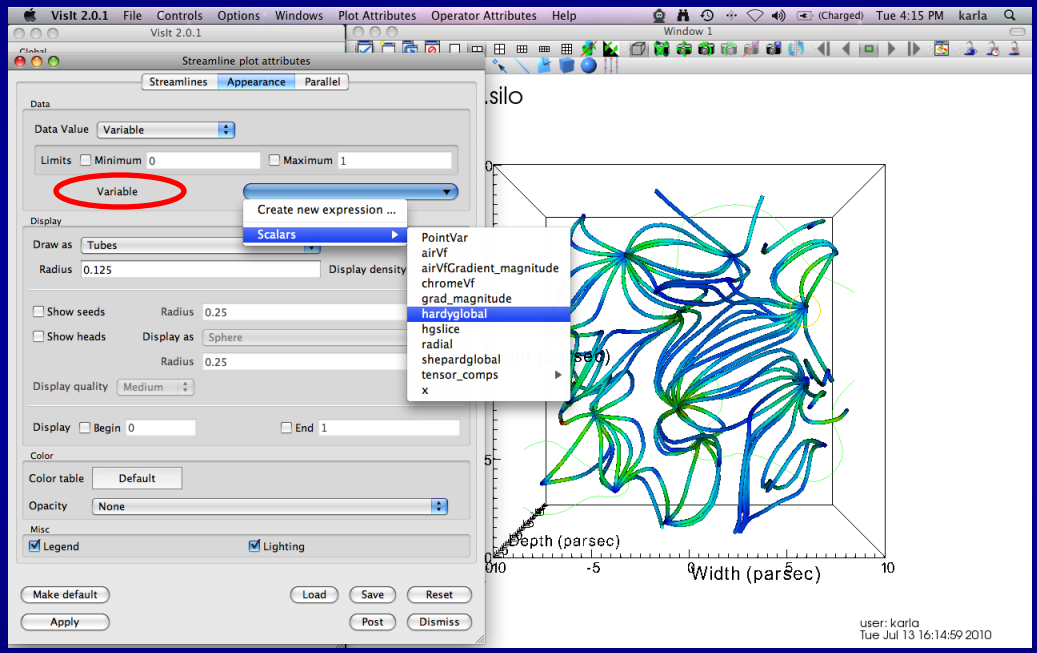

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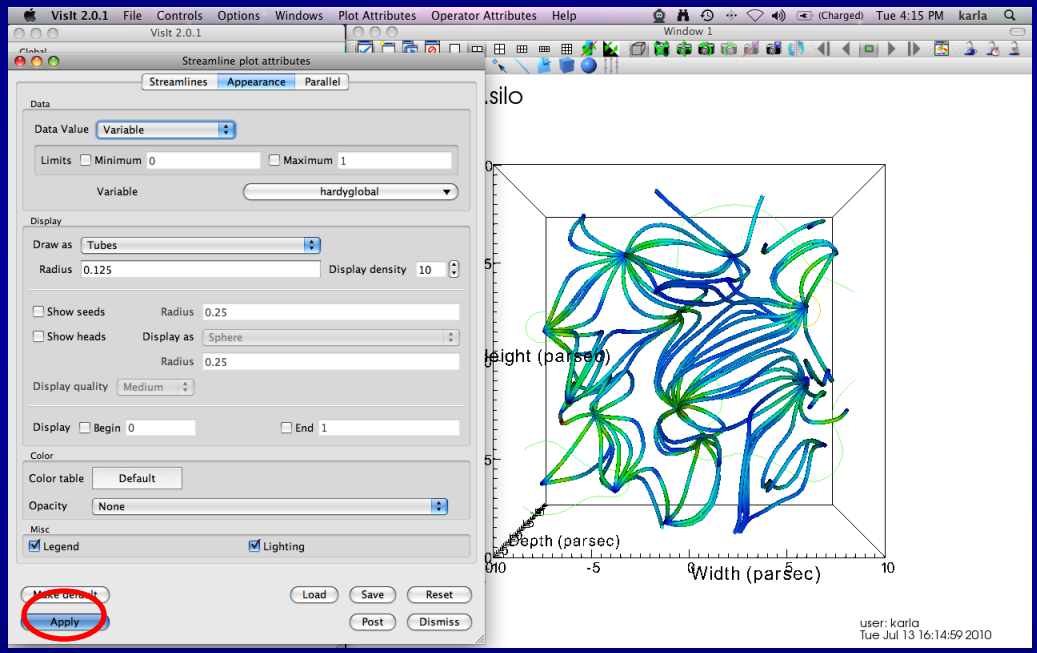

VisIt

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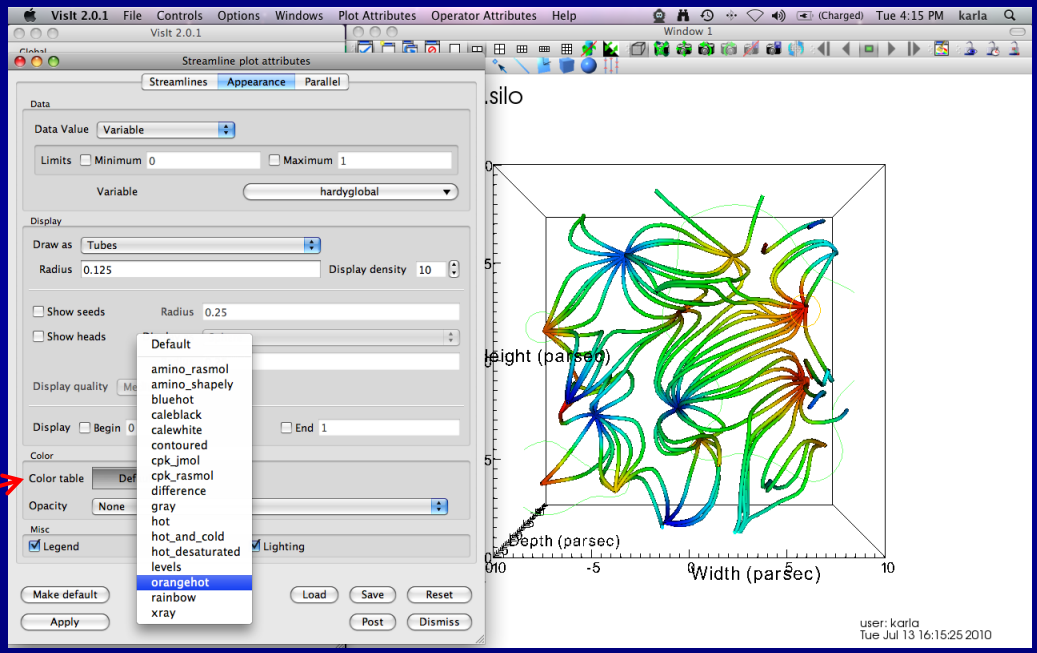

