Introduction To Vapor

ATPSEC 2021

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www.vapor.ucar.edu

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VAPOR
Visualization & Analysis Platform

Open source (free)

Cross platform
(Linux, OSX, Windows)

Comprised of “Renderers”

Goal: Make visualization
easy for geophysicists

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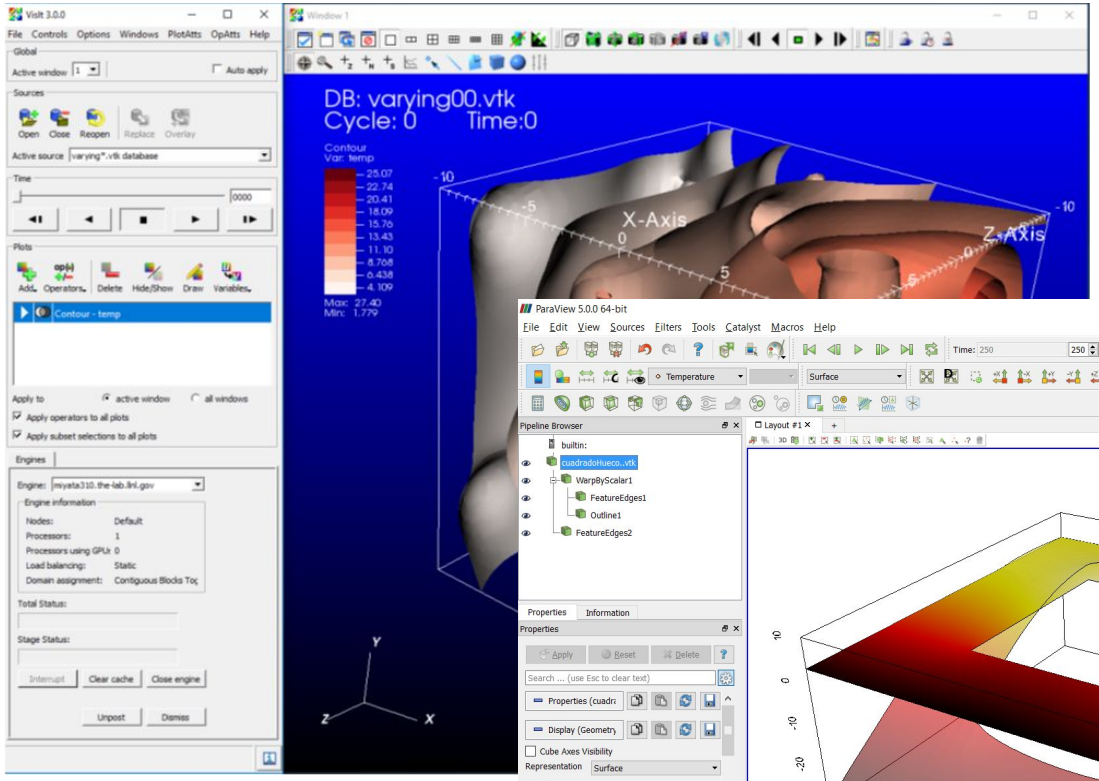
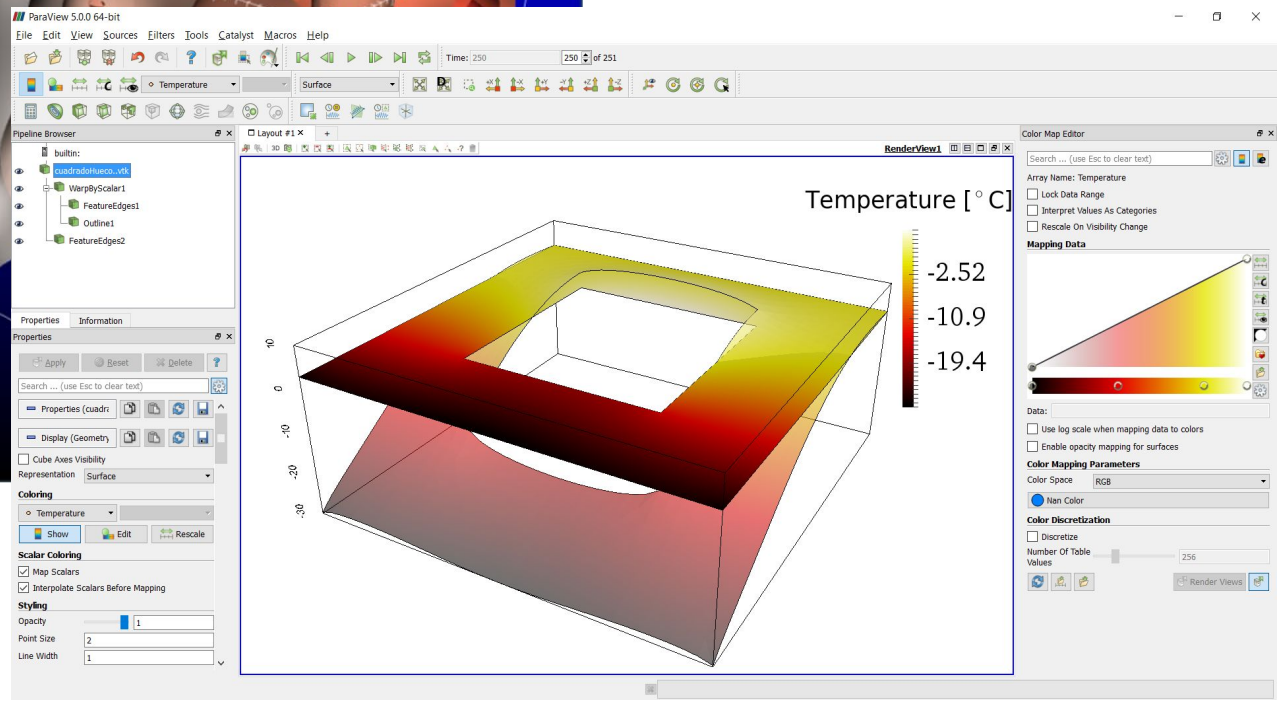
In this session:

- Application overview
- Supported data formats
- Volume Rendering
- Pathline Rendering
- Other renderers, time allowing

