3D Visualization using Visit

Roland Haas

August 2, 2017

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

- Linux
- Max OS X
- Windows

student_files/visit_tov/rho.rl4.h5

About the dataset:

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

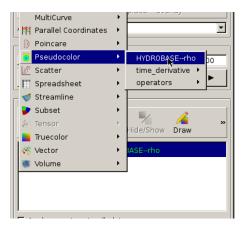
About the Format:

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

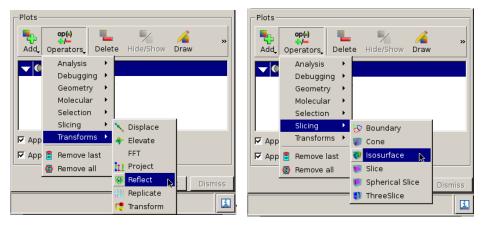
- Start Visit
- open the output file (*.h5)

• Visit 2.4.2	I Window 1
Ble Controls Options V Main	9ndows PlotAtts OpAtts Help 🛛 🔂 🔂 🖸 🗆 🖽 📾 🗰 🗰 🎢 🗽 🗇 🖓 🚳 ֎ 🚳 🔺 📲 🖉
Global	
Active window 1	File open
Sources	Host locahost
R R 6	Path /home/etk-user
Open Close Reopen	Aker *
Active source	🔽 Use "current working directory" by default 🛛 Rie grouping Smart 💌 📃 Remove paths
Time	Directories Files
1	. (current directory) . (oo up 1 directory level)
41 4	Cache vboxClent-clipboard.pld
Plots	config .vboxclent-displaypid .vboxclent-seamless.pid
E	dbus .vminto .vsession-errors
Add, Operators, Dele	GetComponents
	gconfd enstentoolkit.th hondlabs
	gyfs v texput.log v
	Open file as type: Guess from file name/extension 💌 Set default open options
	Refresh OK Cancel
Apply operators to all	plots
P Apply subset selection	ns to all plots
	Unpost Dismiss
Norkspace 1 🕨 84 Apr.	. Hed 22:34:47 🔹 🖭 etk-userBe Visit 2.4.2 Window 1 🛛 File open 🦉 GNU Image 🦉 Toolbox

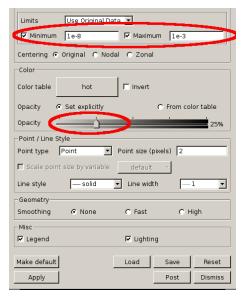
- add a pseudocolor plot from the "Plots" drop-down button
- we will display a number of isocontour lines in the star to show its oscillations
- we will use the Isosurface operator to compute the contour surfaces
- VisIt also offers a Contour plot which however is limited in the transparency options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



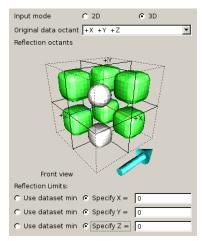
- add Reflect operator from Operators/Transforms/Reflect, to populate the "missing" octants
- add Isosurface operator from Operators/Slicing/Isosurface



- double-click on the Pseudocolor entry in the list of plots to display its options page. Your 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



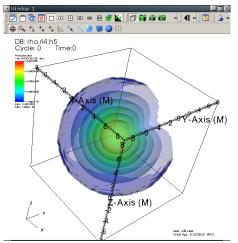
• double click on the Reflect operator, change to 3D and activate (mouse-click in picture) all octants except the original (+X + Y + Z) and (+X - Y + Z), change the reflection point to the origin (bottom)



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

• Isosurface	e operator	attributes		
Select by	N levels			
Minimum	1e-8	Maximum	1e-3	
Variable		default	•	
Scale 🖲 Line	ar 🔿 Log			
Make default]	Load	Save	Reset
Apply			Post	Dismiss

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



- 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 loose the transparancy. Though fiddling with the Screen capture option in File/Save Window Options.... Experiment!
- first though open the Annotation control page

