tecplot®

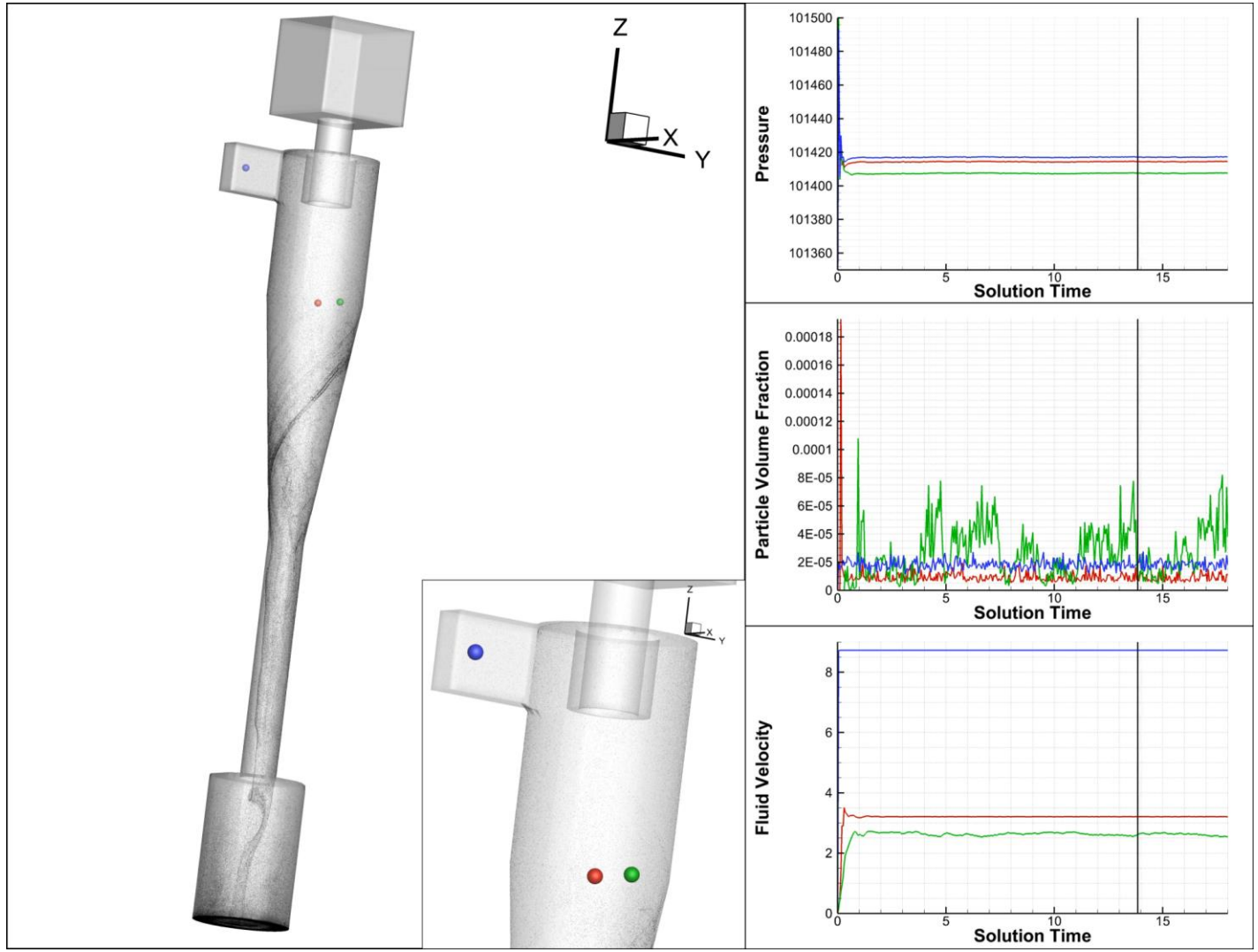
Master the View

Scott Fowler, Product Manager

Who is Tecplot?

