Scientific Visualization 101

ParaView: *An Introductory Hands-On Workshop*

KAUST Visualization Core Lab

Thomas Theußl

Workshop Site: *https://wiki.vis.kaust.edu.sa/training/scivis/2024/paraviewintro*
Install ParaView 5.11.2: https://www.paraview.org/download/

Resources

Presenter/KVL Contact Info:

- Thomas Theußl:
  thomas.theussl@kaust.edu.sa

- KVL website: wiki.vis.kaust.edu.sa

- General Inquiries: help@vis.kaust.edu.sa

User Resources:

- User Guides:
  - https://docs.paraview.org/en/latest/
  - Previously recorded YouTube video

Developer Resources:

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

Workshop Setup

- Local installation of ParaView 5.11.2

- Download example data:
  - https://wiki.vis.kaust.edu.sa/training/scivis/2024/paraviewintro

How to Prepare?

- Review and download the workshop materials
- Bring a laptop with ParaView installed
- ParaView version 5.11 or newer is recommended for the workshop. You can download it from 🌐 here.

Workshop Materials

- Slides: 🌐 slides.pdf
- Data: 🌐 datasets.zip
- Previously recorded 🌐 YouTube video

Visualization Core Lab

Overview of Facilities & Services

KAUST CORE LABS

12 CORE LABS

270 HEADCOUNT
45 FIELDS OF EXPERTISE

MANAGEMENT AND CENTRAL OPERATIONS
29 Staff

ANALYTICAL CHEMISTRY
21 Staff

IMAGING AND CHARACTERIZATION
26 Staff

PLANT GROWTH
10 Staff

ANIMAL RESOURCES
1 Staff

LAB EQUIPMENT MAINTENANCE
27 Staff

RADIATION LABELING
1 Staff

BIOSCIENCE
25 Staff

NANOFABRICATION
19 Staff

SUPERCOMPUTING
18 Staff

COASTAL AND MARINE RESOURCES
50 Staff

PROTOTYPING AND PRODUCT DEVELOPMENT
38 Staff

VISUALIZATION
6 Staff

The Team

help@vis.kaust.edu.sa

Dr. Sohaib Ghani
(LEAD STAFF SCIENTIST)

- VISUAL ANALYTICS
- INFORMATION VIS
- STATISTICAL ANALYSIS

Thomas Theussl
SCIVIS

- SCIENTIFIC VISUALIZATION
- LARGE DATA ANALYSIS
- DISTRIBUTED VISUALIZATION

Dr. James Kress
HPC SCIVIS

- VISUALIZATION SOFTWARE
- HPC INSITU VISUALIZATION
- DISTRIBUTED VISUALIZATION

Dr. Ronell Sicat
VR/AR

- SCIENTIFIC VISUALIZATION
- VR DEVELOPMENT
- 3D RECONSTRUCTION

Dr. Didier Barradas
Data Scientist

- DATA SCIENCE
- MACHINE LEARNING
- DEEP LEARNING

Dr. Abdelghafour Halimi
Data Scientist

- Data Science
- Machine Learning
- Deep Learning

FACILITIES AND SPACES

ZONE 1/2 DISPLAY WALLS: 2D/3D Analytics

HMD's

CUBES VR

ZONE 5 VR

MULTI-PURPOSE ROOM

Accessing KVL Facilities

- Book here (requires Portal Credentials):
  - https://wiki.vis.kaust.edu.sa/booking

Upcoming Training Events

Scientific Visualization Workshop Series Spring 2024

Date	Training Event	Speaker	Registration
February 13, 2024	Scientific Visualization 101: ParaView ~ An Introductory Hands-On Workshop	Thomas Theußl	🌐 Register Now
February 20, 2024	Scientific Visualization 210: ParaView ~ In Situ Visualization using Catalyst	James Kress	🌐 Register Now
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Edit

Avizo Workshop Series By Thermofisher and KVL, Spring 2024

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March 4, 2024	Scientific Visualization 101: Avizo (Day 1) ~ Introductory Level	Sarawuth Wantha	🌐 Register Now
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Hands-on AI Tools and Techniques Workshop Series (Arabic version) Spring 2024