۰V	isI	t 2.4	.2				-	
<u>F</u> ile	<u>C</u> o	ntrols	<u>O</u> ptions	<u>W</u> indows	Plot	Atts	OpAtts	Help
Mai	盒	<u>A</u> nima	ation			Ctrl+	A	
Glc	Ņ	A <u>n</u> not	ation	N		Ctrl+	N	
			<u>t</u> able	~		Ctrl+	т	ply
-So		Comm	nand			Ctrl+	Shift+C	
		<u>D</u> ata-	Level Com	parisons .		Ctrl+	Shift+D	
1	쁌	<u>D</u> atab	oase corre	elations		Ctrl+	D	
0	a+b	<u>E</u> xpre	ssions			Ctrl+	Shift+E	
Act	ᅇ	<u>K</u> eyfra	aming			Ctrl+	к	•
Tim	P	Lighting				Ctrl+L		
	\geq	Lineou	ut			Ctrl+	Shift+L	
		Macro	os					
		<u>M</u> ater	ial Option	s		Ctrl+	м	
Plc		<u>M</u> esh	managem	nent		Ctrl+	Shift+M	F
Pic	Ф	<u>P</u> ick .				Ctrl+	Shift+P	
		Query	over time	e options .		Ctrl+	Shift+Q	»
		A				chall.	~	

- 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

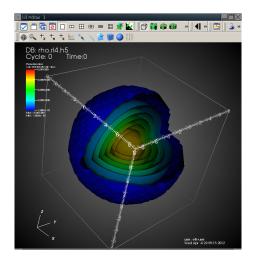
General 2D 3D Array Colors Objects

	Background color
	Foreground color
	Background style 🔿 S 🔳 📕 🔳 🔳 🔳 🔳 📕 🖉 🖉 🖉
	Gradient style Rac
General 2D 3D Array Colors Objects	Gradient color 1 🔤 🛄 📃 🗖 🗖 🗖 🗖 🗖
♥ Show axes ♥ Show triad ♥ Show bounding box	Gradient color 2
General 3D X-Axis Y-Axis Z-Axis	Background Image More colors
Custom title X-Axis	Repetitions in X 1 🔚

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

 Rendering options 							
Basic Advanced Information							
Use scalable rendering							
C Auto C Always	C Never						
When polygon count exceed	2000 KPolys 🔆						
Compress images (geometry too) from eng	jine						
C Auto C Always	Never						
Compact domains on engine							
C Auto C Always	Never						
When domains per process e	When domains per process exceeds 256 芸						
F shadows (scalable rendering only)							
Strength	50%						
□ □ Depth Cueing (scalable rendering only)							
Cue automatically along c	amera depth						
Manual start point -10 0 0							
Manual end point 1000							
Apply color using textures							
Apply	Post Dismiss						

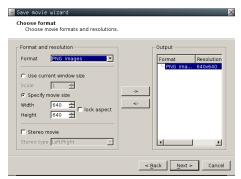
• click on Draw to see how your plot looks like



- 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

•	VisIt 2.4.	2				
File	<u>C</u> ontrols	<u>O</u> ptions	<u>W</u> indows	PlotAtts	OpAtts	<u>H</u> elp
2	Open file			Ctrl+0		
	Close file				•	
	ReOpen file				+	apply
	Refresh file	list		Ctrl+R		
	File <u>i</u> nformat	tion		Ctrl+I		
	Save sessio	n				
	Save sessio	nas				
	Restore session					-
	Restore session with sources					
	Simulations					000
	Save windo	N		Ctrl+S		
	Set Save <u>o</u> p	tions		Ctrl+Sh	ift+0	
	Save movie		<u> </u>			
9	Print window	N	^	Ctrl+P		»
	Export data	base				
	Compute <u>e</u> r	ngines		Ctrl+E		
	Exit			Ctrl+X		
	- 18	Reflect	^	×		

- 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 -> button
- click on next and accept the defaults for all other steps, maybe choosing a different output directory for the frames



- 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