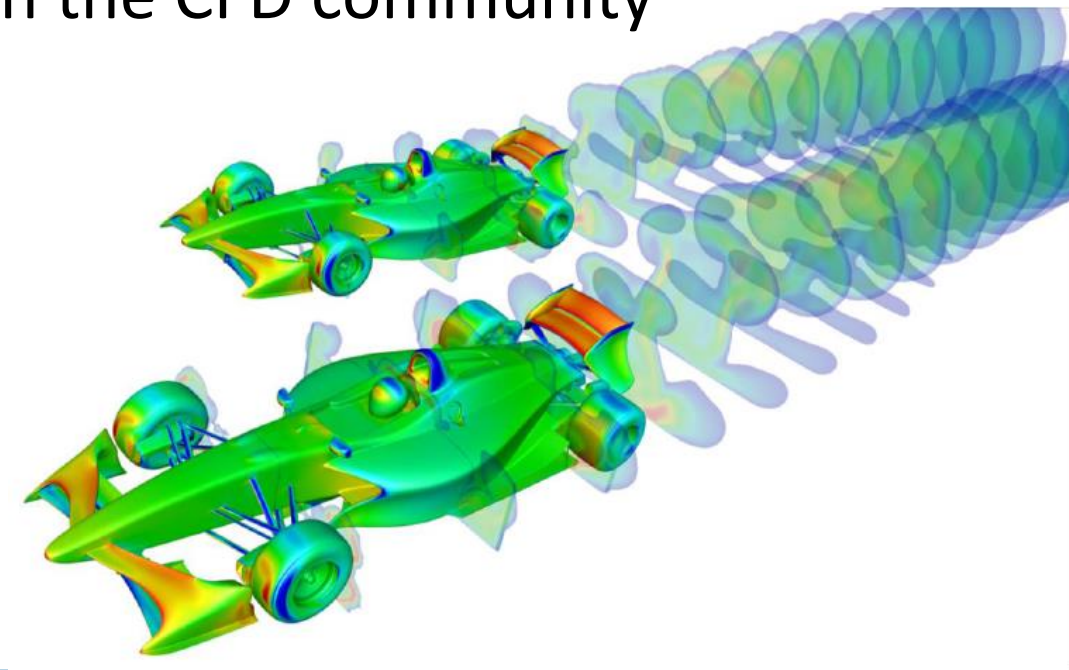
We help Engineers SEE

Empowering engineers and scientists to discover, analyze and understand information in complex data, and helping them effectively communicate their results.



Tecplot at a Glance

- Founded in 1981 by Boeing engineers – Seattle, WA
- Largest independent CFD post-processor – 47,000 users worldwide
- Known for being the most complete and flexible post-processing option
- Focused on large data and emerging needs in the CFD community



Tecplot for Barracuda

- Celebrating 3 years of Tecplot for Barracuda!
  - Unlimited use of Tecplot 360 with Barracuda data
  - Unlimited use of PyTecplot (connected mode)
  - Unlimited CPU count