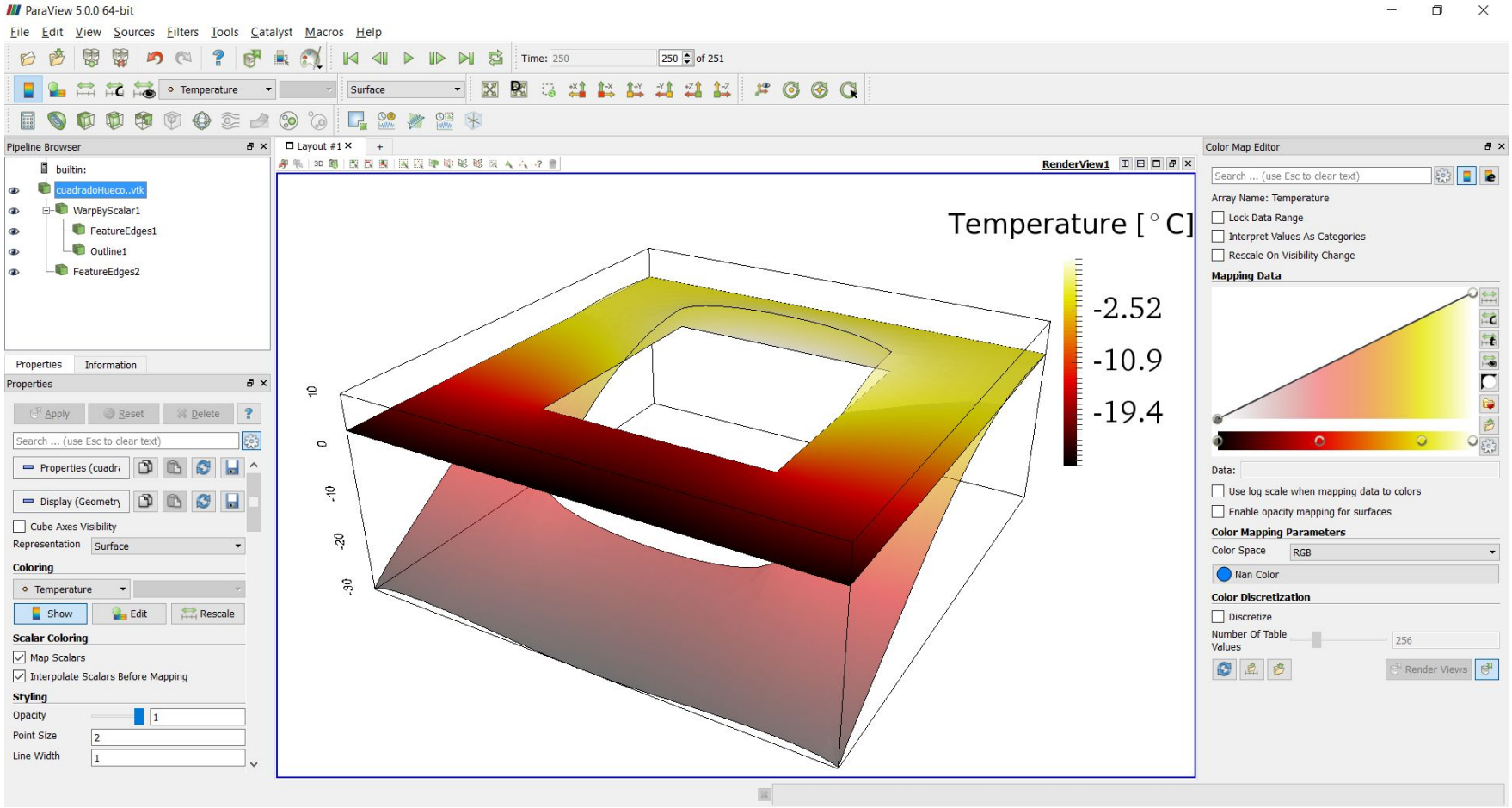
VisIt

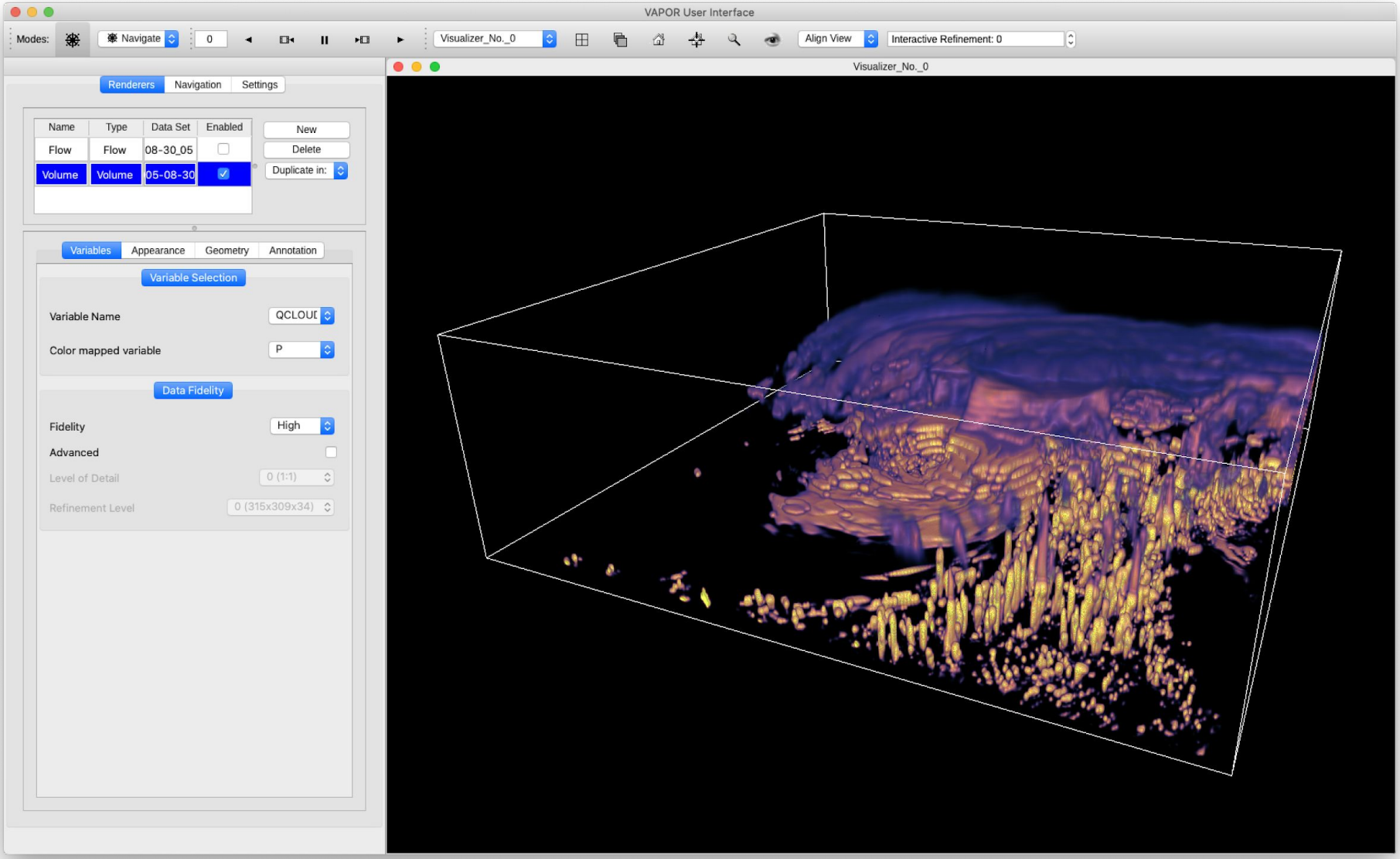


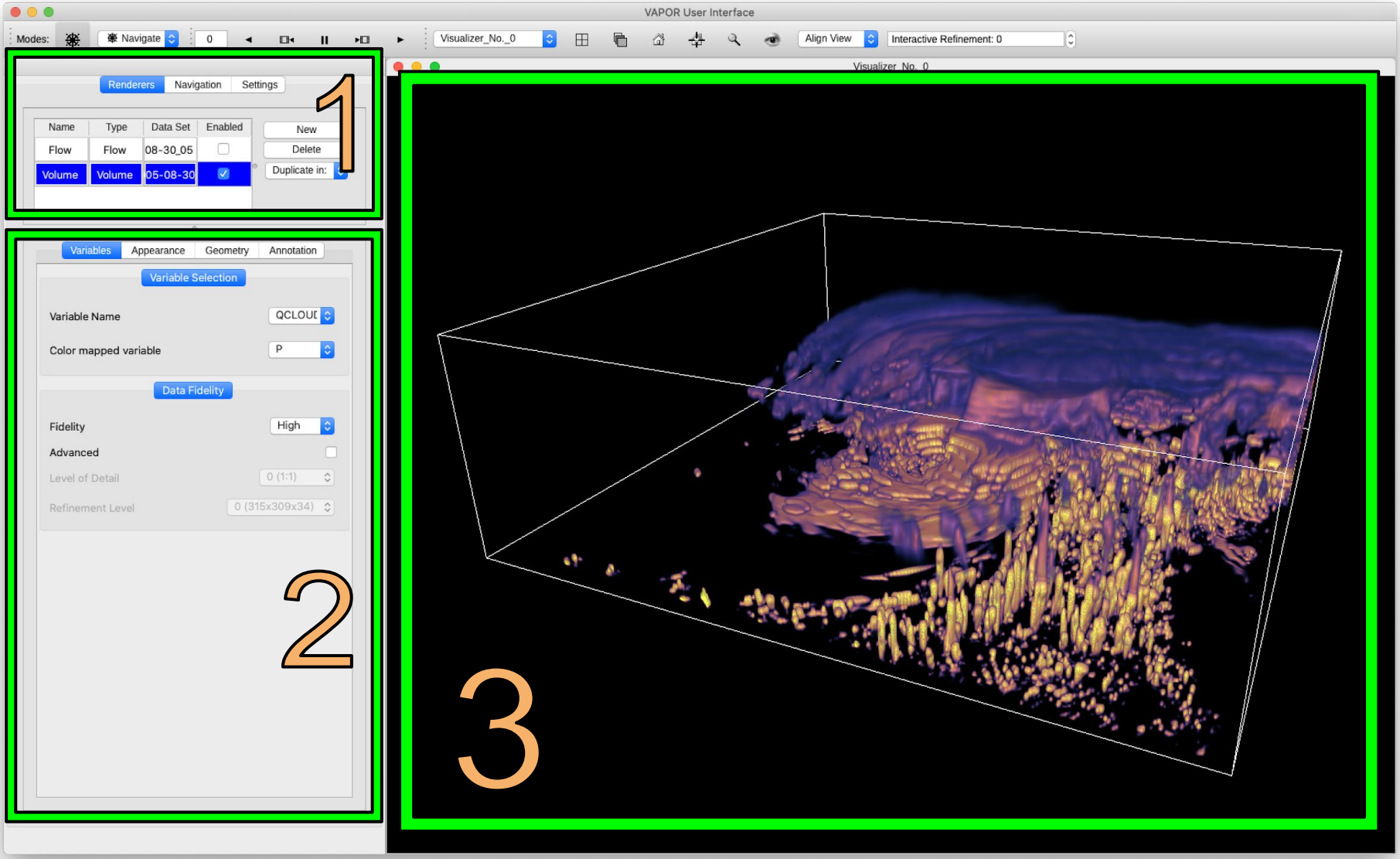
ParaView



Powerful, but steep learning curve




VAPOR User Interface
Modes:
Navigate
0
Visualizer_No._0
Align View
Interactive Refinement: 0
Renderers
Navigation
Settings
Name
Type
Data Set
Enabled
Flow
Flow
08-30_05
Volume
Volume
05-08-30
New
Delete
Duplicate in:
Variables
Appearance
Geometry
Annotation
Variable Selection
Variable Name
QCLOUD
Color mapped variable
P