VisIt

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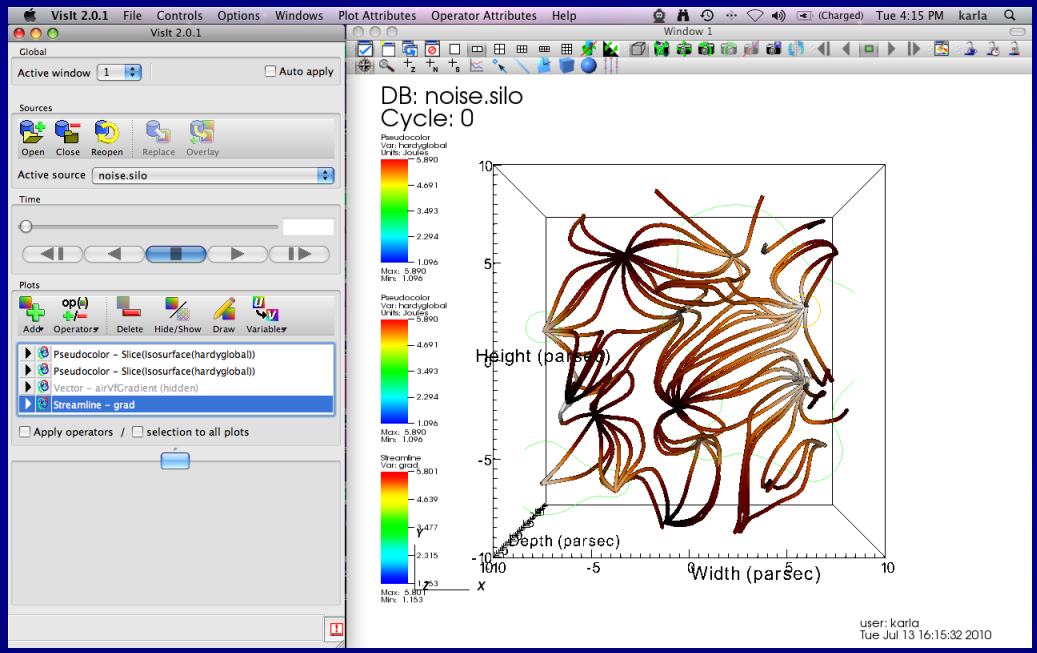
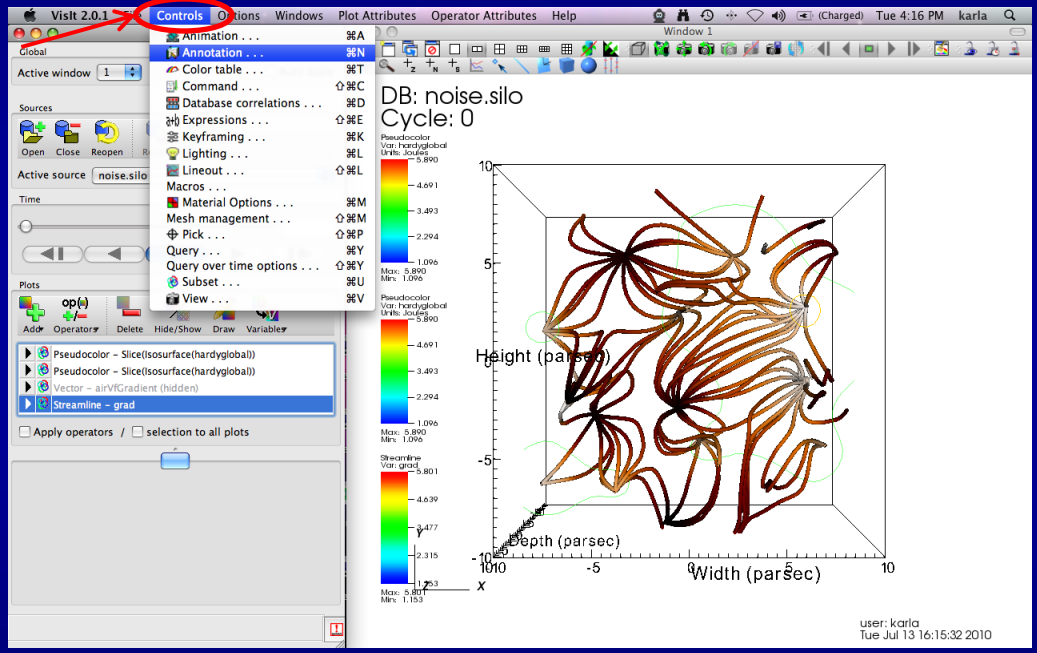


VisIt

Background Color and Legend

- Click on `Controls -> Annotation`
- Click on `Colors`
- Select Black for Background and White for Foreground
- Click `Apply`
- Click on `General`
- Click `no annotations`
- Click `legend`
- Click `Apply & Dismiss`
- Hide `Pseudocolor Plots`



VisIt

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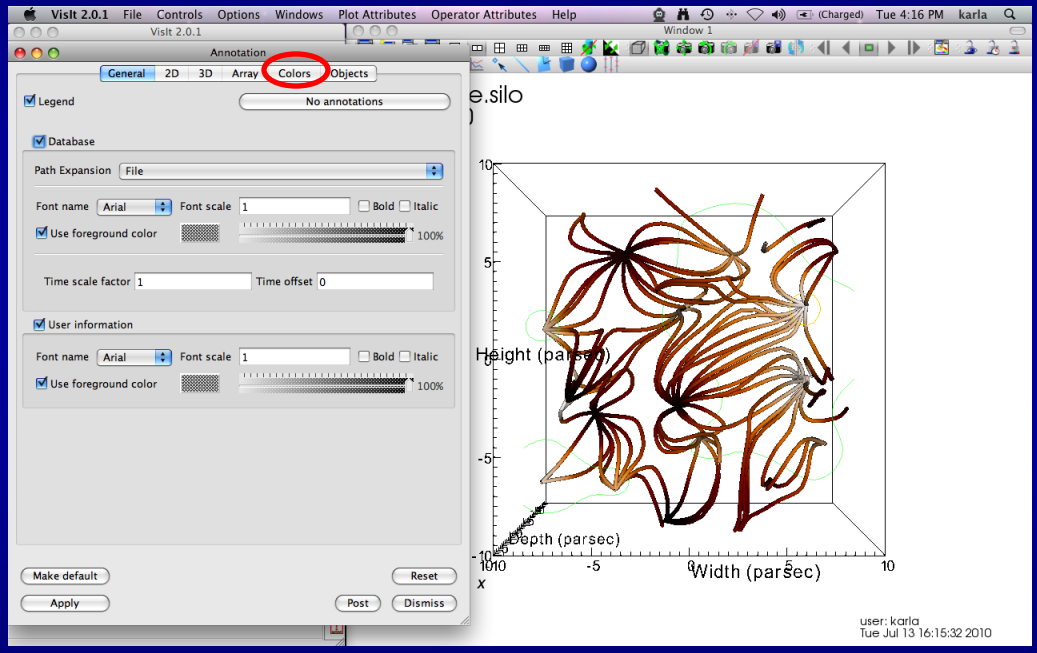

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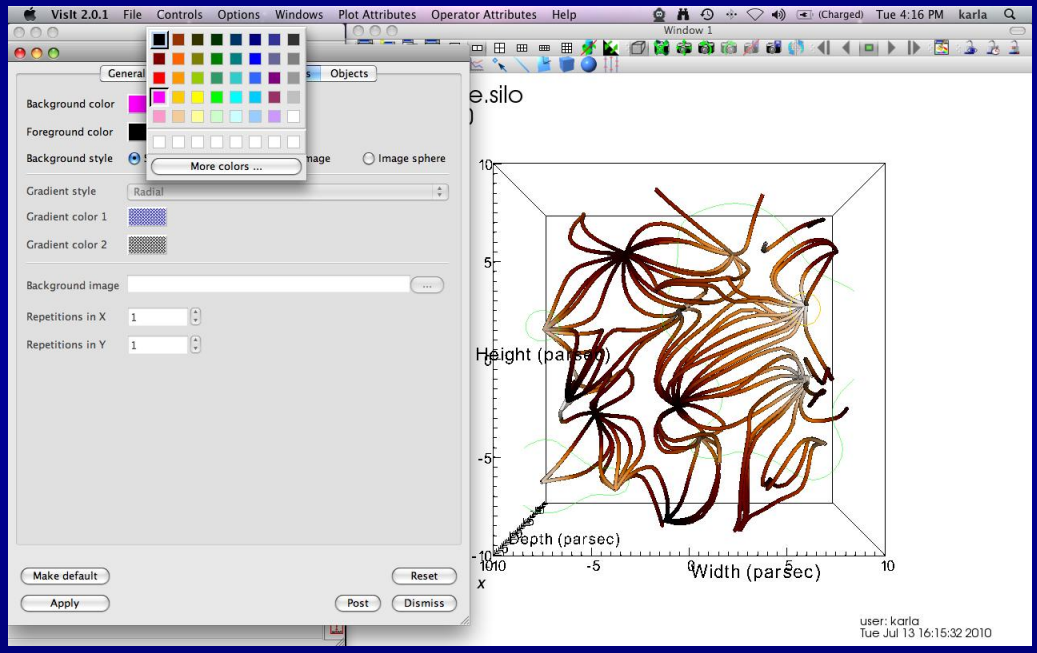