- Distributed & Licensed by CPFD
- Tier 1 technical support provided by CPFD

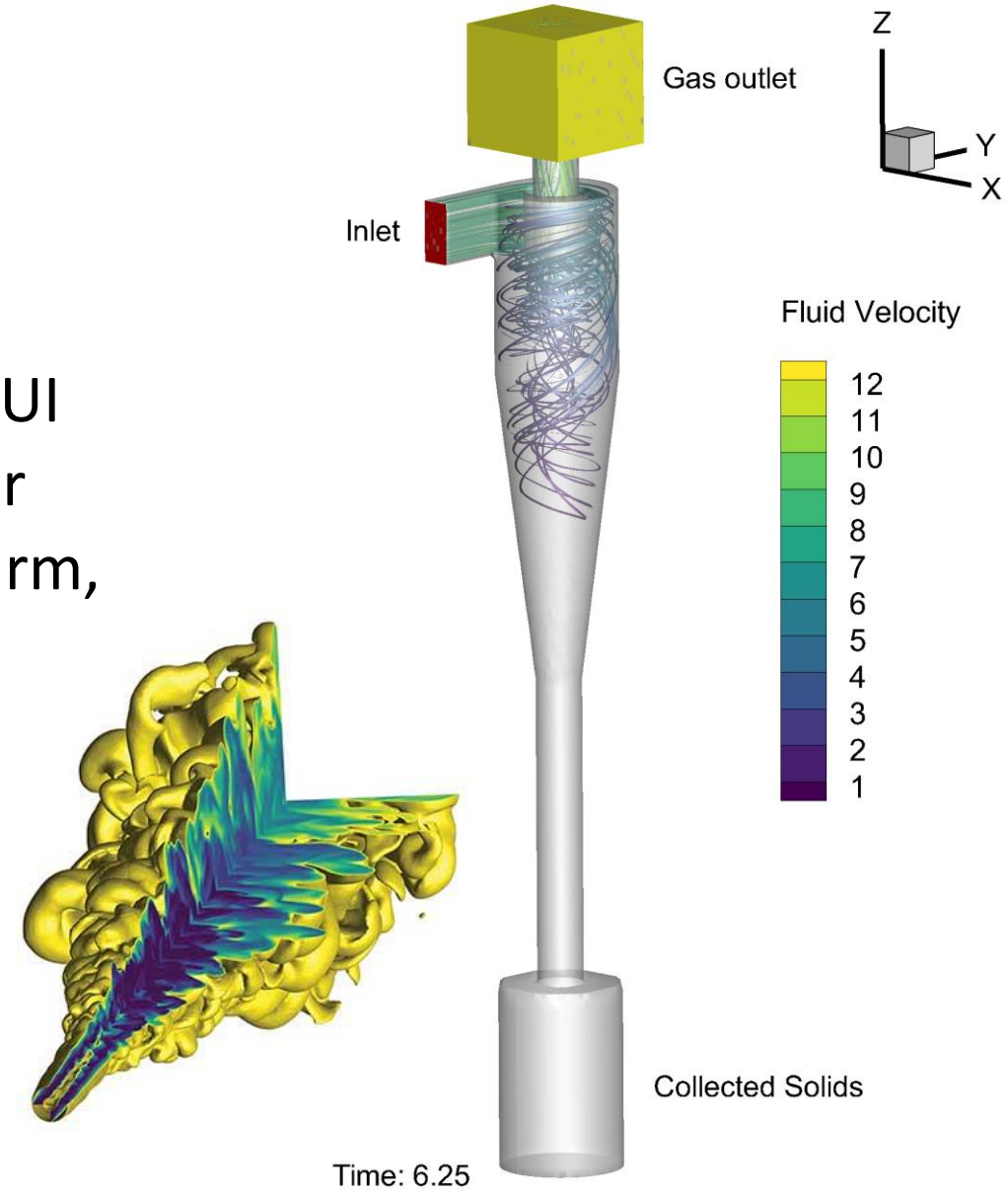
Tecplot for Barracuda

With a full license of Tecplot 360 you get

- More presentation options with multiple pages and frames
- Ability to load data from other sources & solvers
- Faster automation with batch mode
  - Use headless HPC resources or even Python multiprocessing on a single workstation
- Tecplot Chorus
  - Helps organize optimization and design of experiments work

PyTecplot

- The Python API for Tecplot 360
- Record PyTecplot scripts from the Tecplot 360 GUI
- PyTecplot supports 64-bit Python, 3.8 and newer
- Use any Python IDE: Spyder, Jupyter, Idle, PyCharm, etc.
- Gain direct access to the data
- Connect with other Python packages
- Truly headless batch mode
- Create custom GUIs to streamline workflows

