

3D Visualization using Visit

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<https://wci.llnl.gov/codes/visit/executables.html>

- Linux
- Max OS X
- Windows

`student_files/visit_tov/rho.r14.h5`

About the dataset:

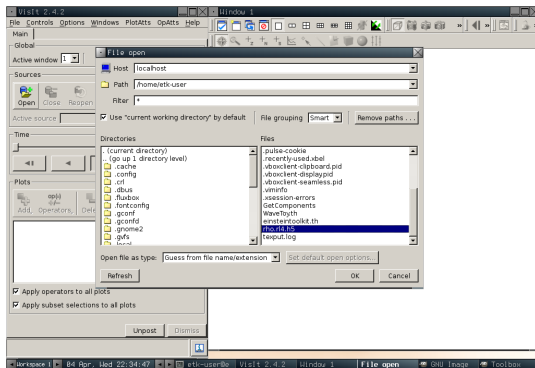
- 3D dataset
- time-series
- density of pulsating neutron star

About the Format:

- HDF5
- Hierarchical Data Format
- data model, library, and file format for storing and managing data
- optimized for large datasets and parallel I/O
- portable
- free library (open source)

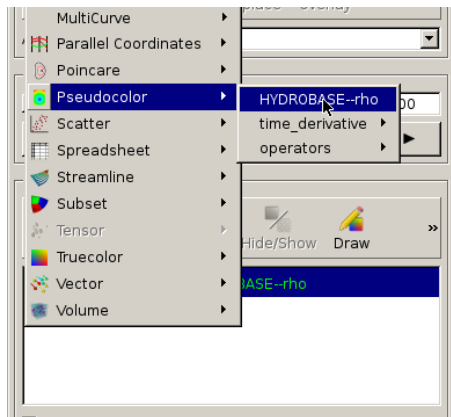
Visualizing density oscillations

- Start Visit
- open the output file (*.h5)



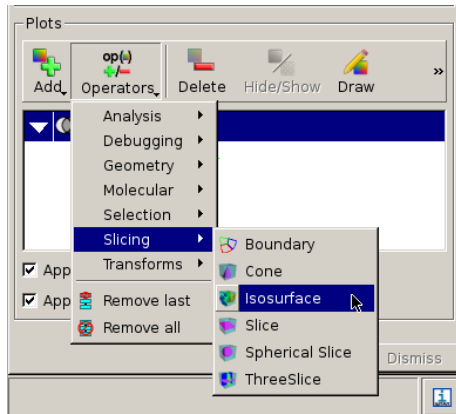
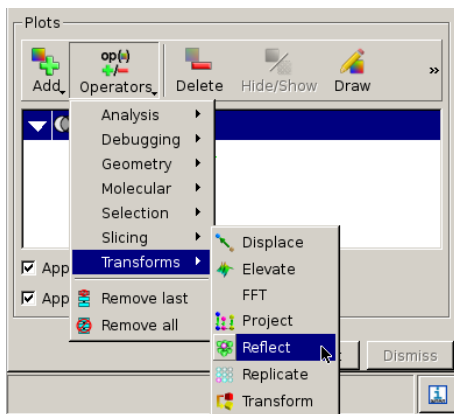
Visualizing density oscillations

- add a pseudocolor plot from the "Plots" drop-down button
- we will display a number of isocontour lines in the star to show its oscillations
- we will use the Isosurface operator to compute the contour surfaces
- VisIt also offers a Contour plot which however is limited in the transparency options compared to the Isosurface, PseudoColor combination we use



Visualizing density oscillations

- add Reflect operator from Operators/Transforms/Reflect, to populate the “missing” octants
- add Isosurface operator from Operators/Slicing/Isosurface



Visualizing density oscillations

- double-click on the Pseudocolor entry in the list of plots to display its options page. You might have to expand the list using the triangle shaped button on the left first
- add transparency by reducing the opacity to about 25% and set limits of $[10^{-8}, 10^{-3}]$ for the plot range. We will use the same range when creating isocontours in the next step
- you have to click on Apply then on Dismiss to apply the new settings

Limits: Use Original Data (dropdown)
 Minimum: 1e-8 Maximum: 1e-3

Centering: Original Nodal Zonal

Color: Color table: hot Invert

Opacity: Set explicitly From color table
Opacity: 25%

Point / Line Style: Point type: Point Point size (pixels): 2
 Scale point size by variable: default