Data Fidelity
Fidelity
High
Advanced
Level of Detail
0 (1:1)
Refinement Level
0 (315x309x34)
Visualizer_No._0


VAPOR User Interface
Modes:
Navigate
0
Visualizer_No._0
Align View
Interactive Refinement: 0
Visualizer_No._0
Renderers
Navigation
Settings
1
Name
Type
Data Set
Enabled
Flow
Flow
08-30_05
Volume
Volume
05-08-30
New
Delete
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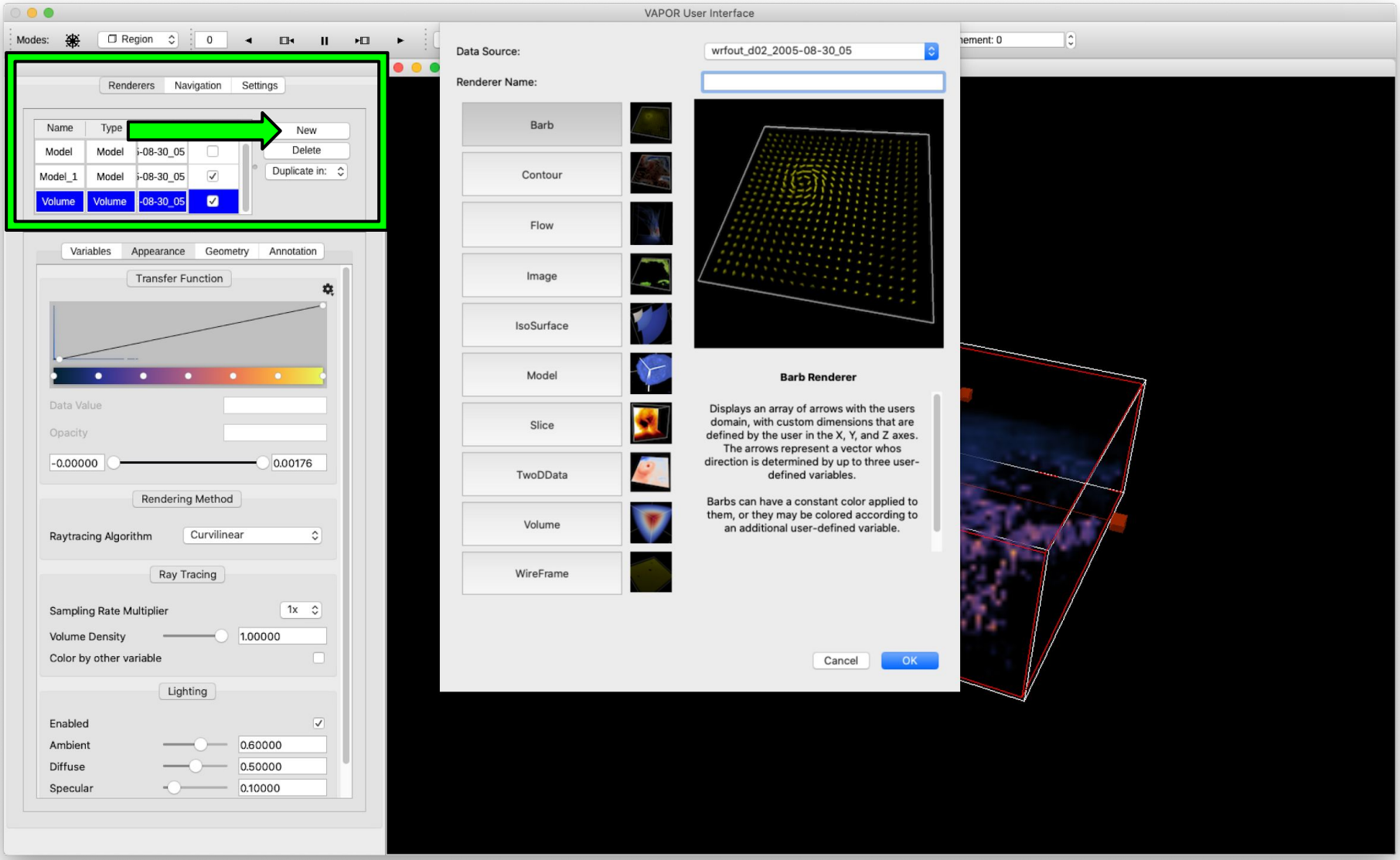
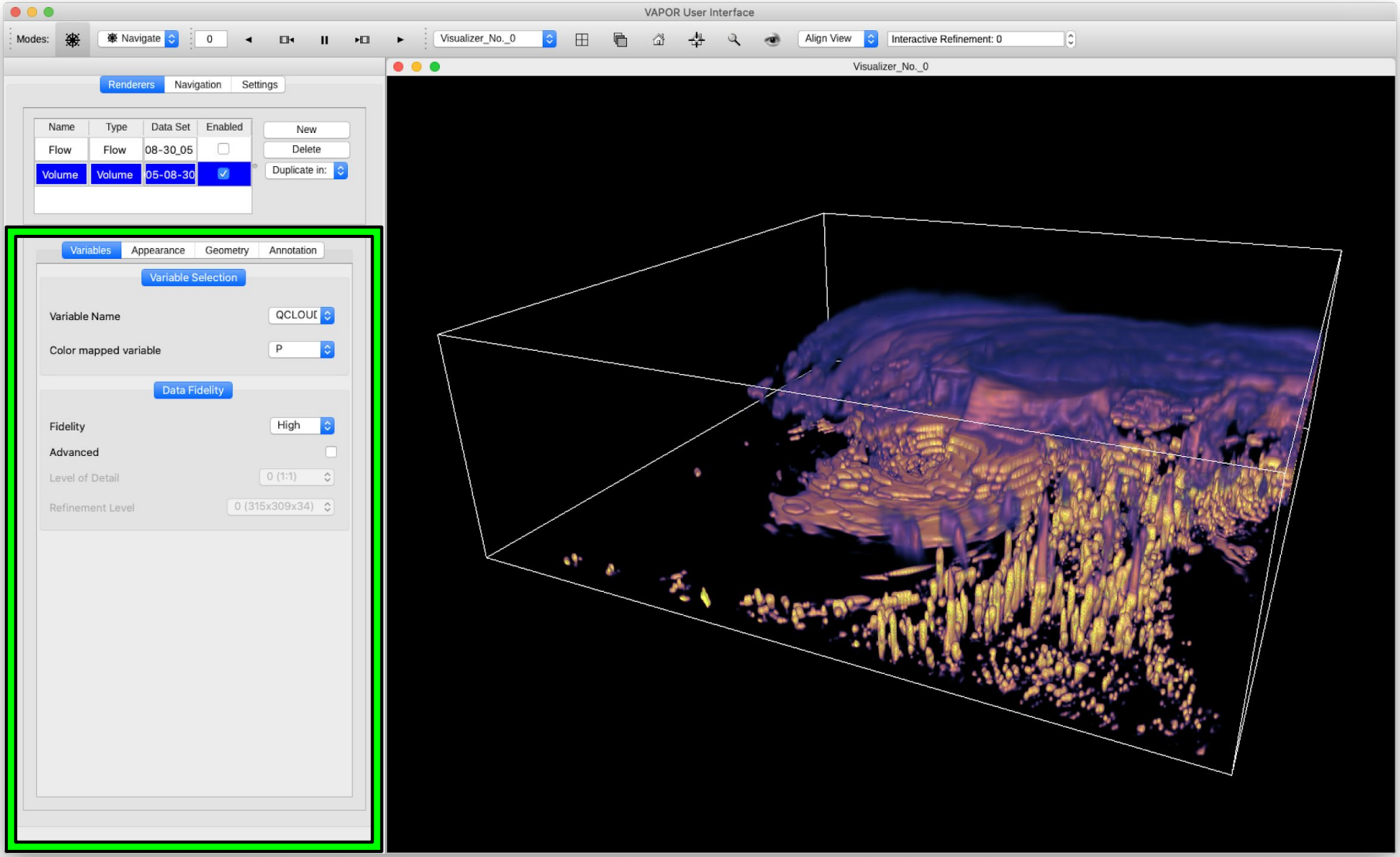
0 (1:1)
Refinement Level
0 (315x309x34)
2
3