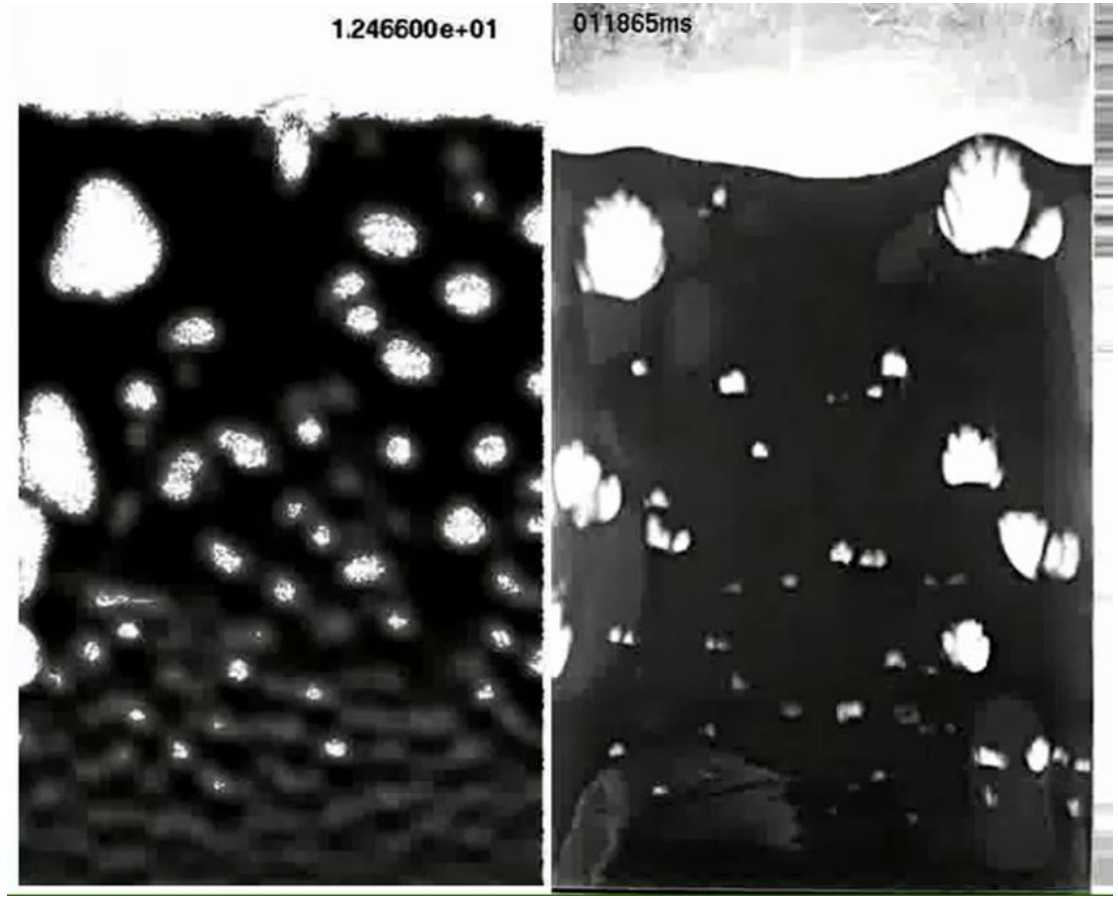


PyTecplot

```
import glob
import sys
import tecplot as tp

if '-c' in sys.argv:
    tp.session.connect()

files = ["bvr.grid.plt"]
files.extend(glob.glob("bvr.cells*.plt"))
files.extend(glob.glob("bvr.particles*.plt")
files.append("bvr.setup.plt")

tp.data.load_tecplot(files)
tp.active_frame().load_stylesheet("plot_style.sty")