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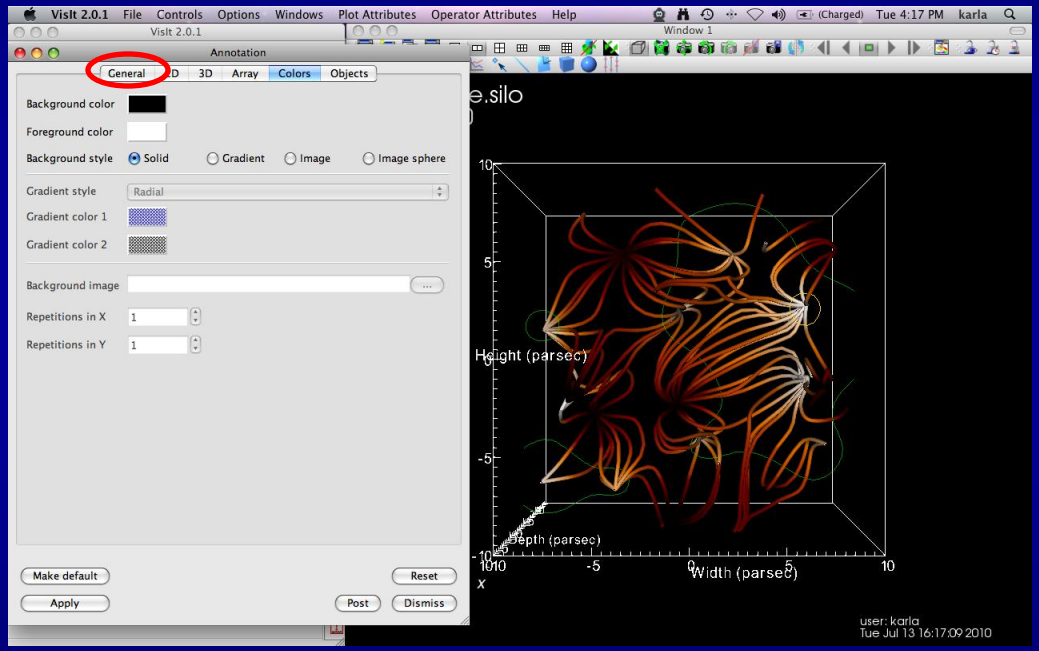

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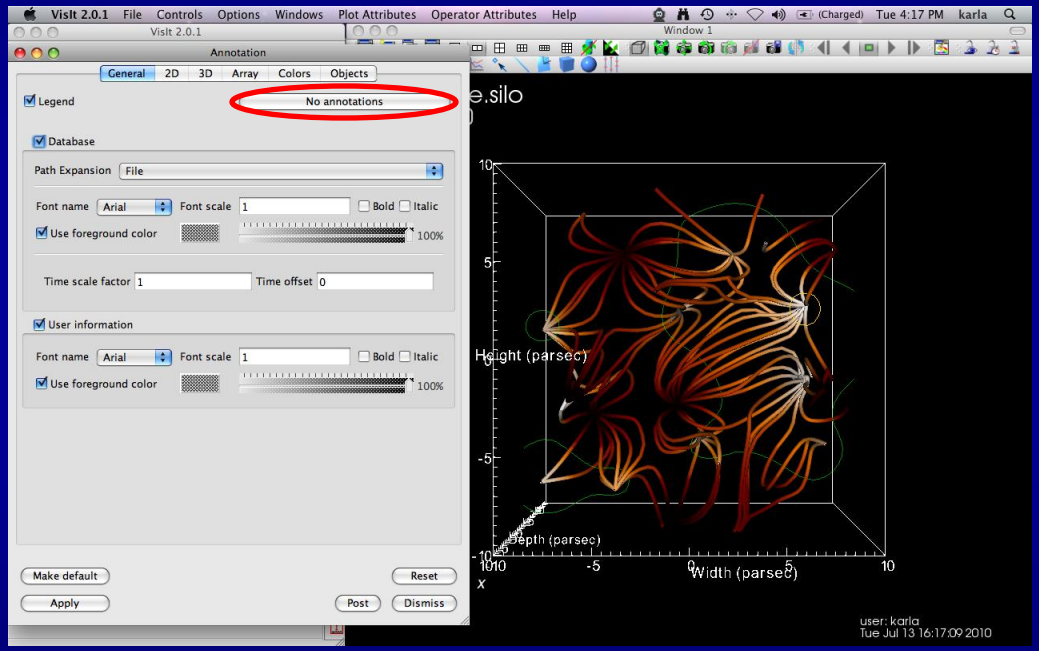

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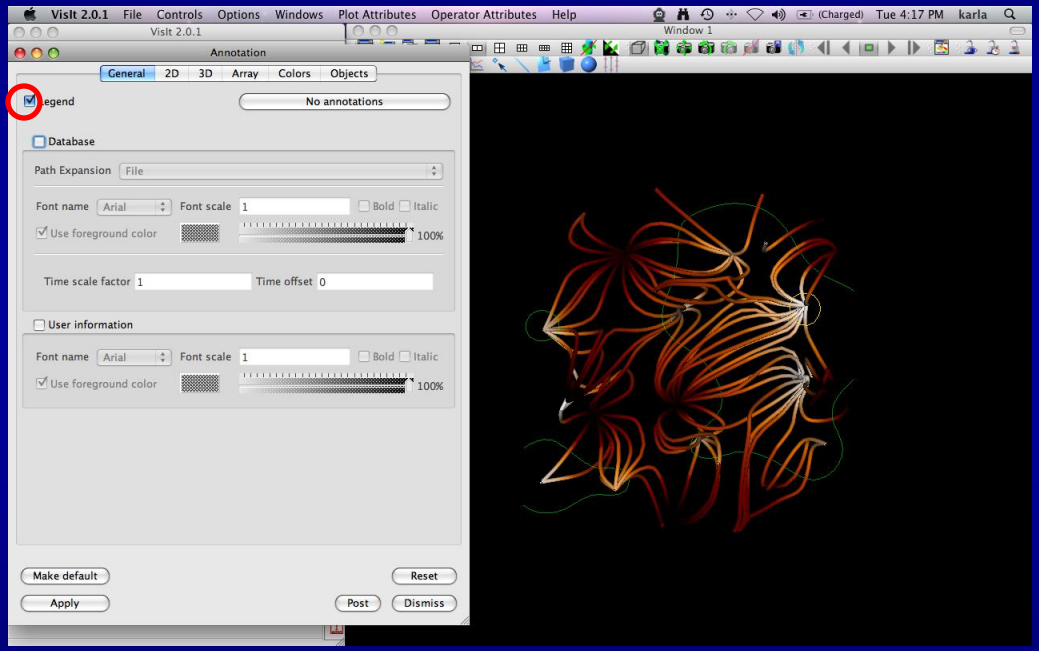