VAPOR User Interface
Modes:
Region
Renderers
Navigation
Settings
Name
Type
Model
Model_1
Volume
New
Delete
Duplicate in:
Variables
Appearance
Geometry
Annotation
Transfer Function
Data Value
Opacity
-0.00000
0.00176
Rendering Method
Raytracing Algorithm
Curvilinear
Ray Tracing
Sampling Rate Multiplier
1x
Volume Density
1.00000
Color by other variable
Lighting
Enabled
Ambient
0.60000
Diffuse
0.50000
Specular
0.10000
Data Source:
wrfout_d02_2005-08-30_05
Renderer Name:
Barb
Contour
Flow
Image
IsoSurface
Model
Slice
TwoDData
Volume
WireFrame
Barb Renderer
Displays an array of arrows with the users domain, with custom dimensions that are defined by the user in the X, Y, and Z axes. The arrows represent a vector whos direction is determined by up to three user-defined variables.
Barbs can have a constant color applied to them, or they may be colored according to an additional user-defined variable.
Cancel
OK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Visualizer_No._0
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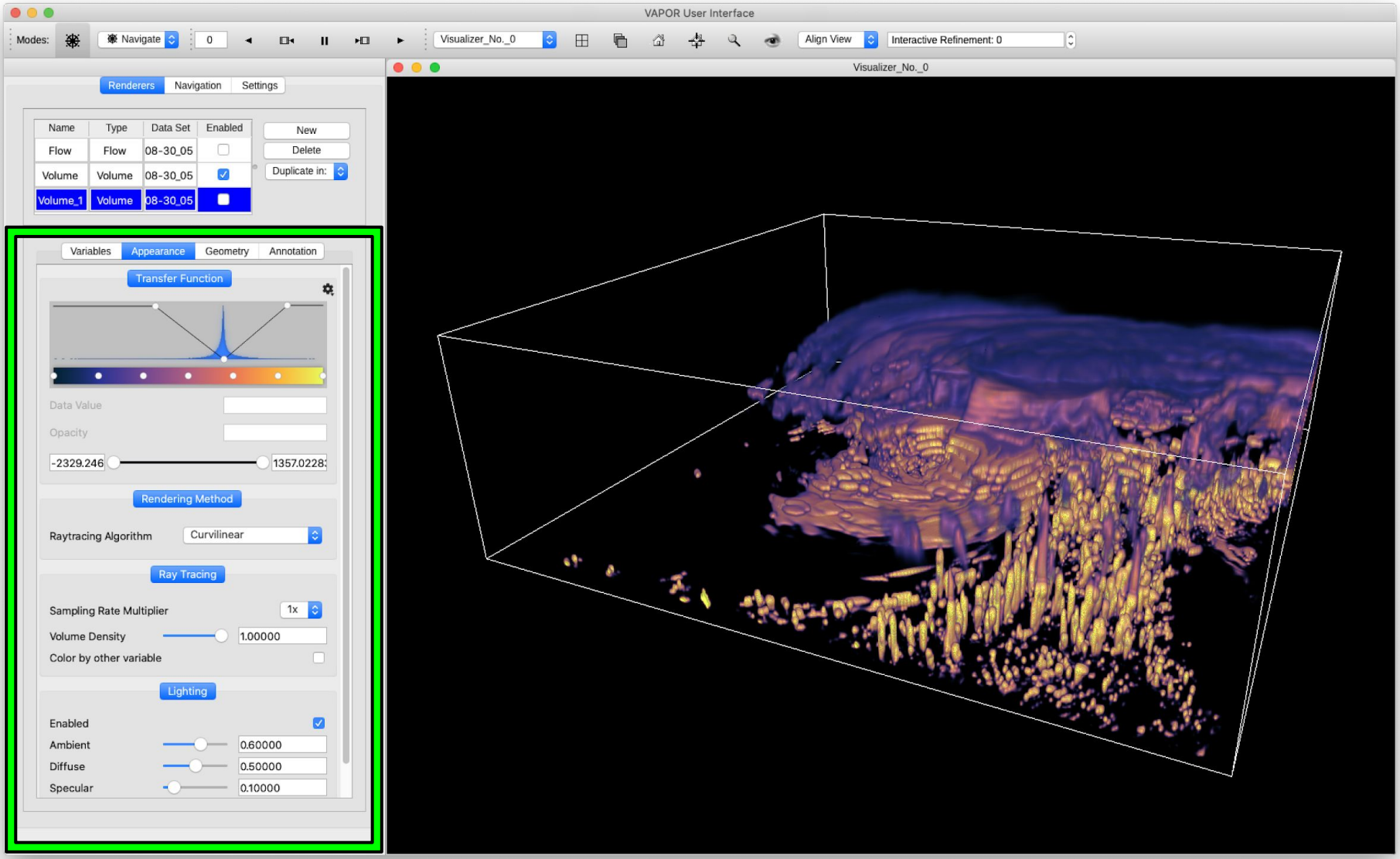
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Visualizer_No._0
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Type
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Flow
Flow
08-30_05
Volume
Volume
08-30_05
Volume_1
Volume
08-30_05
New
Delete
Duplicate in:
Variables
Appearance
Geometry