for t in tp.active_frame().plot().solution_times:
    tp.active_frame().plot().solution_time = t
    tp.export.save_png(f"image_{t}.png", width=2048)
```

Advanced Analysis with Tecplot 360 & PyTecplot

Bubble Characteristics



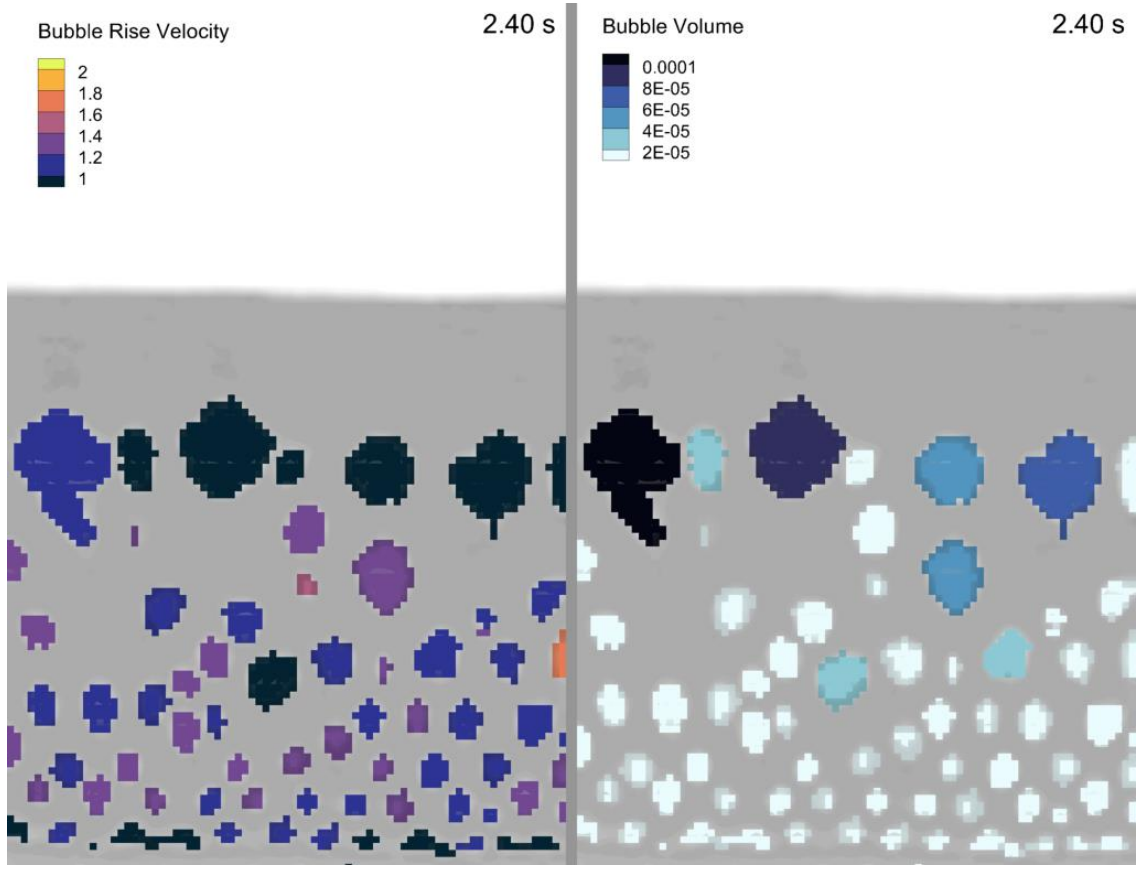
Can I quantify the bubble characteristics in a fluidized bed simulation?