Line style: solid Line width: 1

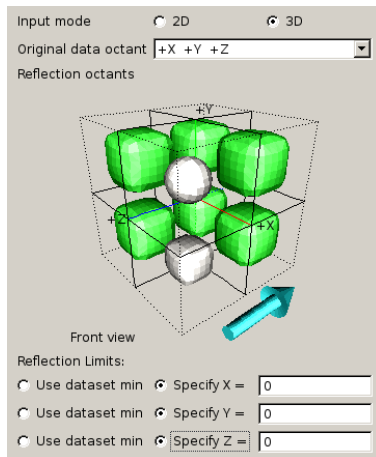
Geometry: Smoothing: None Fast High

Misc: Legend Lighting

Buttons: Make default, Apply, Load, Save, Reset, Post, Dismiss

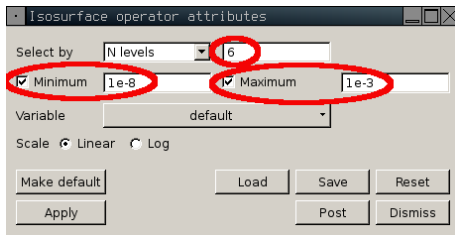
Visualizing density oscillations

- double click on the Reflect operator, change to 3D and activate (mouse-click in picture) all octants except the original ($+X + Y + Z$) and ($+X - Y + Z$), change the reflection point to the origin (bottom)



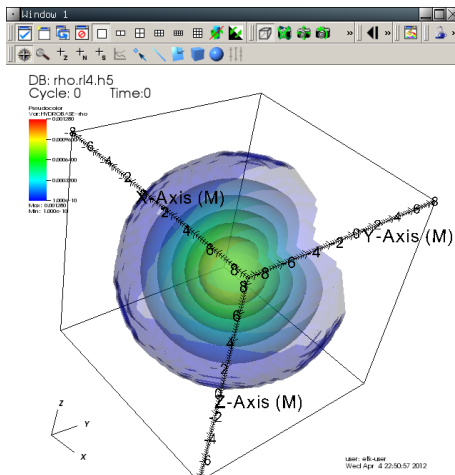
Visualizing density oscillations

- double click on the Isosurface operator and select the range used for the Pseudocolor plot, use 6 levels and leave the scaling at linear



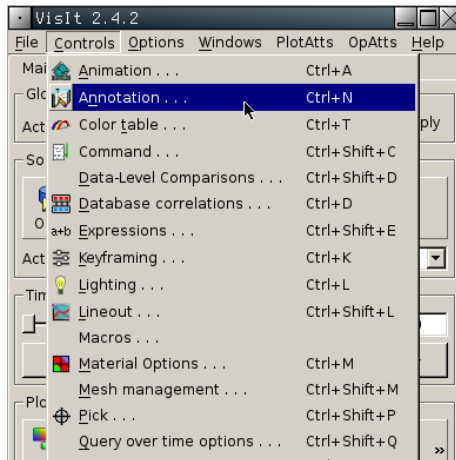
Visualizing density oscillations

- click on Draw to see how your plot looks
- rotate to an orientation that looks nice, by grabbing the plot with the mouse



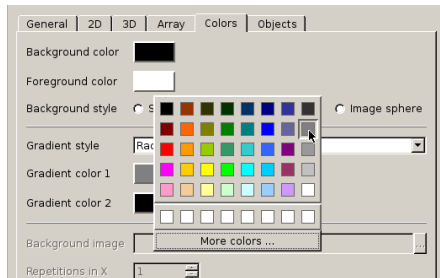
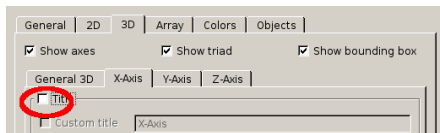
Visualizing density oscillations

- next we will change VisIt's rendering options to add shadows and change the background to something more attractive
- unfortunately this means we will eventually lose the transparency. Though fiddling with the Screen capture option in File/Save Window Options.... Experiment!
- first though open the Annotation control page