Annotation
Transfer Function
Data Value
Opacity
-2329.246
1357.0228
Rendering Method
Raytracing Algorithm
Curvilinear
Ray Tracing
Sampling Rate Multiplier
1x
Volume Density
1.00000
Color by other variable
Lighting
Enabled
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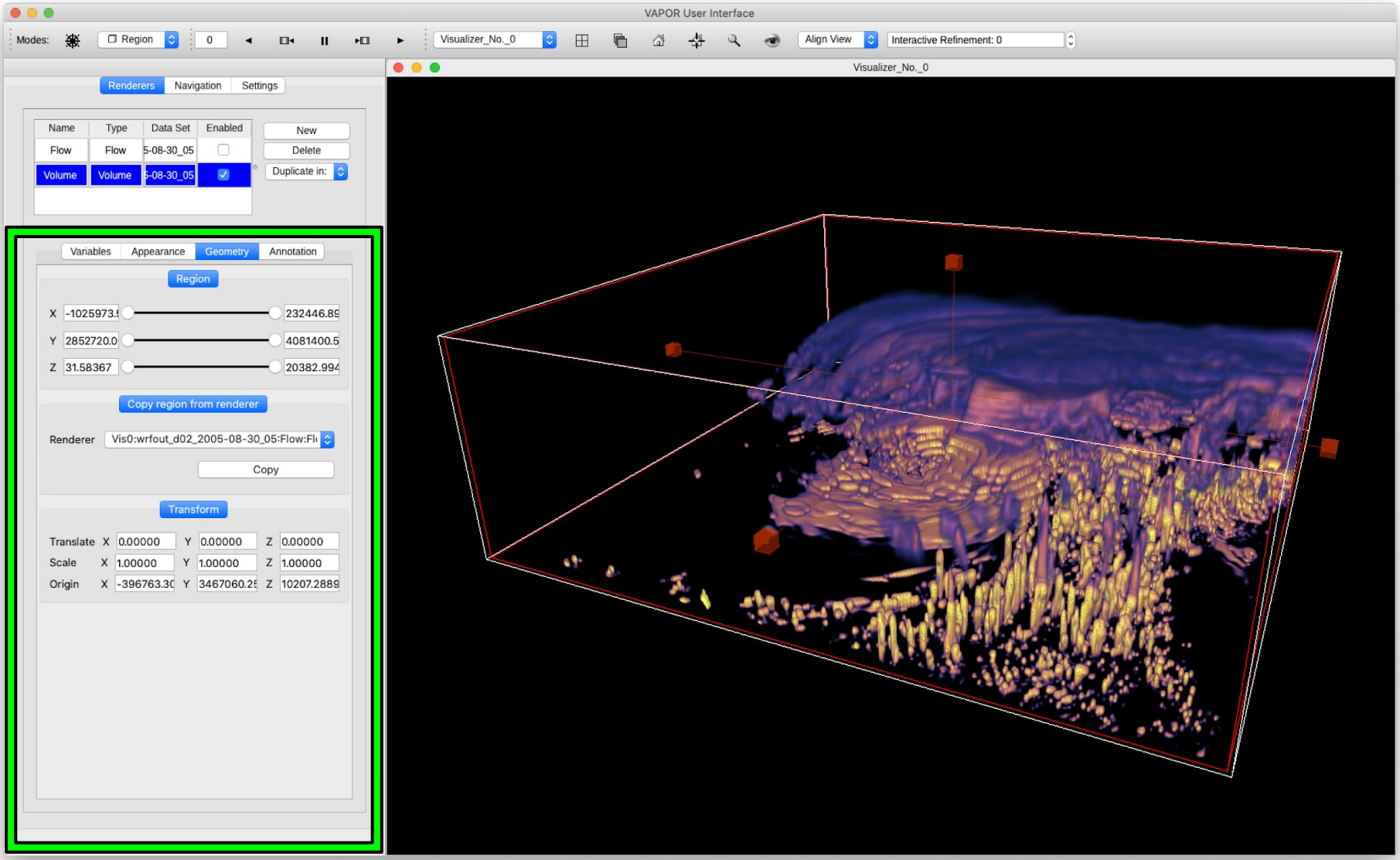
0.60000
Diffuse
0.50000
Specular
0.10000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Type
Data Set
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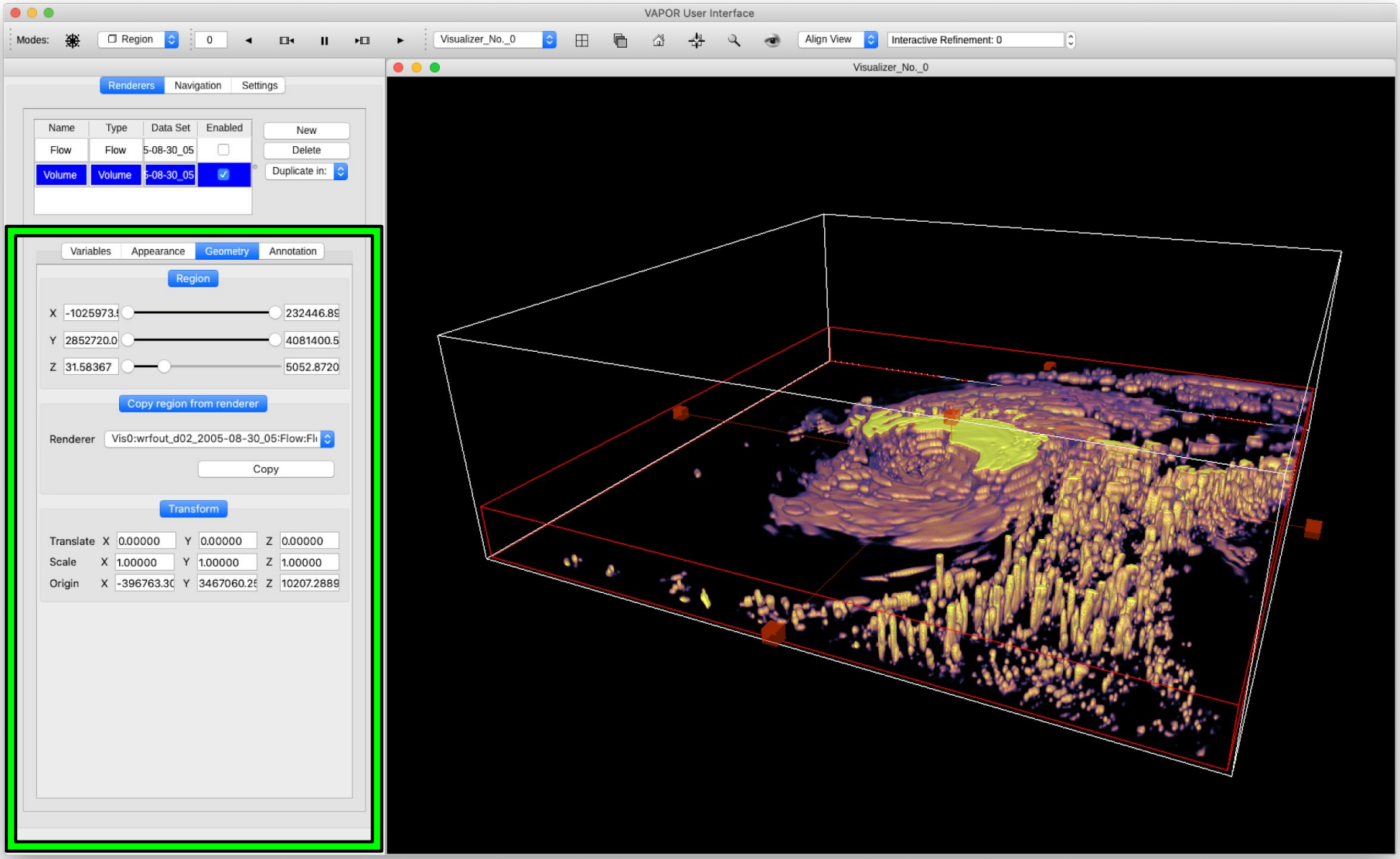
Flow
5-08-30_05
Volume
Volume
5-08-30_05
New
Delete
Duplicate in:
Variables
Appearance
Geometry
Annotation
Region
X -1025973.5 232446.89
Y 2852720.0 4081400.5
Z 31.58367 20382.994
Copy region from renderer
Renderer Vis0:wrfout_d02_2005-08-30_05:Flow:Fl
Copy
Transform
Translate X 0.00000 Y 0.00000 Z 0.00000
Scale X 1.00000 Y 1.00000 Z 1.00000
Origin X -396763.30 Y 3467060.25 Z 10207.2889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Annotation
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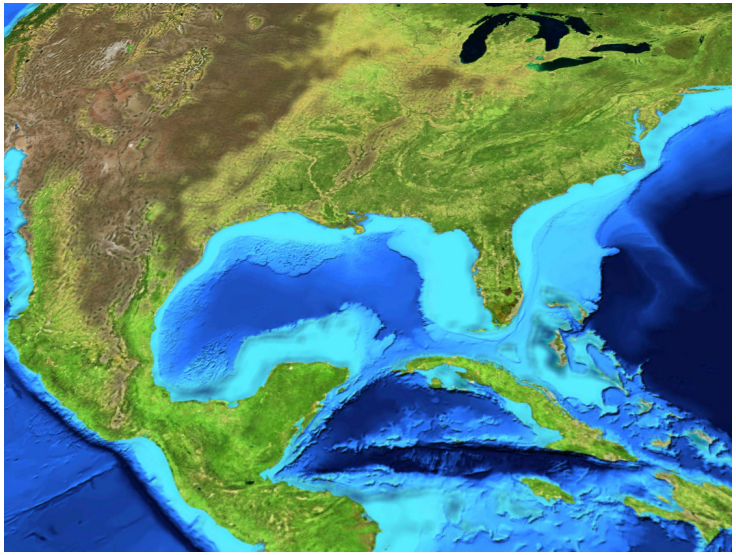
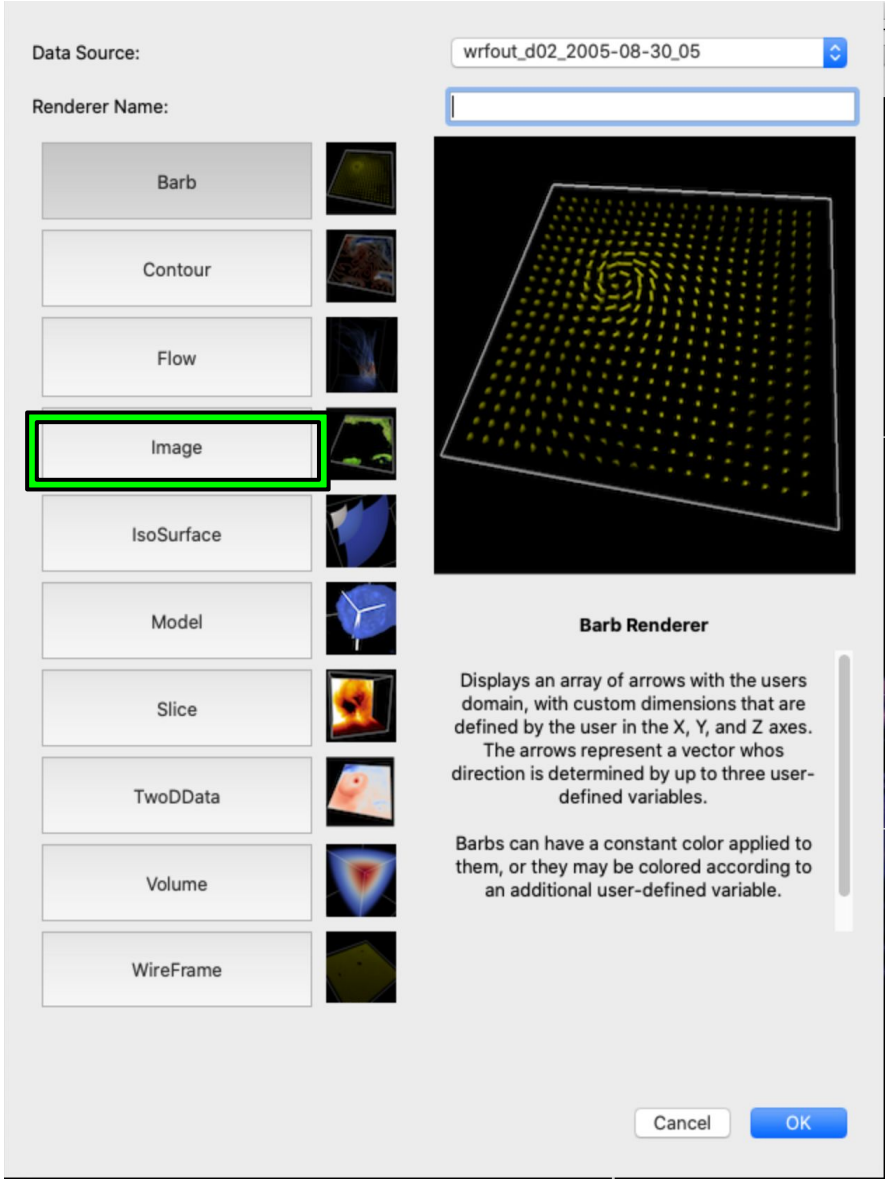
232446.89
Y 2852720.0
4081400.5
Z 31.58367
5052.8720
Copy region from renderer
Renderer
Vis0:wrfout_d02_2005-08-30_05:Flow:Fl
Copy
Transform
Translate X 0.00000 Y 0.00000 Z 0.00000
Scale X 1.00000 Y 1.00000 Z 1.00000
Origin X -396763.30 Y 3467060.25 Z 10207.2889
Visualizer_No._0