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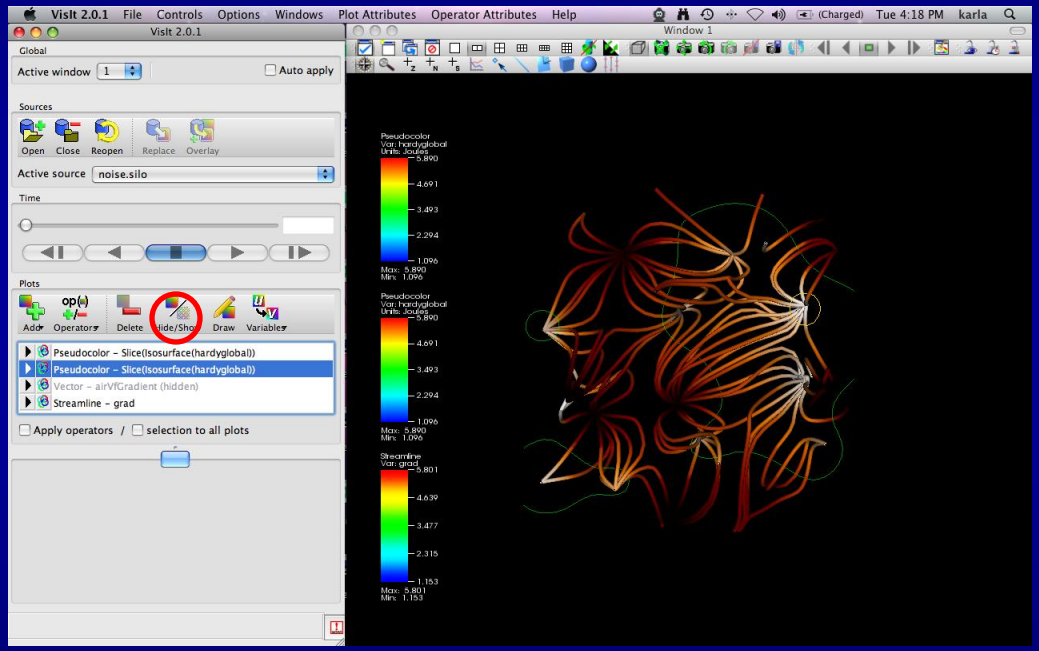

VisIt

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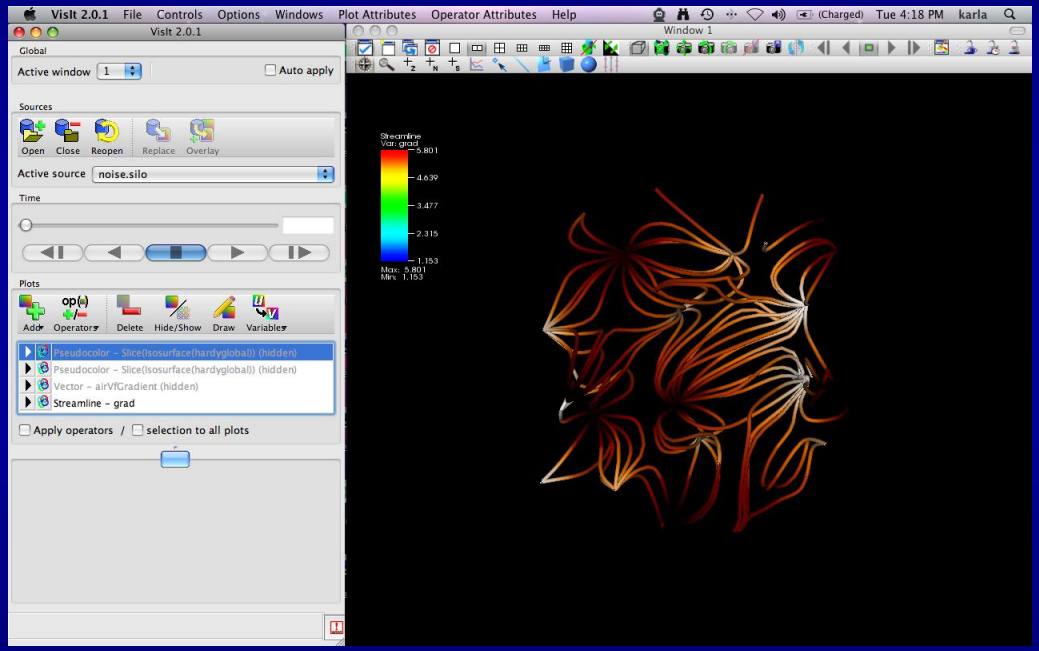
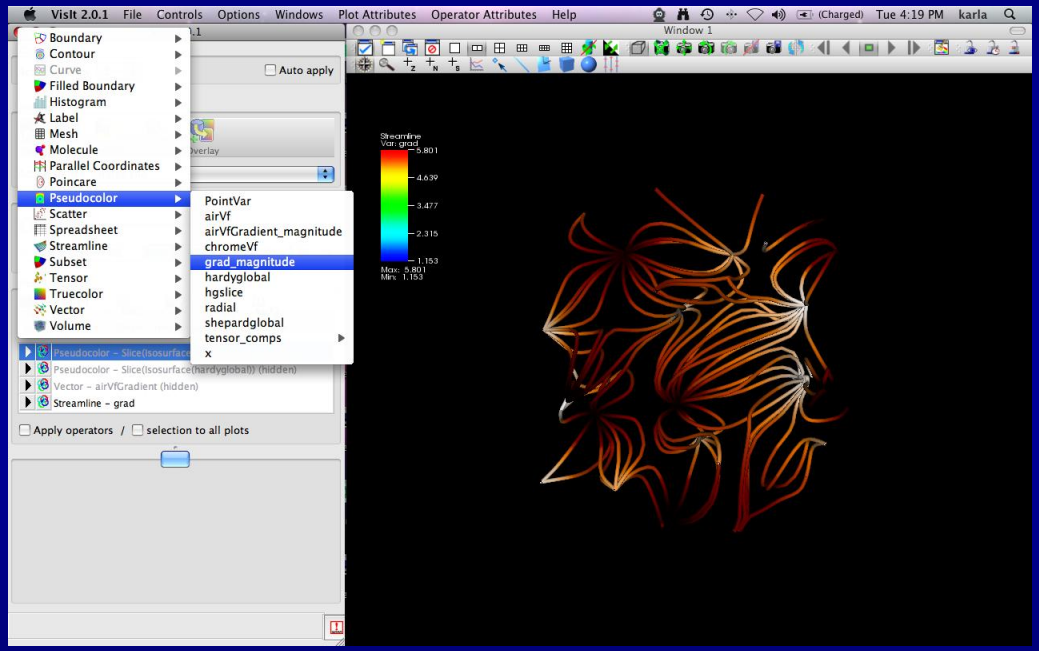


VisIt

Create Slice

- Click `Add -> Pseudocolor -> grad_magnitude`
- Click `Draw`
- Click `Operator -> Slicing -> Slice`
- Double click on `Slice`
- Select `Z Axis`
- Unselect `project to 2D`
- Click `Apply & Dismiss`
- Click `Draw`
- Click `Hide/Show`



