Exchange Workshop

2023-04-25

What are the Exchange Workshops?

- A space to learn practical skills useful for all (or most) of our phd students, and valued elsewhere, e.g.
  - Data exploration and figure preparation
  - Useful statistics (e.g. error bars)
  - Version control and project management
  - Software and laboratory tools and workflows
  - Essentials of machine learning
- A place to share what you know on those topics with your colleagues and get recognition

What are the Exchange Workshops?

- Workshops are organized twice per year (april/may, october/november)
- They are fully hands-on: learn-by-doing, not learn-by-listening
- You can suggest new topics and volunteer as instructors
- All resources will remain accessible at (and discussion can continue through) Aero's GitHub repositories

We need your feedback!

- After this first workshop, let us know what you think through the survey that we will hand out

XW1 Paraview: Needed materials

- Paraview 5.11 (https://www.paraview.org/)
- Python >=3.10 + Numpy + VTK (Miniconda)
- Datasets (Drive)

XW1 Paraview: Agenda

- Introduction to Paraview (Oscar, 15 min)
- First tutorial exercise (Pedro Jiménez, 1h 15 min)
- Coffee Break (10 min)
- Second tutorial exercise (Juan Manuel Catalán, 1h 15 min)
- Advanced tutorial: scripting (Carlos Martínez, 45 min)

XW1 Paraview: Tasks after the Workshop!

- (Easy): Produce and submit one figure (using tutorial datasets or your own)
- (Super easy): Complete feedback survey
- Receive your participation certificate

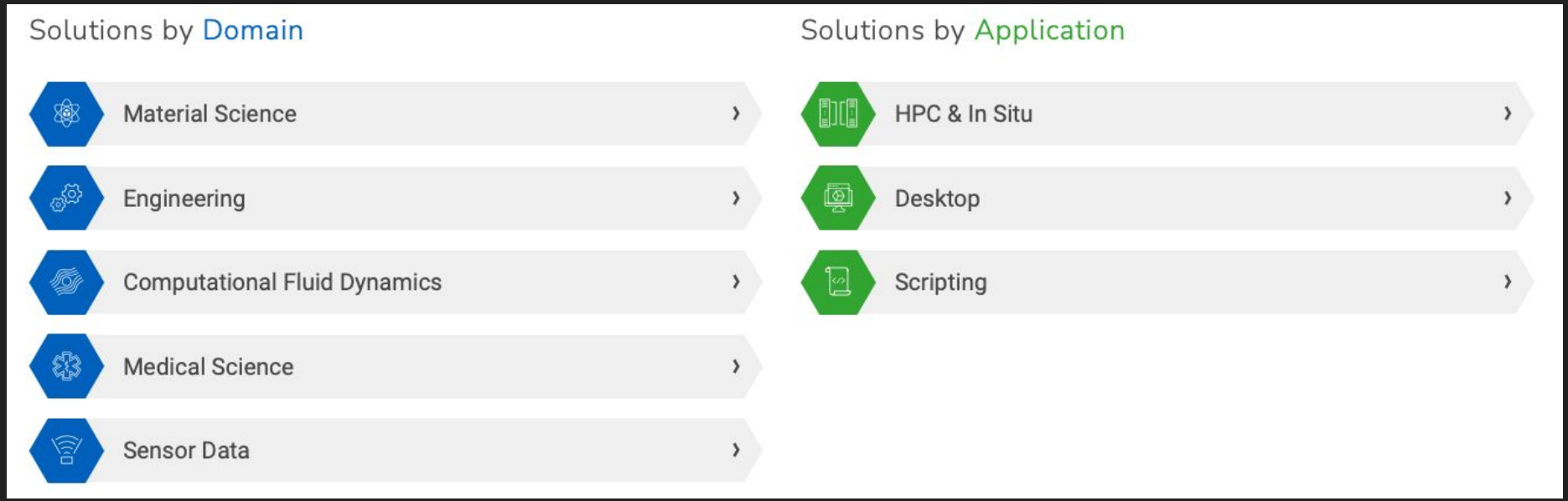
Introduction to Paraview

Introduction to Paraview

ParaView is the world's leading open source tool for the analysis and visualization of simulation and laboratory data

- Interactive: build pipelines with custom filters to create the views that you want of your data. You can compute derived variables, query for max/min, etc
- Automatizable: batch processing through saved states and scripting (even in-situ during a simulation!)
- Scalable: Can open huge datasets, in parallel, locally or remotely using the aggregate disk space, processing power, and memory of a cluster
- Cross-platform: Windows, Linux, Mac
- Extensible: as it is open source and scriptable, it is possible to develop plugins and connect paraview with other tools

Introduction to Paraview



What can Paraview do for your research?