In this lesson:

- **Image**
- Volume
- Flow





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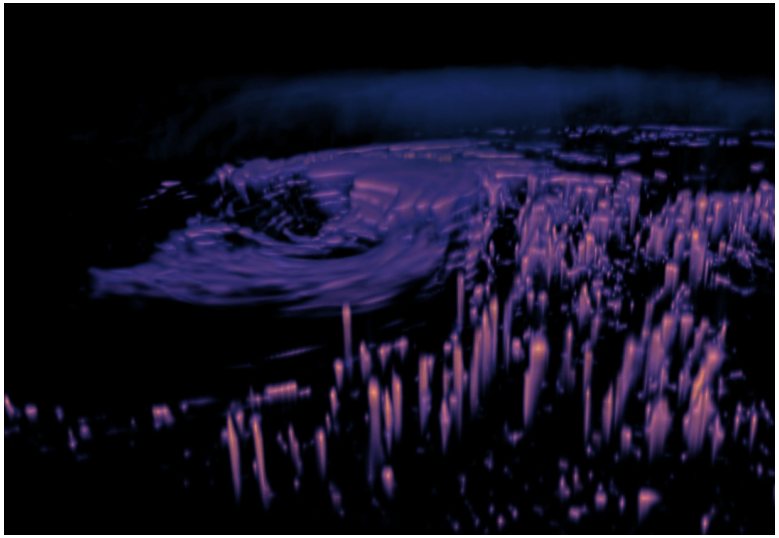