Can I compute the size of the bubbles?
Can I compute the rise velocity of the bubbles?

Yes!

Advanced Analysis with Tecplot 360 & PyTecplot

Bubble Characteristics

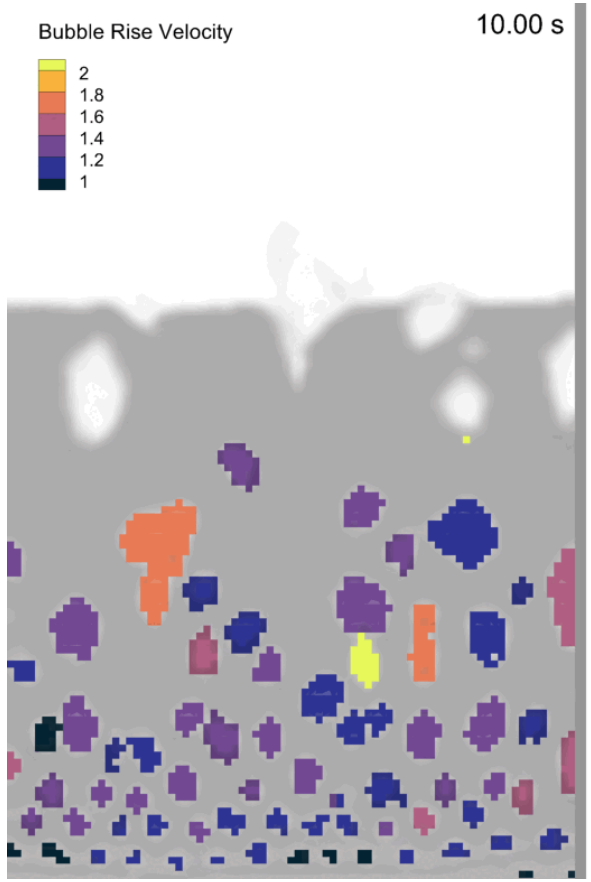


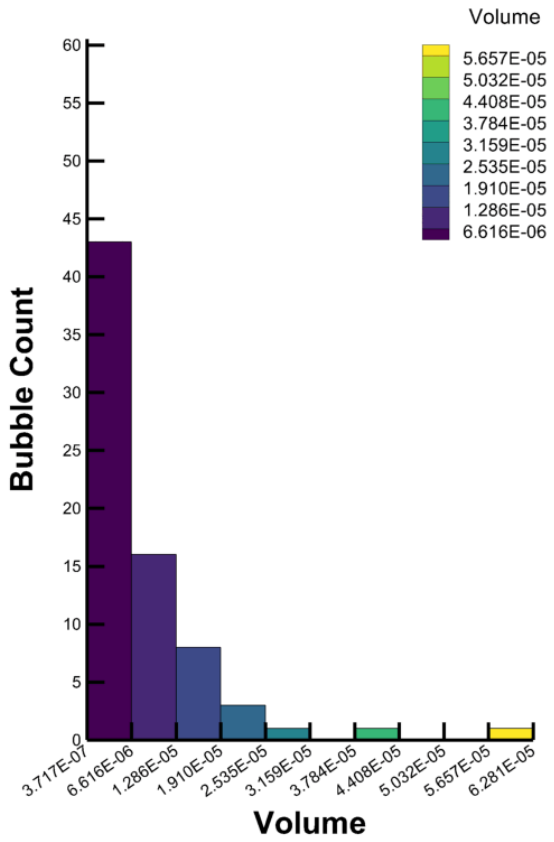
Steps

- Define the bubbles using value blanking
- Extract each separate bubble to a new zone
- Compute the volume and average z-velocity of each bubble
- Add the resulting values as new scalars in the dataset
- Plot the results

Advanced Analysis with Tecplot 360 & PyTecplot

Bubble Characteristics





Automate with PyTecplot

- Only 60 lines of code
- Repeatable with similar datasets
- Executes fast in batch-mode!

Connected Mode
1392 seconds (23 minutes)

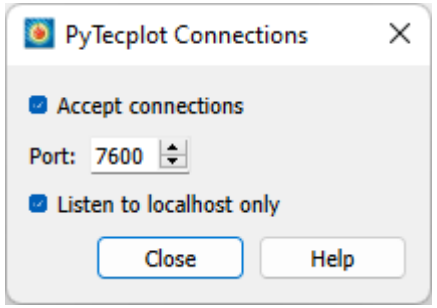
Batch Mode
Serial: 35.7 seconds (39x faster)
4 cores: 17.7
8 cores: 11.4
16 cores: 7.8
32 cores: 7.3 (4.8x faster than serial, 190x faster than connected)

Advanced Analysis with Tecplot 360 & PyTecplot

Batch vs Connected

Connected Mode (included with Tecplot for Barracuda)

- PyTecplot drives the Tecplot 360 GUI
- Communication with the GUI is done through socket connections
- Great for developing and debugging PyTecplot scripts
- Not great for data analysis, as large data arrays need to be passed over sockets