VisIt

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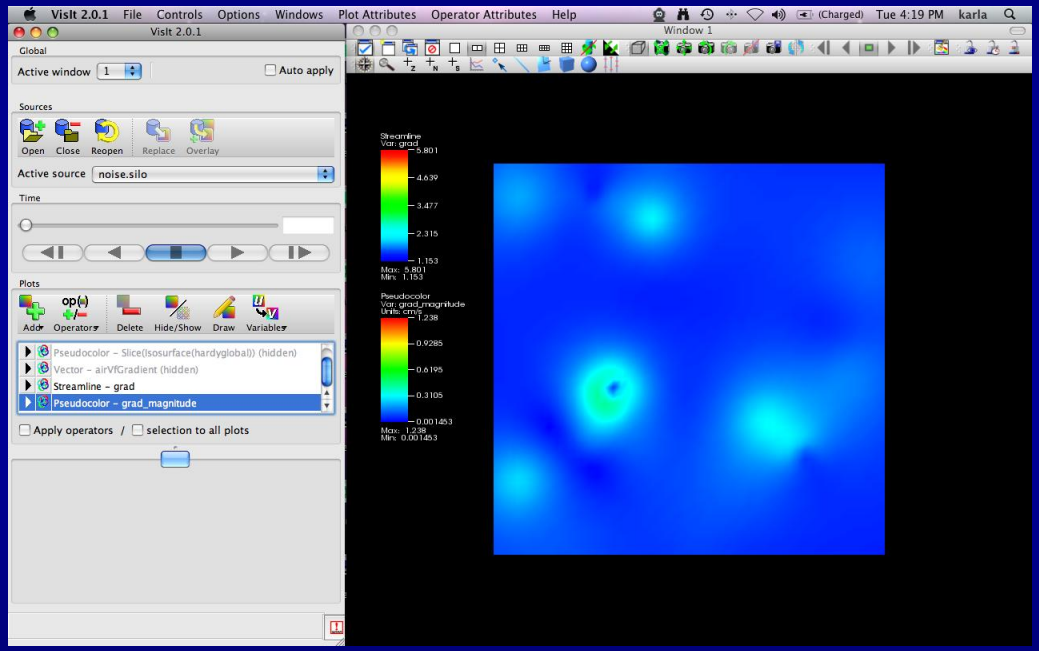

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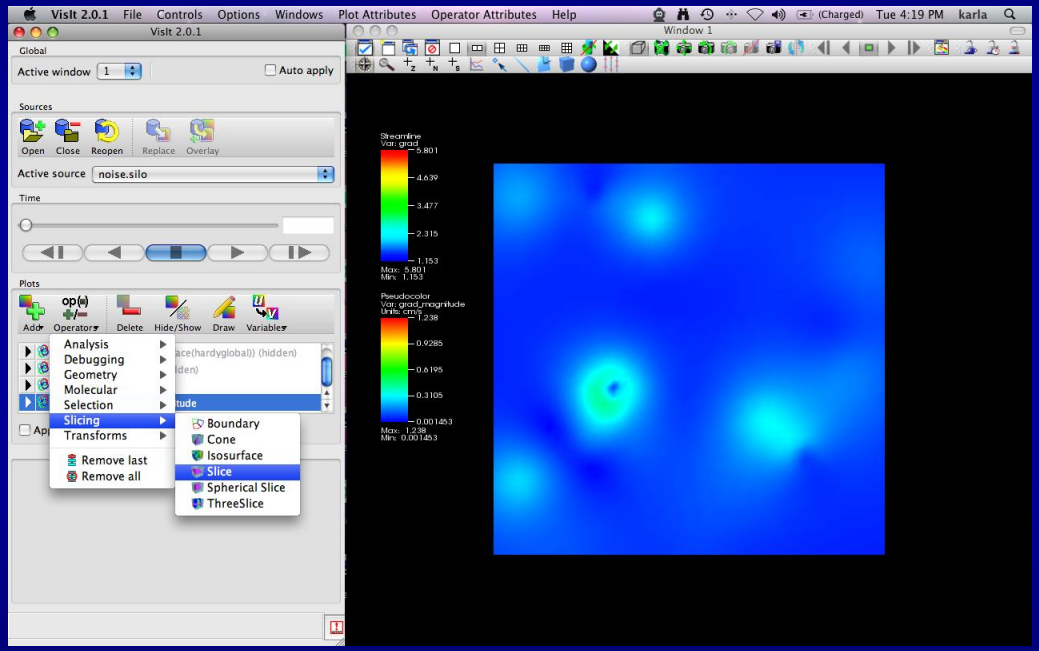

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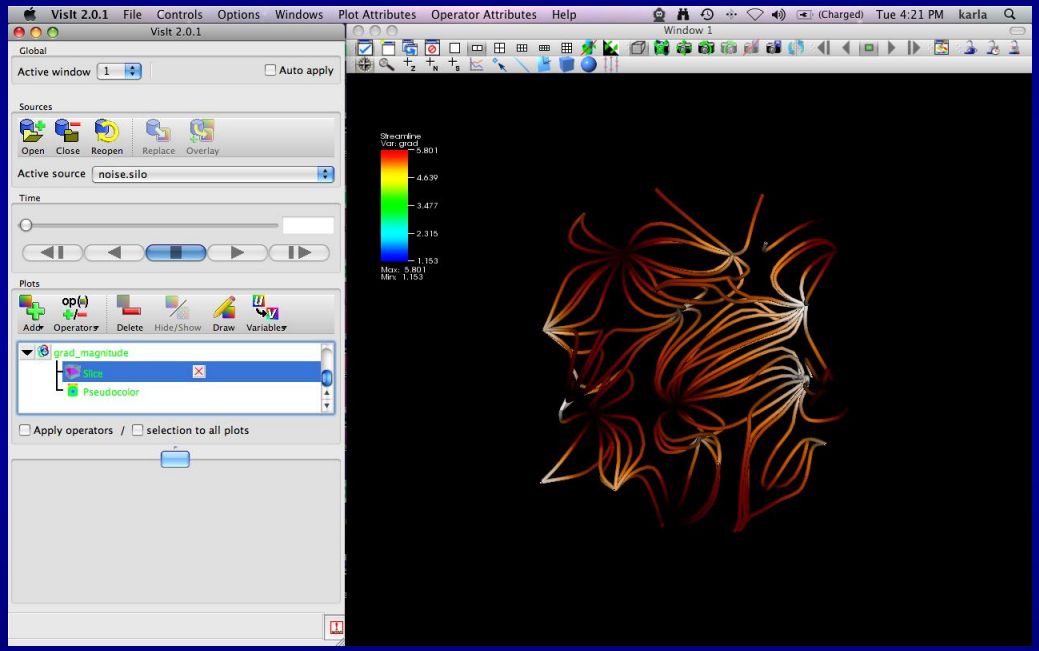

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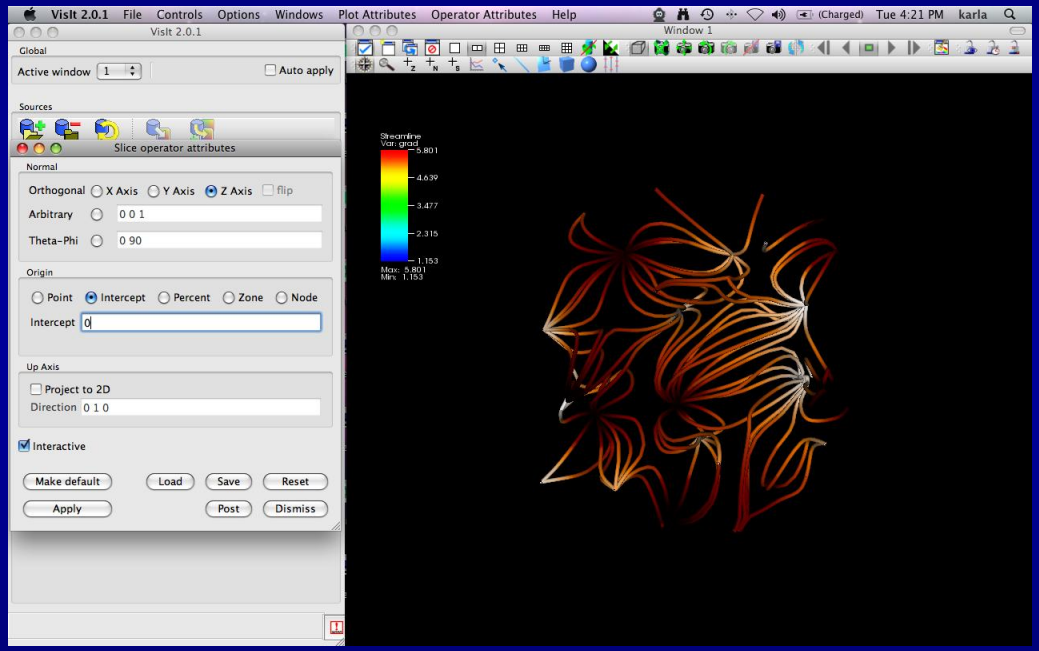