1) Explore complex datasets **interactively**

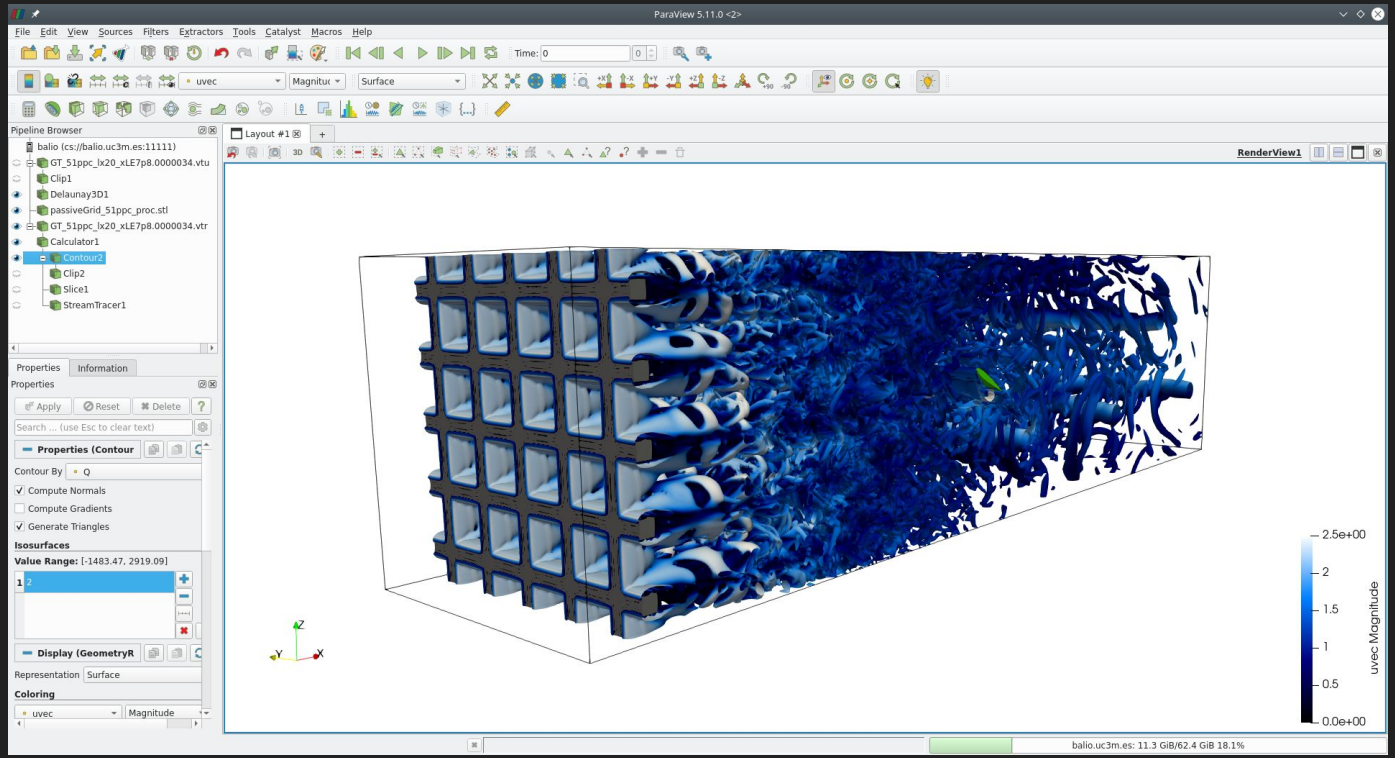
Raw data:

$\vec{u}(\vec{x},t)$ $p(\vec{x},t)$

~512^3 grid points
~100 time snapshots

Features of interest:

- Vortical structures
- Flow trajectories
- Define planes for further analysis



What can Paraview do for your research?