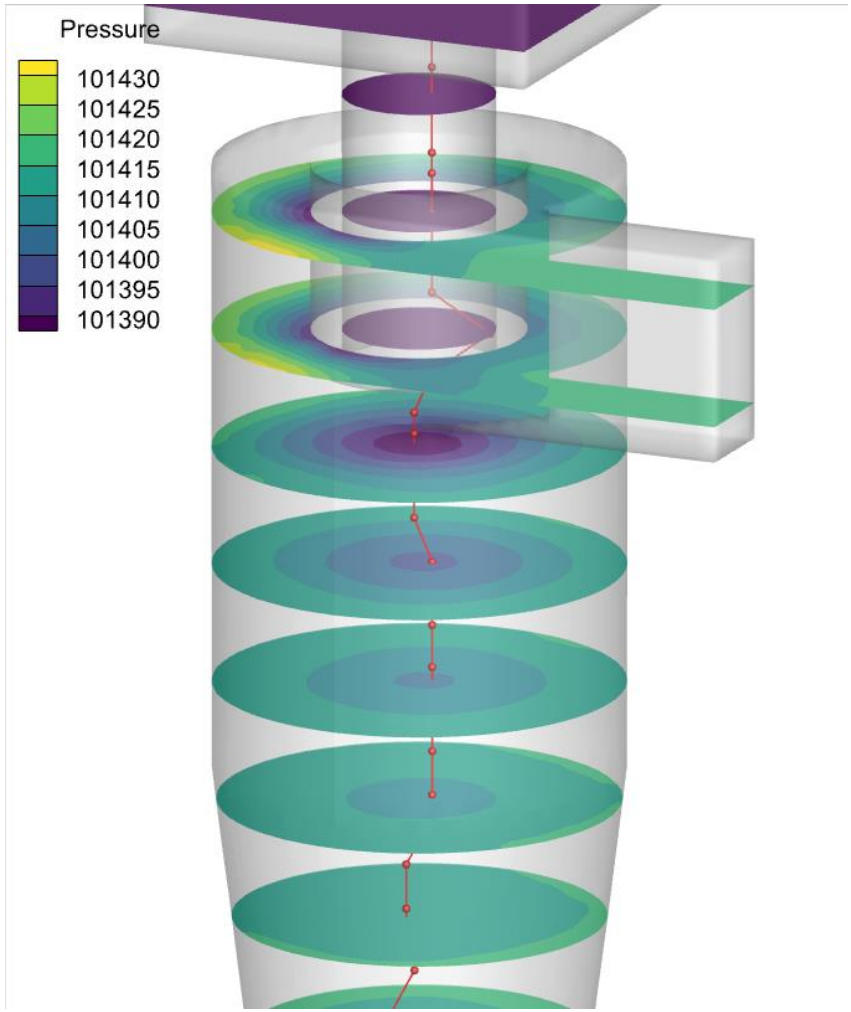


Batch Mode (requires Tecplot 360)

- Runs truly headless
- Uses the Tecplot 360 “engine” – has all the capabilities of the 360 GUI
- Great for data analysis as large data arrays are passed by pointer (fast)
- Can be run embarrassingly parallel on HPC or on a single node using Python’s multiprocessing module

Advanced Analysis with Tecplot 360 & PyTecplot

Locate Minimum Pressure

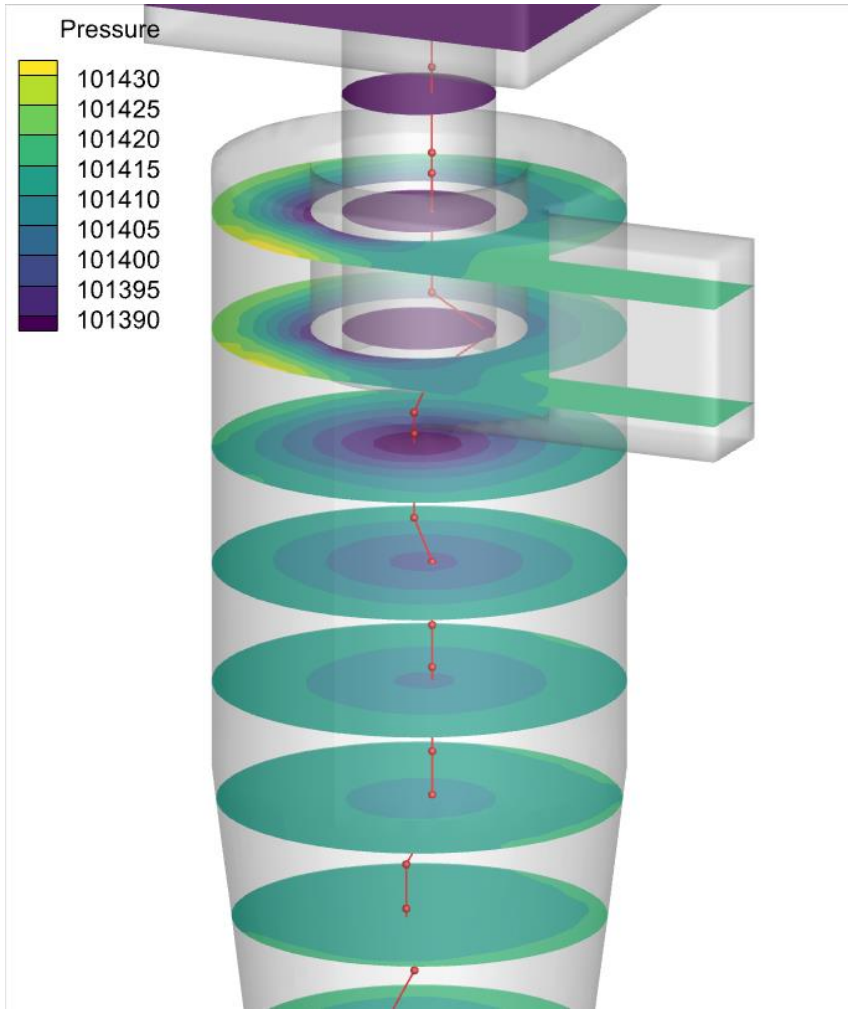


Can I identify the location of minimum pressure with respect to height?

Yes!