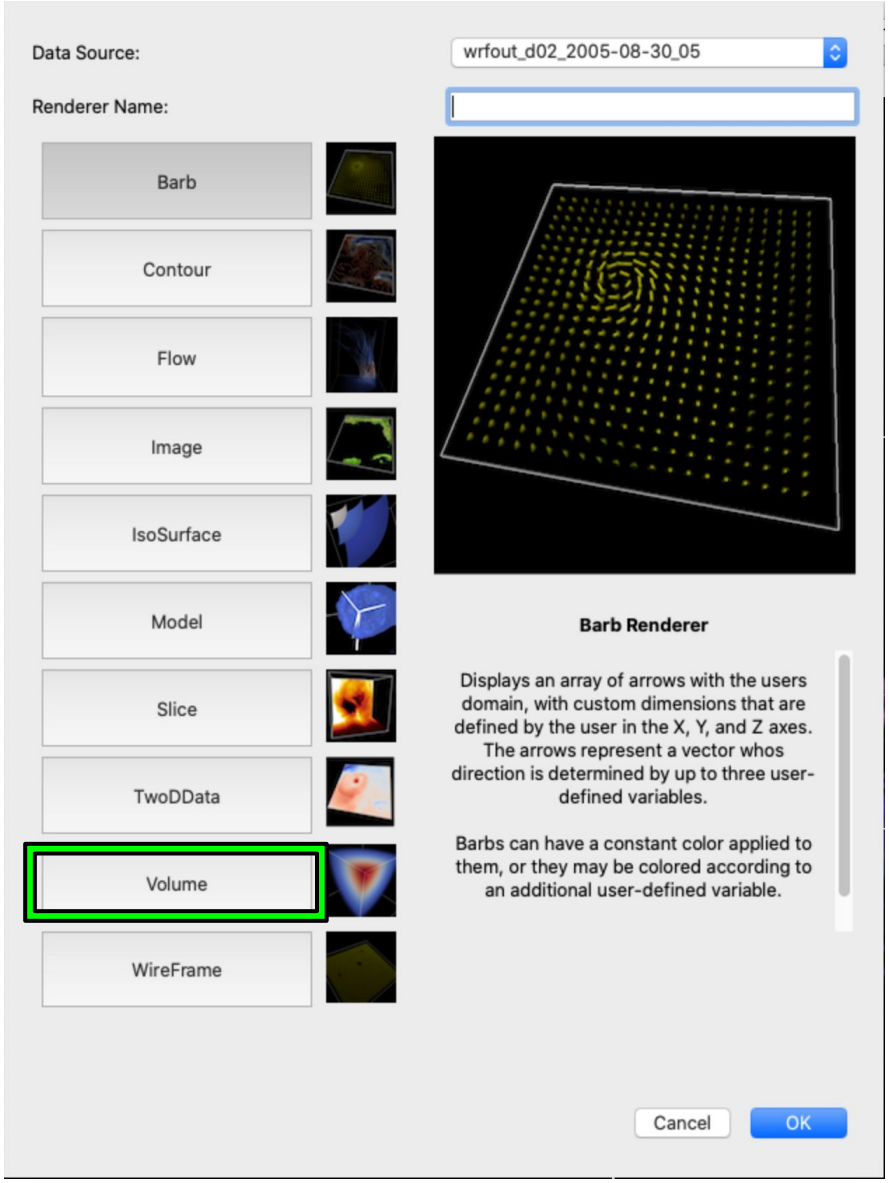

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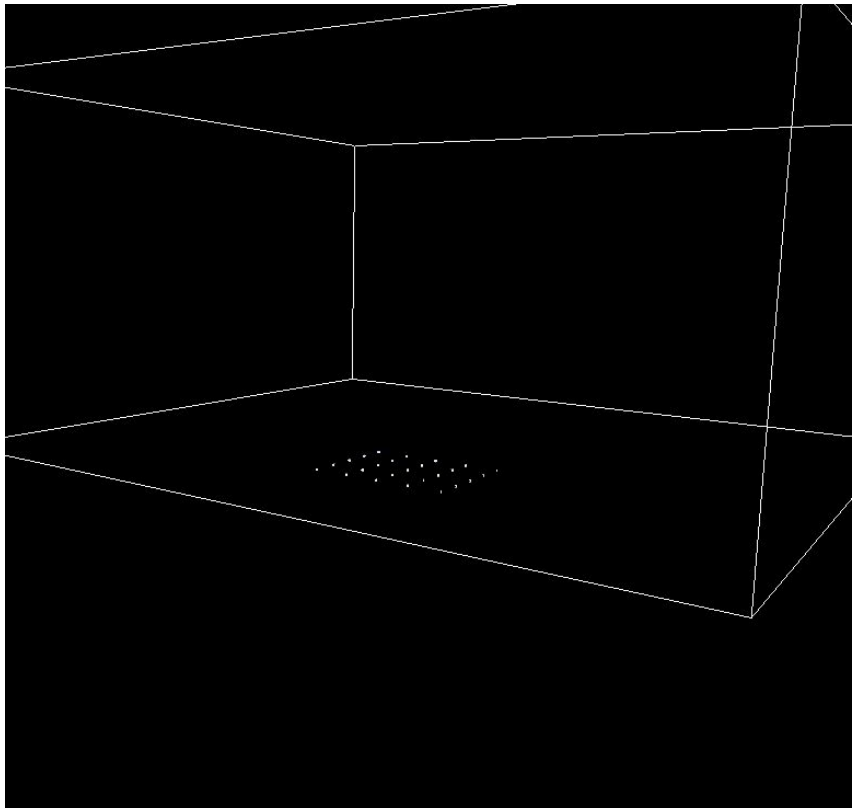

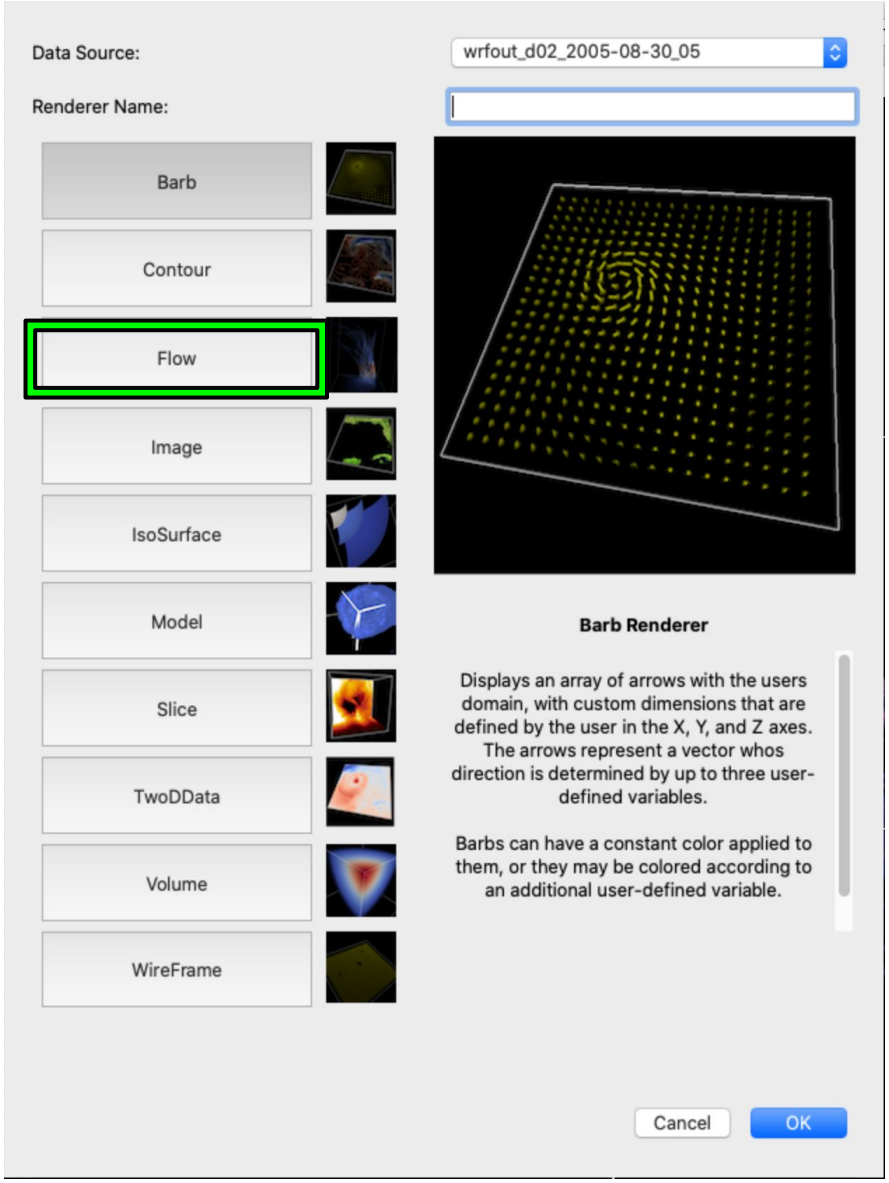

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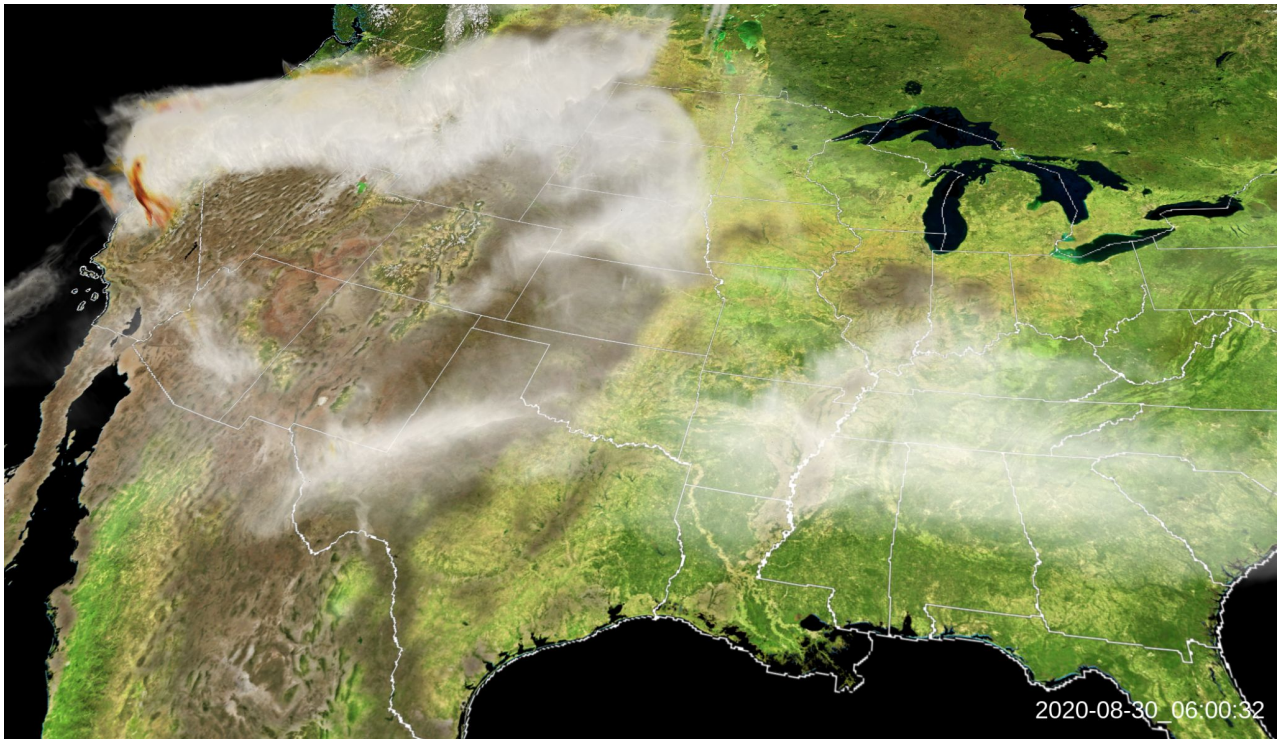
Native support:

- **WRF-ARW**
- MPAS
- NetCDF-CF
- Brick of Values (BOV)
- Data collection Particles (DCP)