1) Explore complex datasets **interactively**

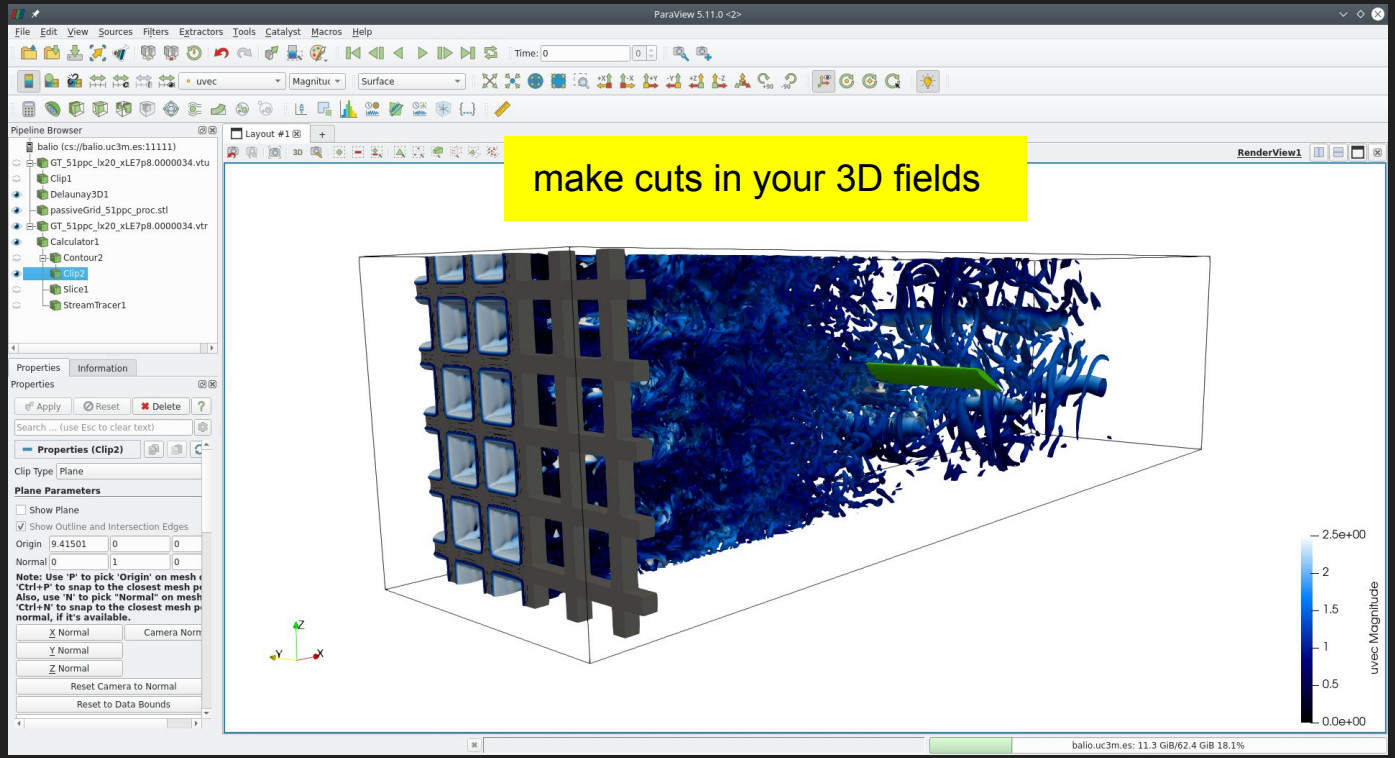
Raw data:

$\vec{u}(\vec{x},t)$ $p(\vec{x},t)$

~512^3 grid points
~100 time snapshots

Features of interest:

- Vortical structures
- Flow trajectories
- Define planes for further analysis



What can Paraview do for your research?

1) Explore complex datasets **interactively**

Raw data:

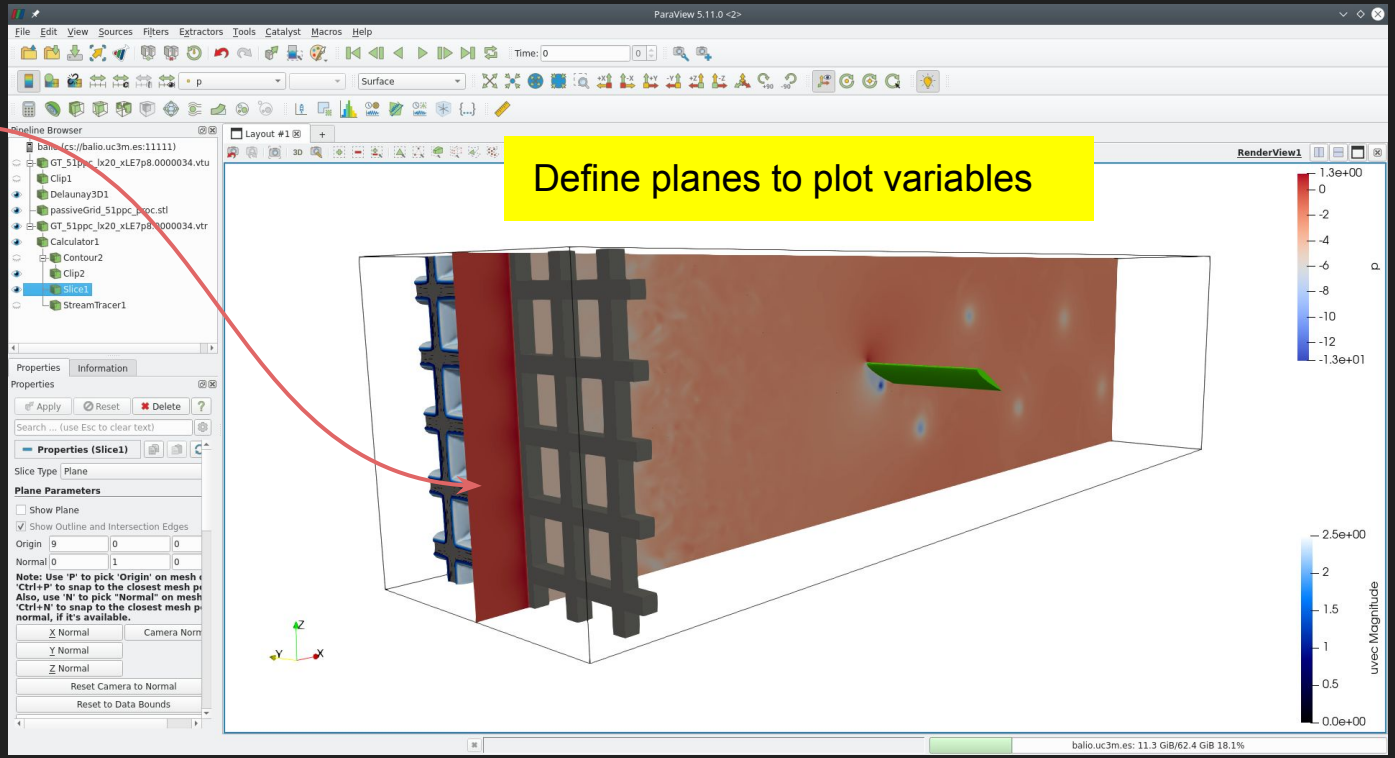
$\vec{u}(\vec{x},t)$ $p(\vec{x},t)$

~512^3 grid points

~100 time snapshots

Features of interest:

- Vortical structures
- Flow trajectories
- Define planes for further analysis



What can Paraview do for your research?

1) Explore complex datasets **interactively**

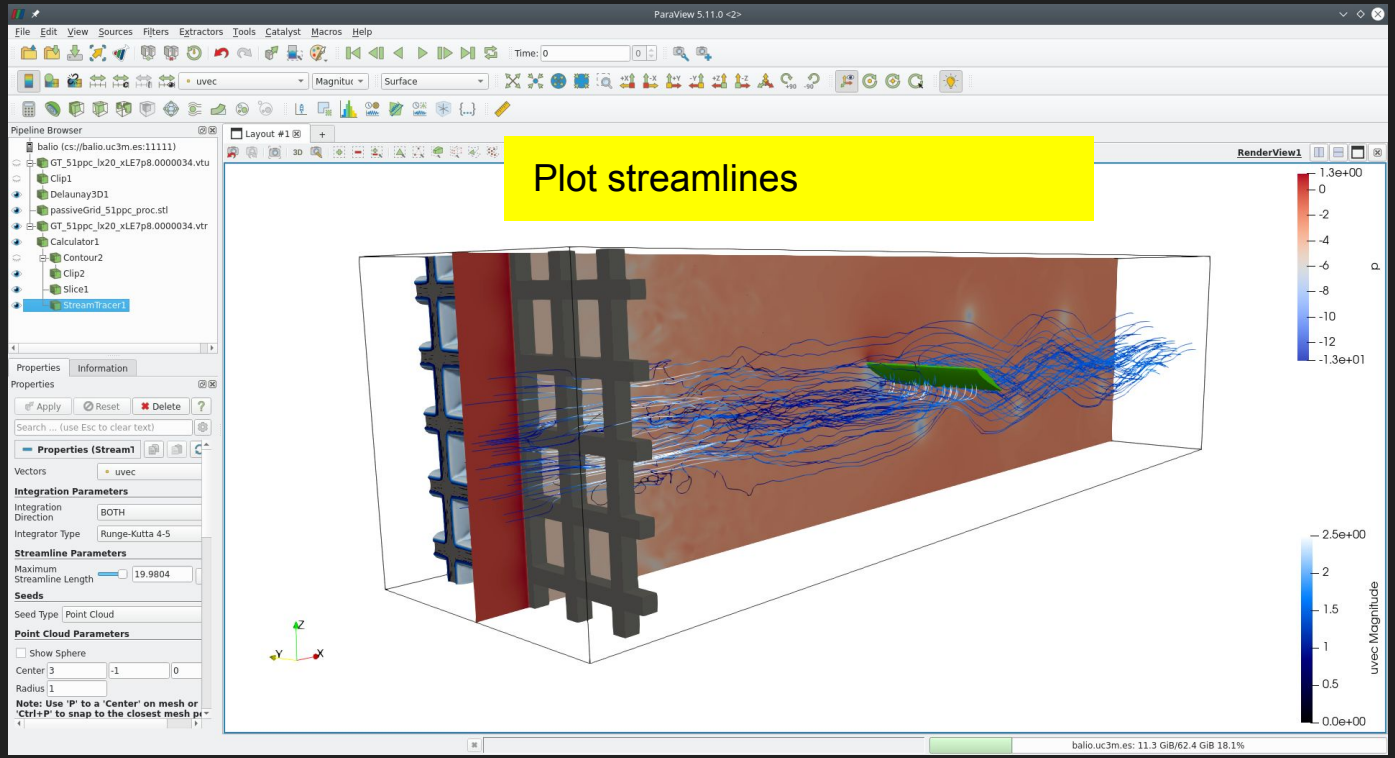
Raw data:

$\vec{u}(\vec{x},t)$ $p(\vec{x},t)$

~512^3 grid points
~100 time snapshots

Features of interest:

- Vortical structures
- Flow trajectories
- Define planes for further analysis



What can Paraview do for your research?

1) Explore complex datasets **interactively**

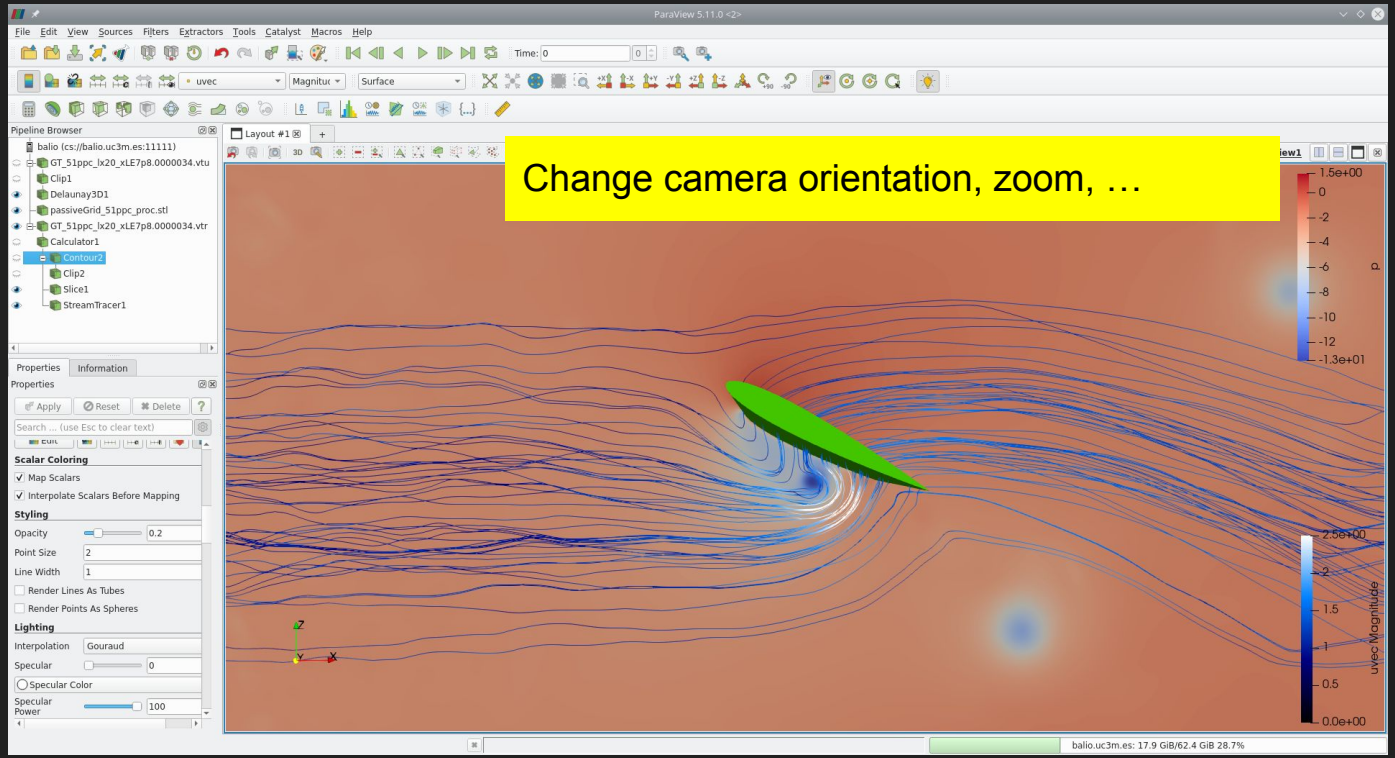
Raw data:

$\vec{u}(\vec{x},t)$ $p(\vec{x},t)$

~512^3 grid points
~100 time snapshots

Features of interest:

- Vortical structures
- Flow trajectories
- Define planes for further analysis



What can Paraview do for your research?

1) Explore complex datasets **interactively**

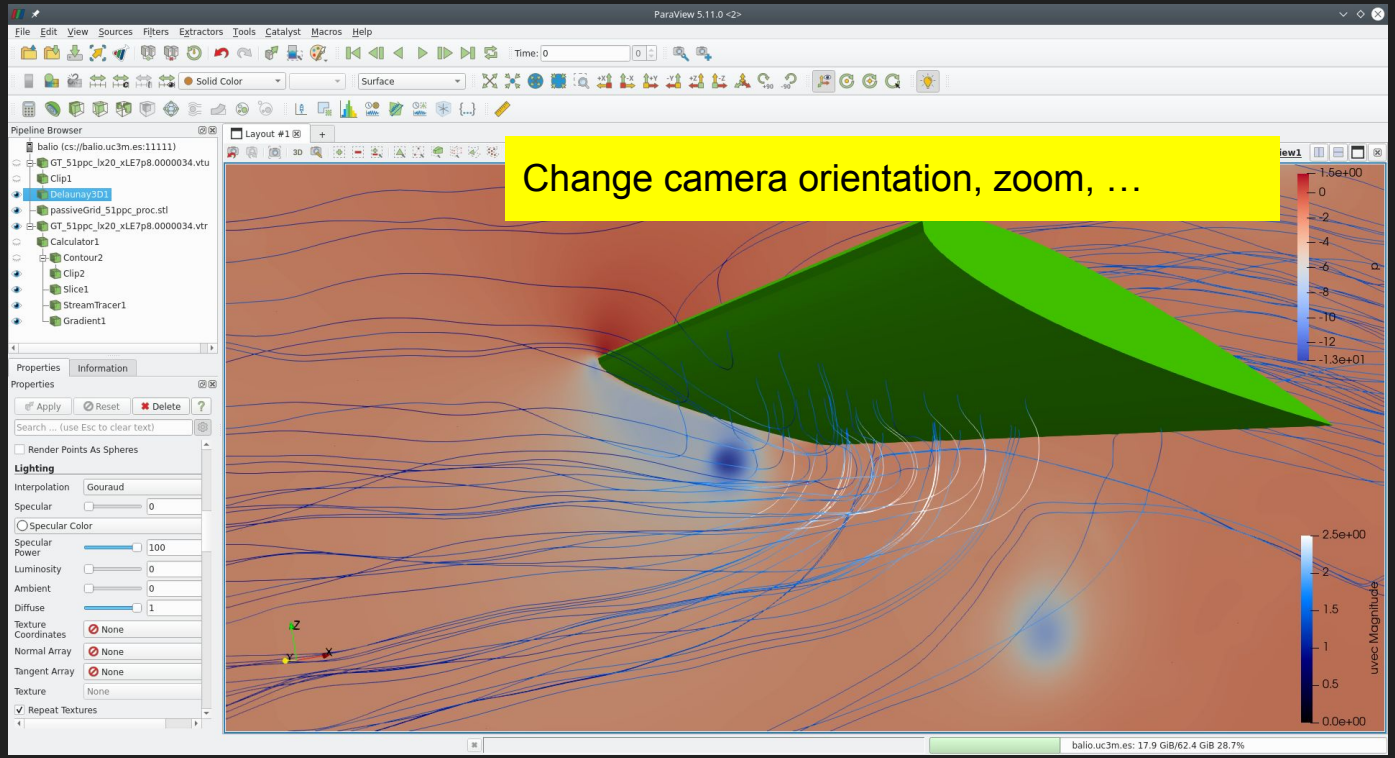
Raw data:

$\vec{u}(\vec{x},t)$ $p(\vec{x},t)$

~512^3 grid points
~100 time snapshots

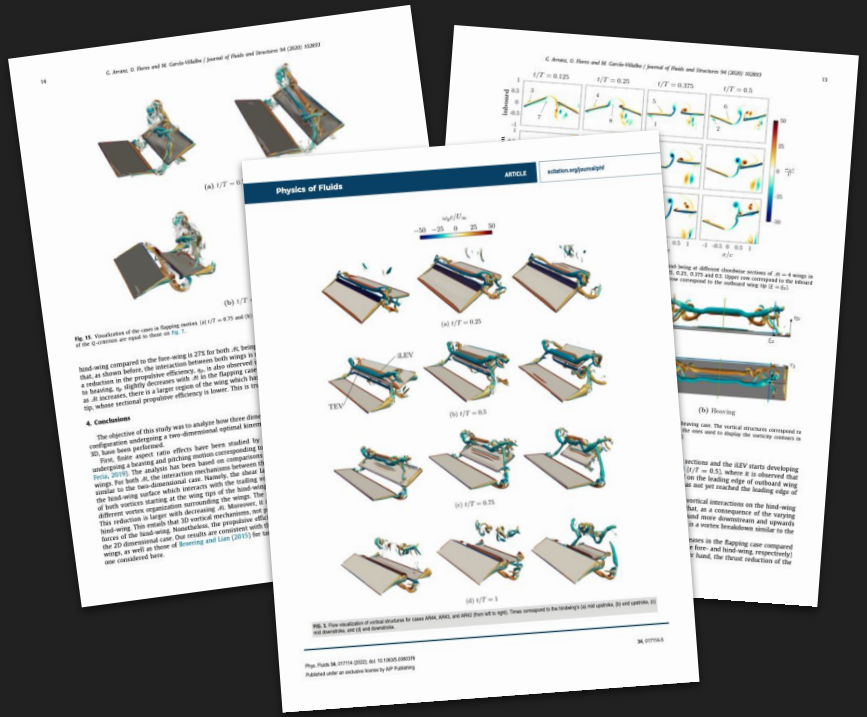
Features of interest:

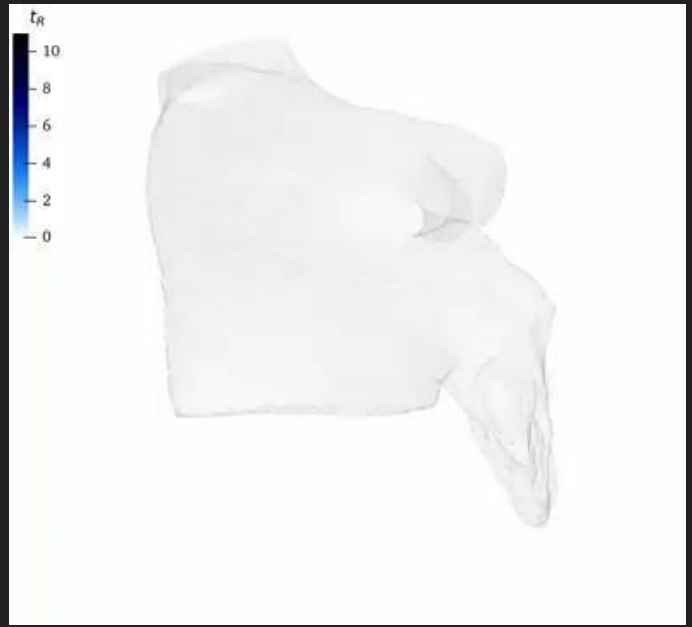
- Vortical structures
- Flow trajectories
- Define planes for further analysis



What can Paraview do for your research?

1) Explore complex datasets **interactively**
2) Prepare high quality figures and videos for papers and presentations.





The learning curve of Paraview

- Easy to start plotting things, some advanced features are harder to master.