Advanced Analysis with Tecplot 360 & PyTecplot

Locate Minimum Pressure

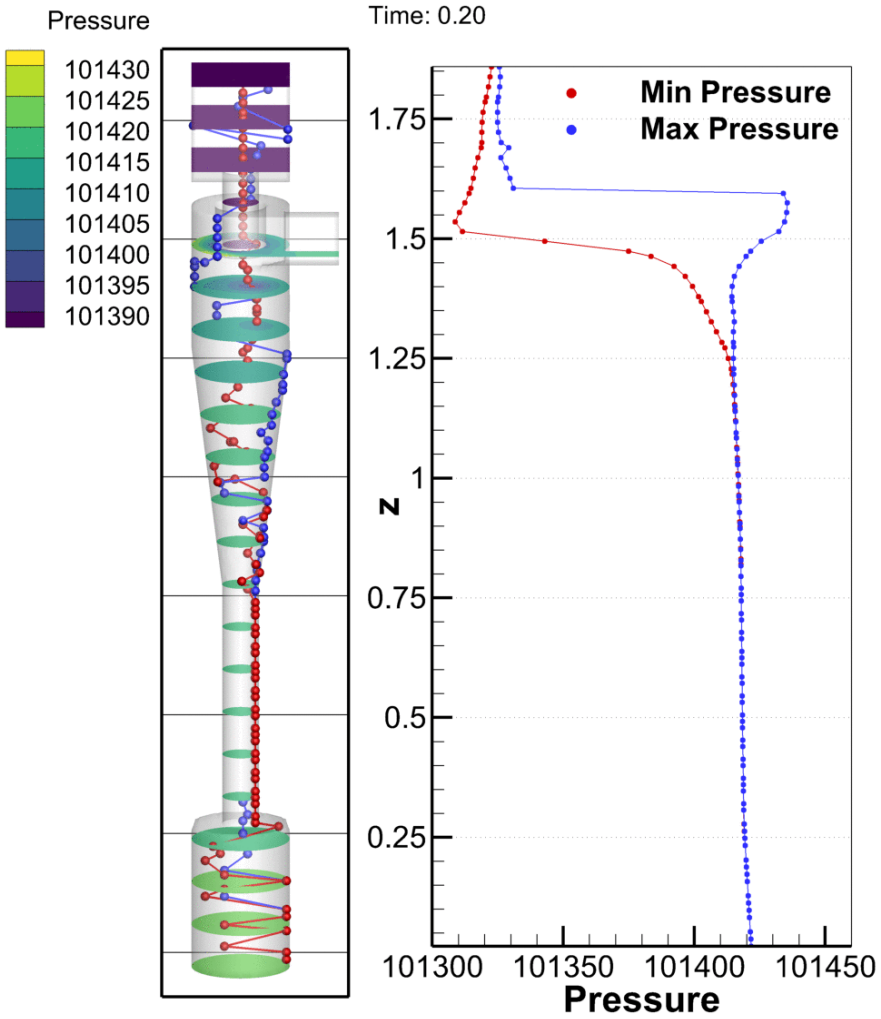


Steps

- Extract slices at regular Z intervals
- Use PyTecplot to locate the cell which has the minimum pressure value
- Get the XYZ location at that cell number
- Create a new linear zone which contains the results

Advanced Analysis with Tecplot 360 & PyTecplot

Locate Minimum Pressure



Automate with PyTecplot

- Only 60 lines of code (again!)
- 361 timesteps, 6.7Gb
- https://github.com/Tecplot/handyscripts/blob/master/jupyter_notebooks/MinimumPressure/MinimumPressureLocation.ipynb

Connected Mode

30,600 seconds (510 minutes)

Batch Mode

Serial: 776 seconds (39x faster than connected)
2 cores: 338 seconds
4 cores: 145 seconds
8 cores: 70 seconds
16 cores: 43 seconds
32 cores: 37 seconds (21x faster than serial, 827x faster than connected)

Summary

Tecplot 360

- Load data from multiple sources
- Unlimited CPU threads
- Organize your layouts using multiple pages

Tecplot Chorus

- Perform comparative analysis
- Explore design spaces, operating envelopes, geometry configurations

PyTecplot

- Speed up automation with PyTecplot
- Build custom GUIs
- Headless plot generation

Summary

- Tecplot 360 is about more than just making pretty pictures and movies. It's about knowledge extraction.
- Get more information out of your Barracuda simulation results with PyTecplot.
- And get that information faster in batch mode!

- Use support@tecplot.com as a resource!

Thank you, CPFD!