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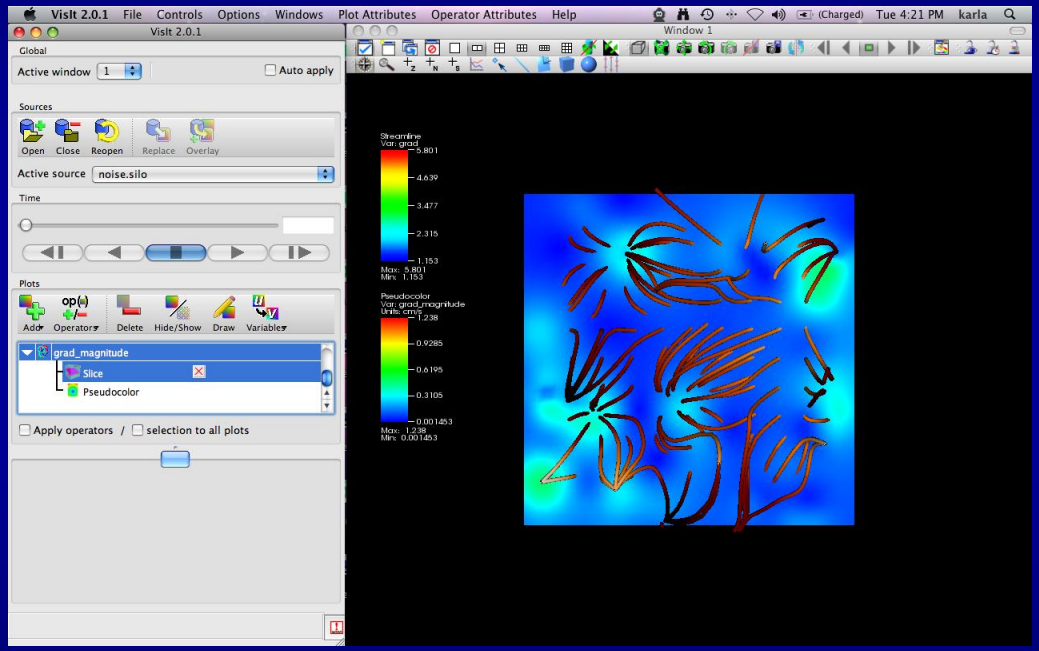

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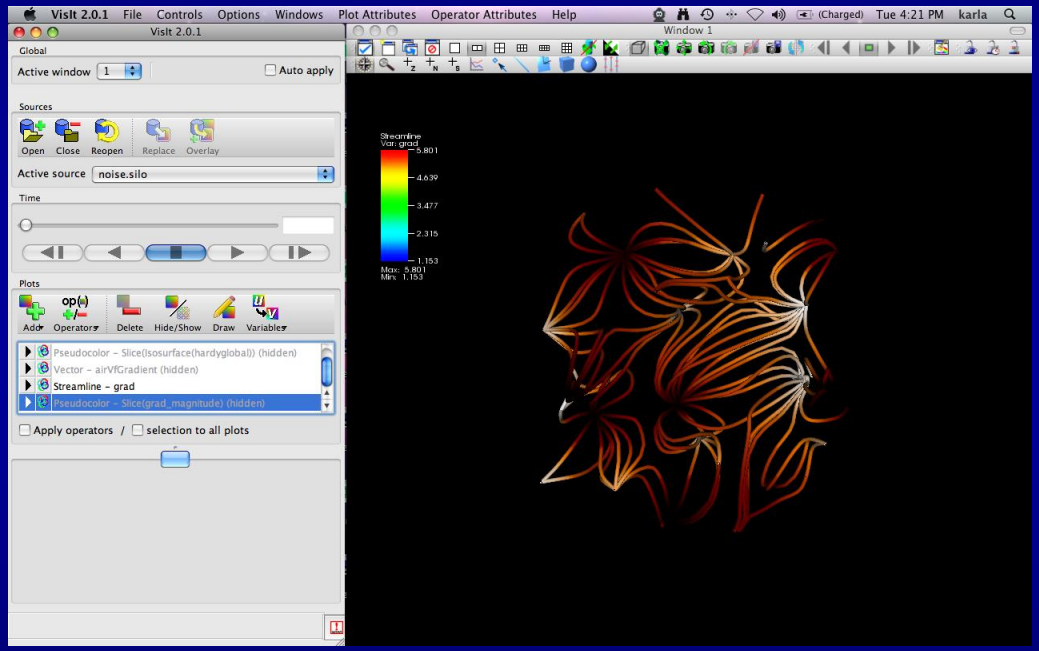
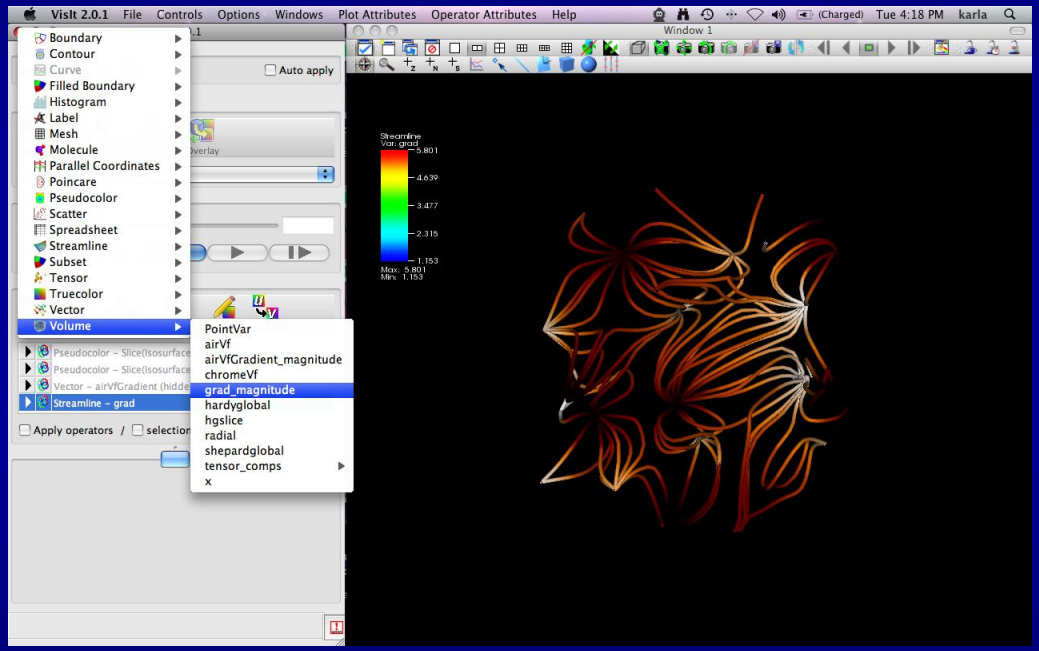


VisIt

Create Volume Rendering

- Click `Add -> Volume -> grad_magnitude`
- Click `Draw`
- Double click on `Volume`
- Change Transfer Function
- Click `Apply`
- Click `Dismiss`