- Paraview reads data in a variety of formats …

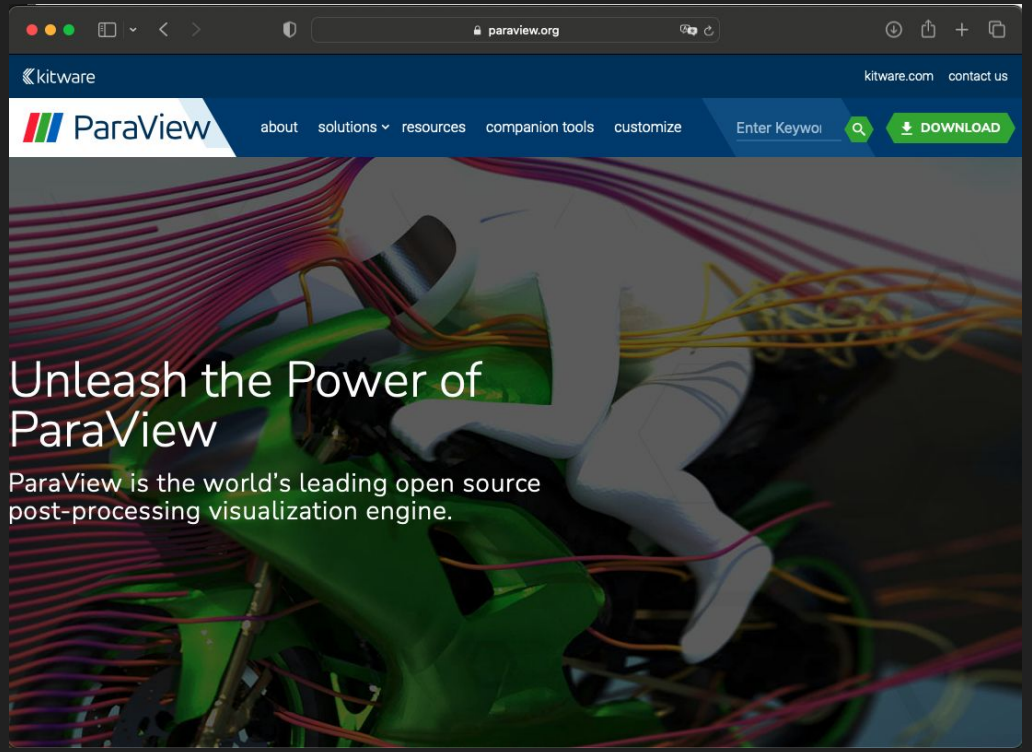
ParaView contains readers for these well-known file formats:

- ADIOS 2
- AMReX
- Ansys Ensight
- CAM
- CGNS
- Chombo
- CFD
- CONVERGE CFD
- CosmoReader (Cosmo and Gadget2 particle formats)
- EnSight CASE
- Enzo
- EXODUS
- Flash
- Fluent
- GenericIO
- GDAL
- LAMPSS
- LS-DYNA
- FEM
- MOC
- MPAS
- Nek5000
- NetCDF (CF)
- OpenFOAM
- Plot3D
- Protein Data Bank
- Spyplot
- Tecplot
- Unstructured POP
- XDMF

The learning curve of Paraview

- Easy to start plotting things, some advanced features are harder to master.

- Paraview reads data in a variety of formats … and there is plenty of information online (Tutorials, wikis, libraries, …)



What will you (hopefully) learn in this workshop?

1) Load datasets in VTK format (from GUI)
2) Use the GUI to plot scalar and vector fields, and explore them
3) Save figures and videos
4) Start using the python interpreter to load datasets and automatize plotting your data.

XW1 Paraview: Agenda

- Introduction to Paraview (Oscar, 15 min)
- First tutorial exercise (Pedro Jiménez, 1h 15 min)
- Coffee Break (10 min)
- Second tutorial exercise (Juan Manuel Catalán, 1h 15 min)
- Advanced tutorial: scripting (Carlos Martínez, 45 min)

After the workshop: Task description

XW1 Paraview: Tasks after the Workshop!

We will email you with all the details in a few days, but here is the summary of what you will need to do:

- (Easy): Produce and submit one figure (using tutorial datasets or your own)
- (Super easy): Complete feedback survey
- Receive your participation certificate

Further information

Where to get help?

https://docs.paraview.org/en/latest/

https://docs.paraview.org/en/latest/UsersGuide/index.html

https://docs.paraview.org/en/latest/Tutorials/SelfDirectedTutorial/index.html

https://docs.paraview.org/en/latest/Tutorials/ClassroomTutorials/index.html

Paraview repository

https://gitlab.kitware.com/paraview/paraview