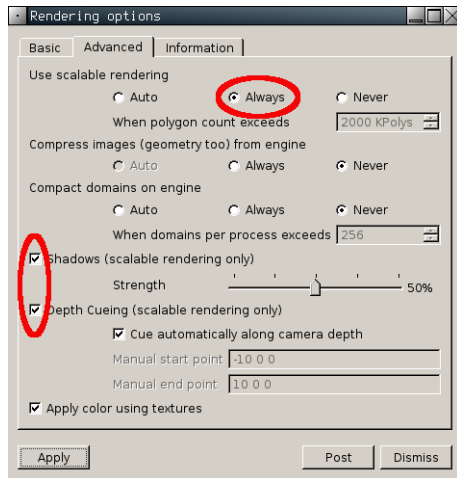
Visualizing density oscillations

- in the X-Axis subtab of the 3D tab, disable the axis title
- repeat for the other two axes
- in the Colors tab, change the background to black and the foreground to white
- add a gradient to the background, with a dark gray as the second colour



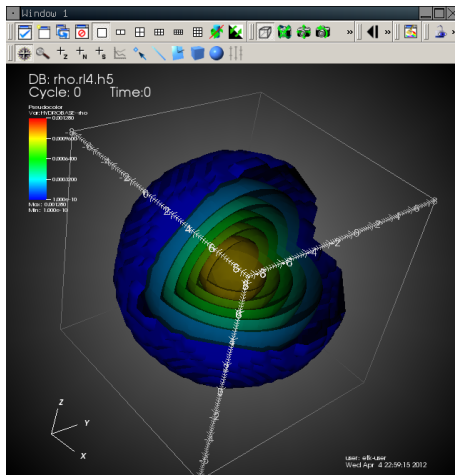
Visualizing density oscillations

- open VisIt's rendering options from the Options->Rendering... menu
- on the Advanced tab, enable scalable rendering, Shadows and Depth Cueing



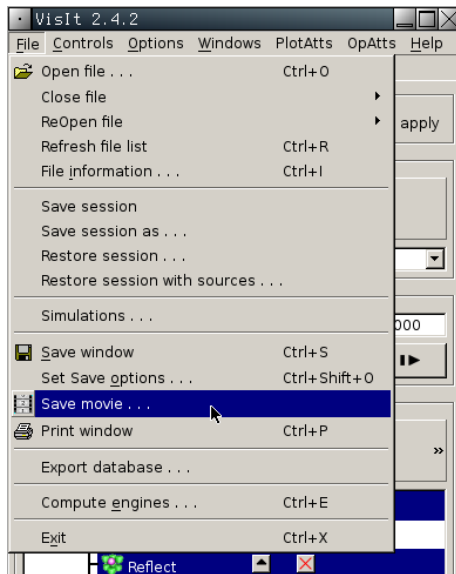
Visualizing density oscillations

- click on Draw to see how your plot looks like



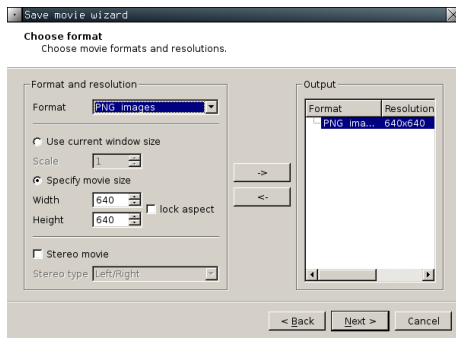
Visualizing density oscillations

- in this last step we will let VisIt render frames of a small movie showing the oscillations
- to start the movie wizard, select Save movie... from the File menu



Visualizing density oscillations

- Finally, inside the wizard, change the frame size to approximately 640×640 pixels (multiples of 16 are best)
- choose png output
- add the movie format to the list on the right using the \rightarrow button
- click on next and accept the defaults for all other steps, maybe choosing a different output directory for the frames



Visualizing density oscillations

- once VisIt is done, which will take some minutes, we can render the frames into an actual movie
- for this, cd into the folder containing the frames and use, e.g., ffmpeg:
`ffmpeg -qscale 1 -i movie%04d.png movie.avi`
 - `-qscale 1` sets the quality scale for the encoder. 1 is best quality.
 - `-i movie%04d.png` tells ffmpeg the names of the input files, it accepts printf format specifiers to construct a file name based on the frame number. ffmpeg stops encoding once it generates a name for which no or no valid file is found.
- play the movie, e.g., using mplayer