VisIt

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- Click `Draw`
- Double click on `Volume`
- Change Transfer Function
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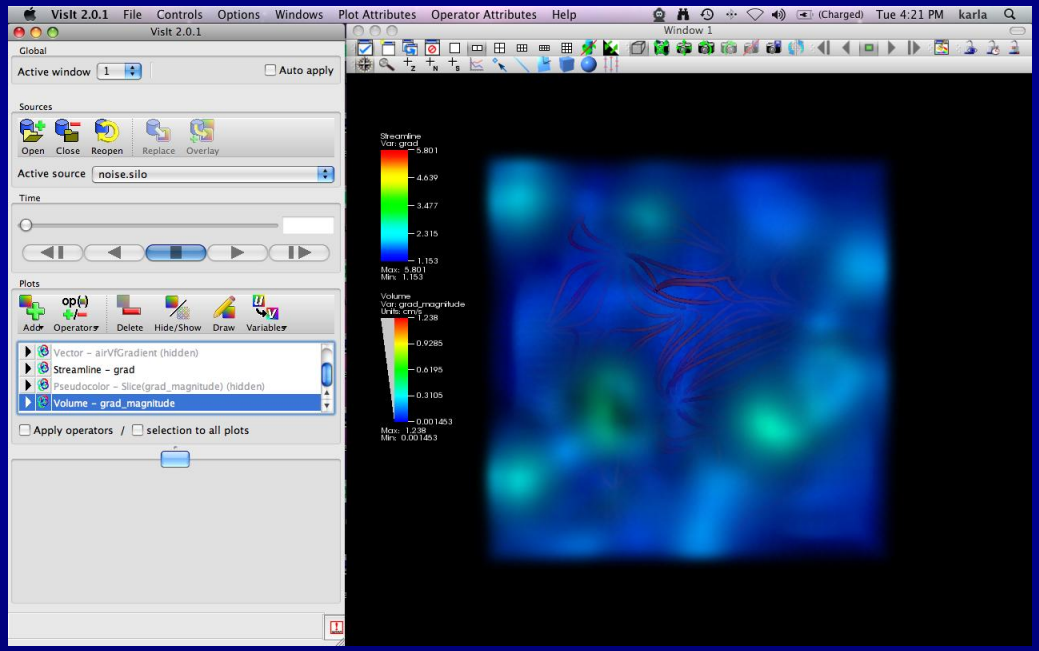

VisIt

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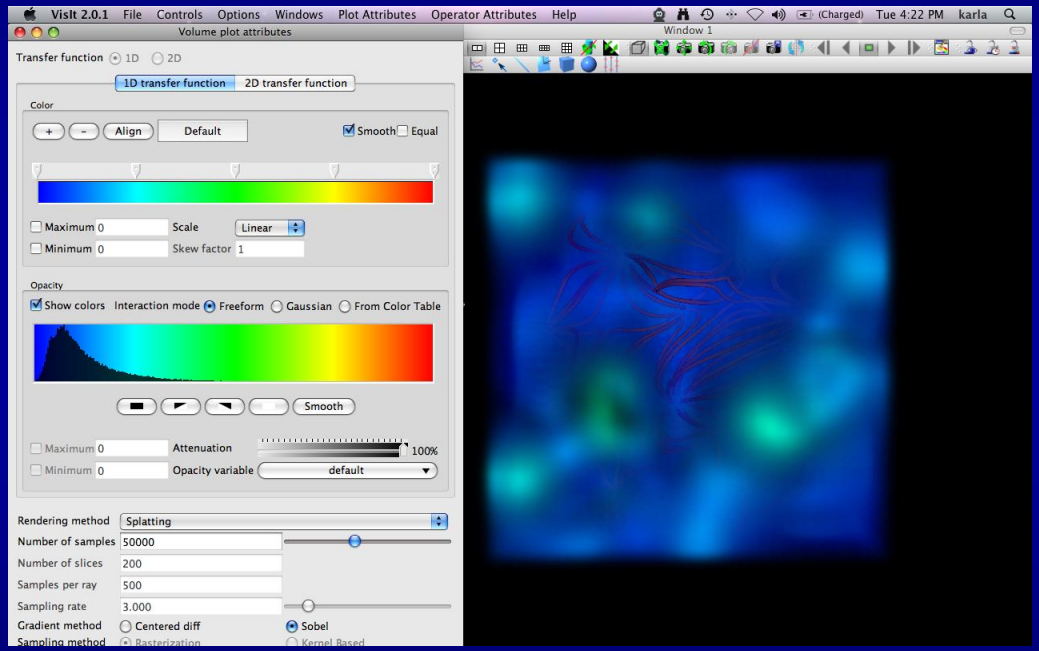
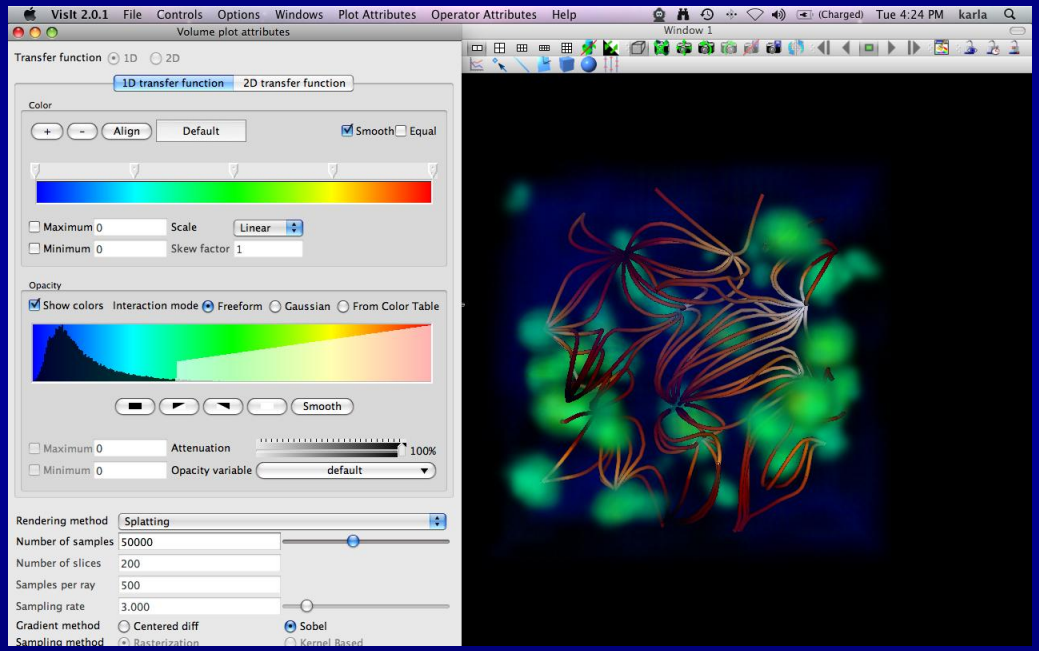
- Click `Apply`
- Click `Dismiss`



VisIt

Create Volume Rendering

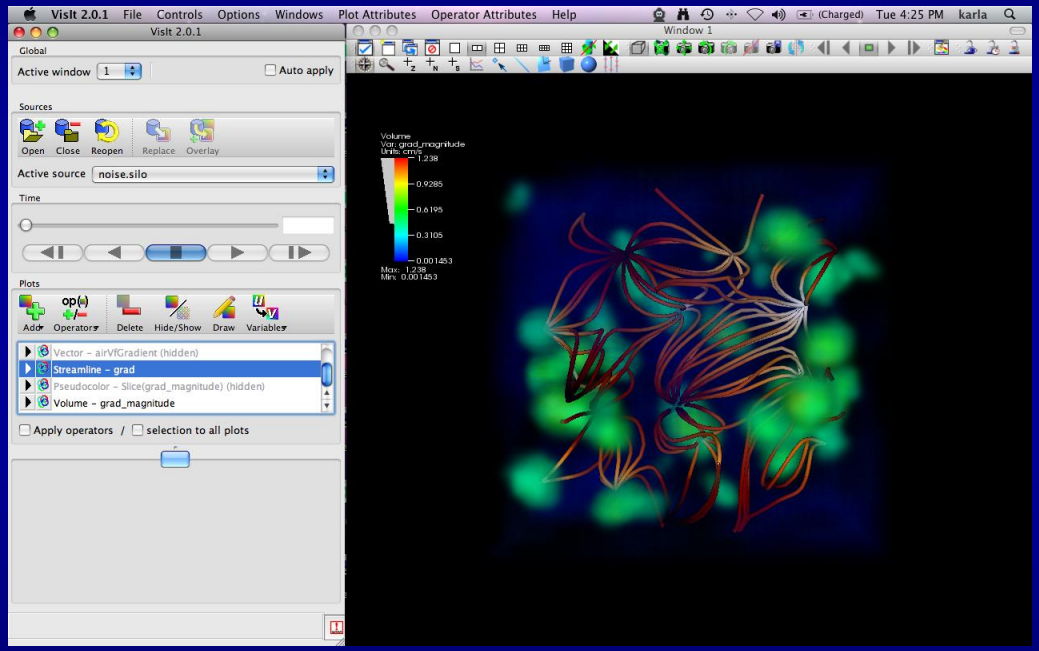
- Click `Add -> Volume -> grad_magnitude`
- Click `Draw`
- Double click on `Volume`
- Change Transfer Function
- Click `Apply`
- Click `Dismiss`