Native support:

- WRF-ARW
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- NetCDF-CF
- Brick of Values (BOV)
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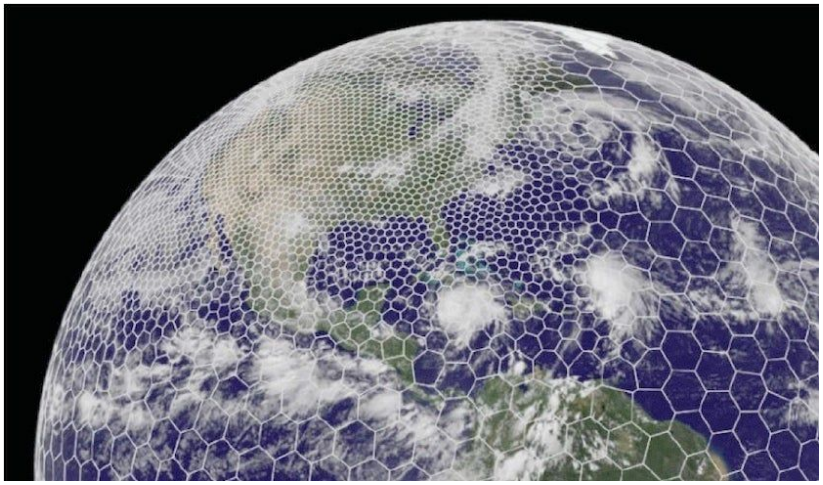

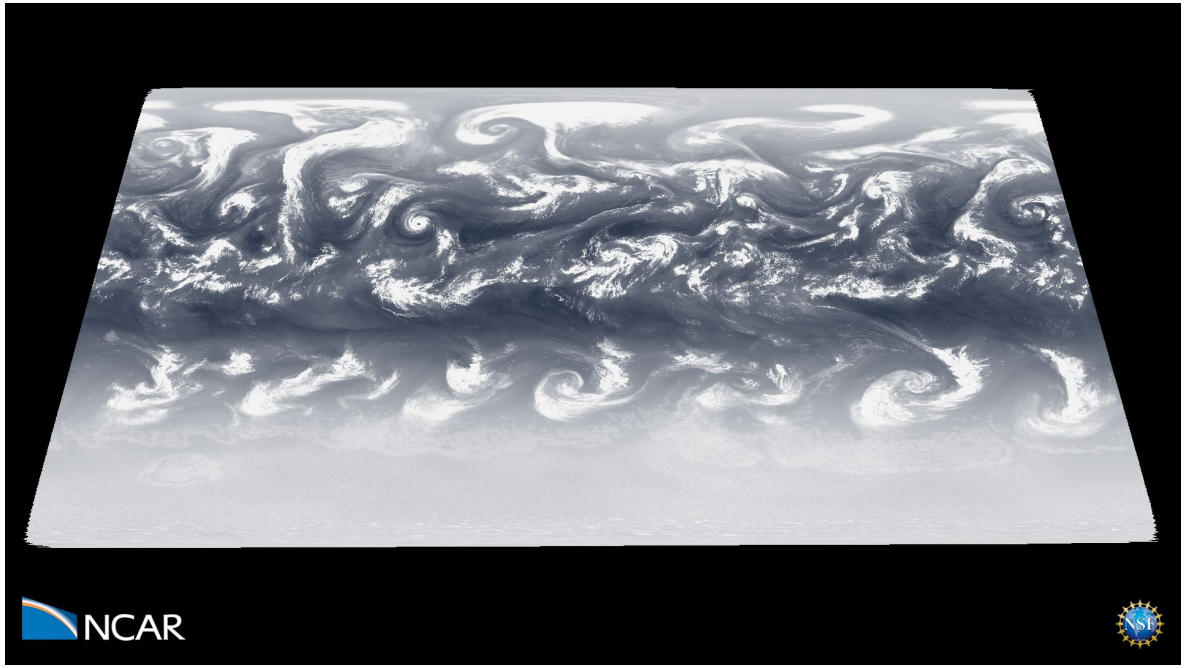

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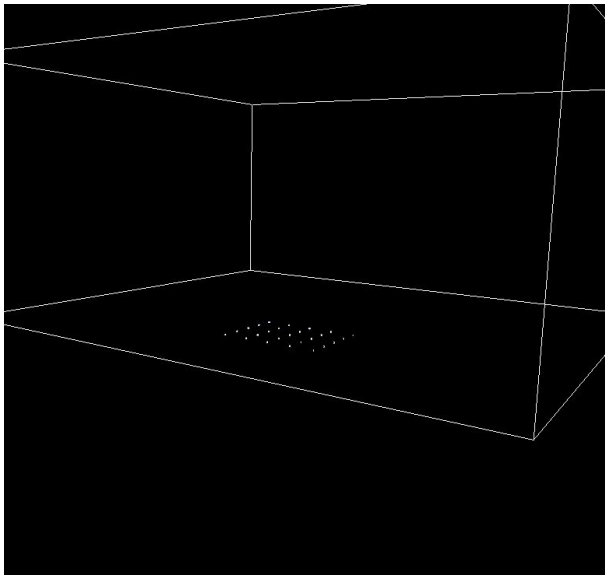

```
netcdf simple {
dimensions:
        time = UNLIMITED ; // (1 currently)
        z = 24 ;
        y = 48 ;
        x = 48 ;
variables:
        double temperature(time, z, y, x) ;
```

```
netcdf simple5 {
dimensions:
        x = 48 ;
        y = 48 ;
        z = 24 ;
        time = UNLIMITED ; // (1 currently)
variables:
        double x(x) ;
                x:axis = "X" ;
        double y(y) ;
                y:axis = "Y" ;
        double z(z) ;
                z:axis = "Z" ;
        double time(time) ;
                time:axis = "T" ;
                time:units = "seconds since 2000-1-1 0:0:0" ;
        double temperature(time, z, y, x) ;

// global attributes:
```

Native support:

- WRF-ARW
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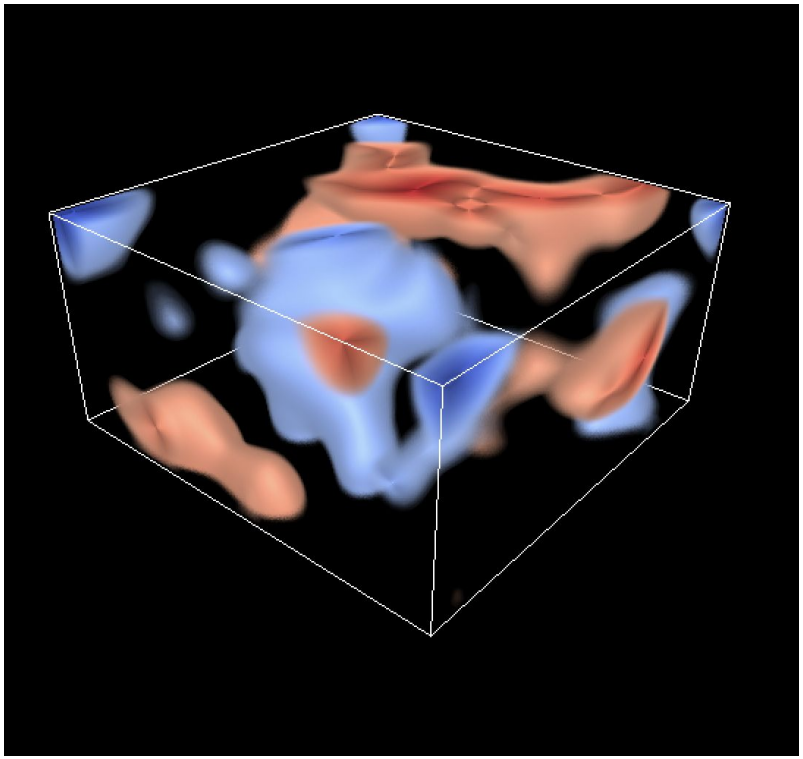
- NetCDF-CF
- **Brick of Values (BOV)**
- Data collection Particles (DCP)



```
# Example BOV file

TIME: 1.1
DATA_FILE: bovA1.bin
DATA_SIZE: 10 10 10
DATA_FORMAT: FLOAT
VARIABLE: myVariable
BRICK_ORIGIN: 0. 0. 0.
BRICK_SIZE: 10. 20. 5.
```

- Vapor Data Collection (VDC)
  View data at different levels of compression to speed up performance