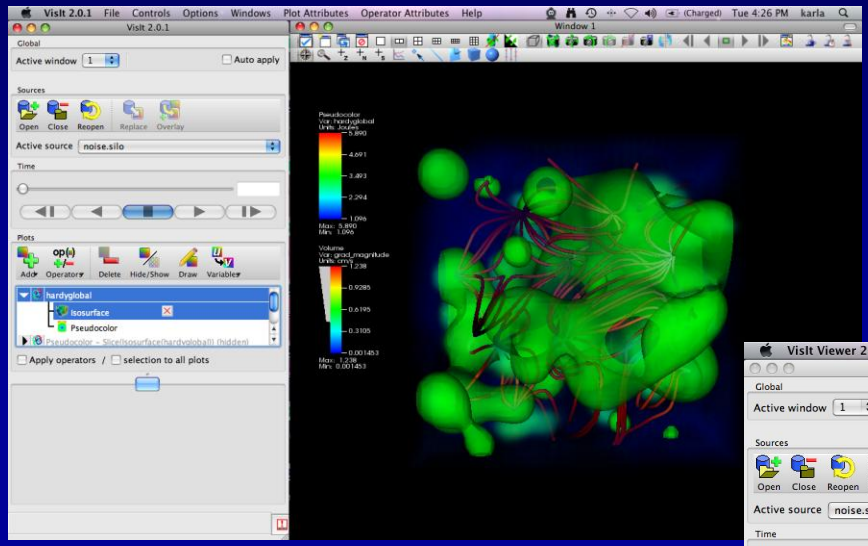


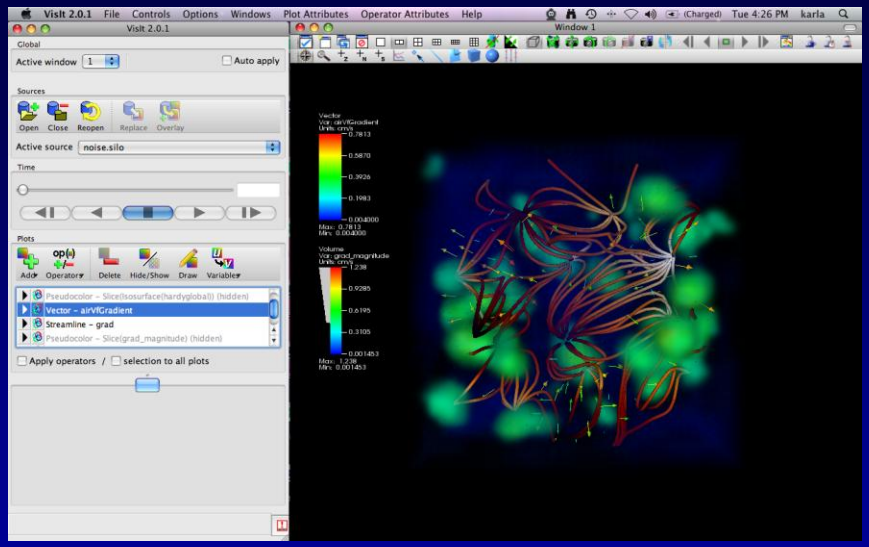
VisIt

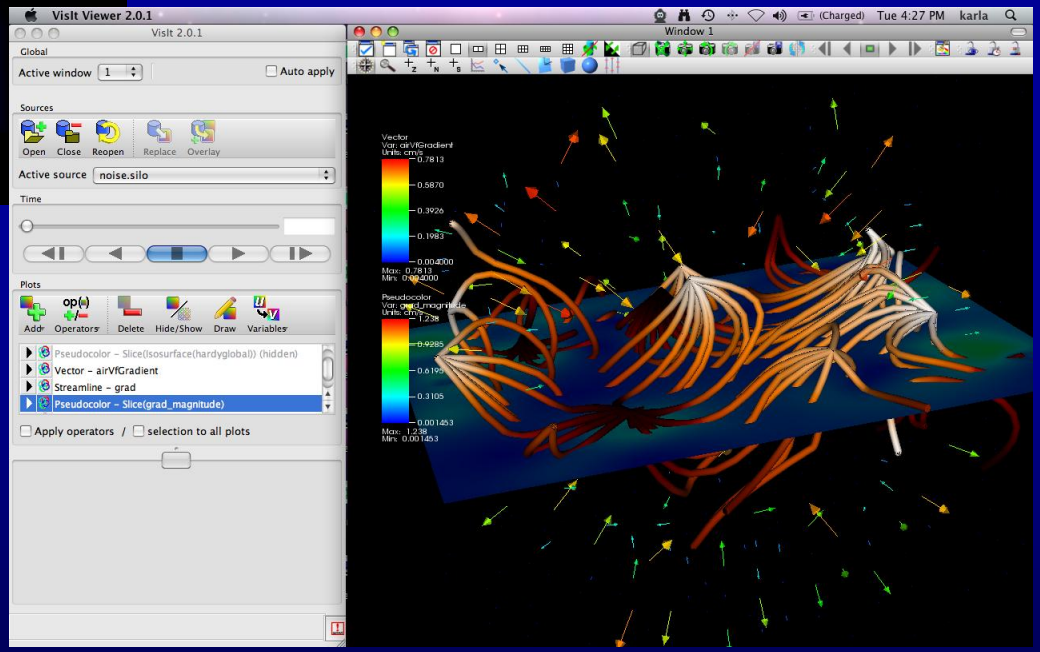
Create Volume Rendering

- Click `Add -> Volume -> grad_magnitude`
- Click `Draw`
- Double click on `Volume`
- Change Transfer Function
- Click `Apply`
- Click `Dismiss`




VisIt 2.0.1
Global
Active window
Auto apply
Sources
Open
Close
Reopen
Replace
Overlay
Active source
noise.silo
Time
Plots
Add
Operators
Delete
Hide/Show
Draw
Variables
hardyglobal
Isosurface
Pseudocolor
Apply operators
selection to all plots
Window 1


VisIt 2.0.1
Global
Active window
Auto apply
Sources
Open
Close
Reopen
Replace
Overlay
Active source
noise.silo
Time
Plots
Add
Operators
Delete
Hide/Show
Draw
Variables
Pseudocolor - Slice(isosurface(hardyglobal)) (hidden)
Vector - airVfGradient
Streamline - grad
Pseudocolor - Slice(grad_magnitude) (hidden)
Apply operators
selection to all plots
Window 1


VisIt Viewer 2.0.1
VisIt 2.0.1
Global
Active window
Auto apply
Sources
Open
Close
Reopen
Replace
Overlay
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noise.silo
Time
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Pseudocolor - Slice(grad_magnitude)
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selection to all plots
Window 1

TACC

Questions?

- More tutorials available:
  - https://wci.llnl.gov/codes/visit/manuals.html