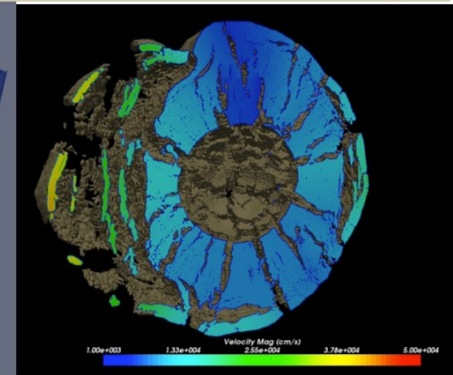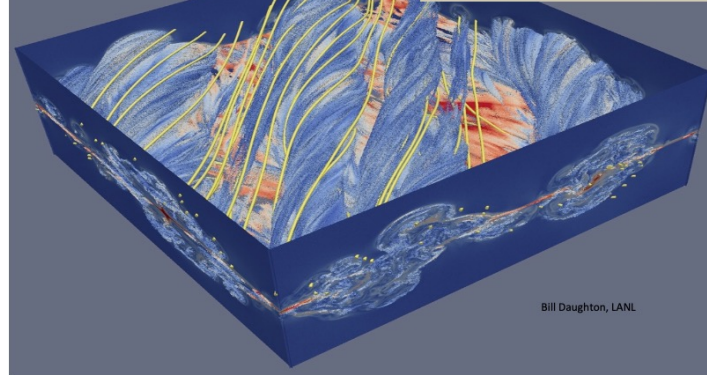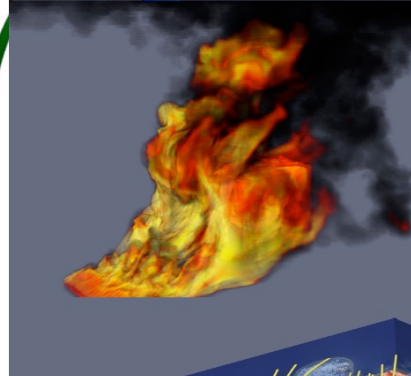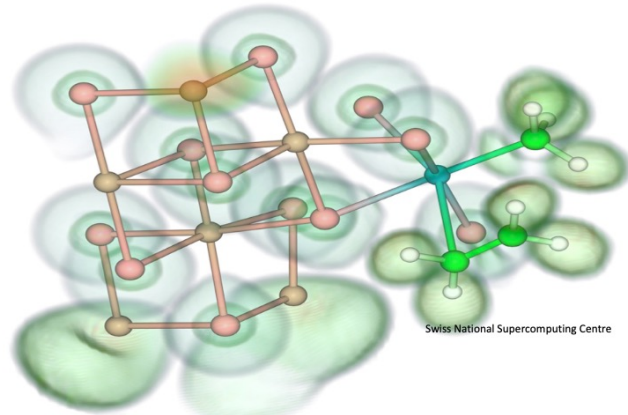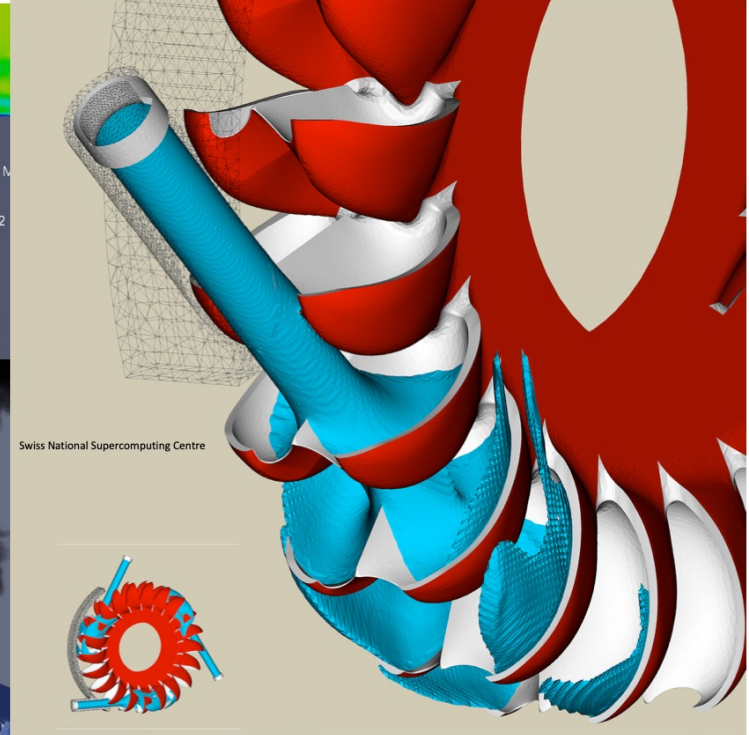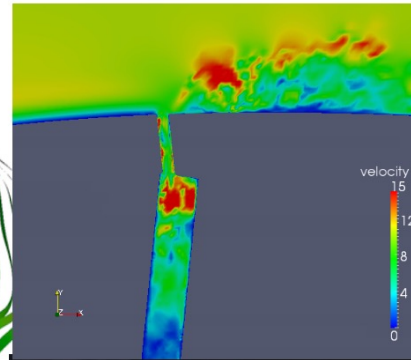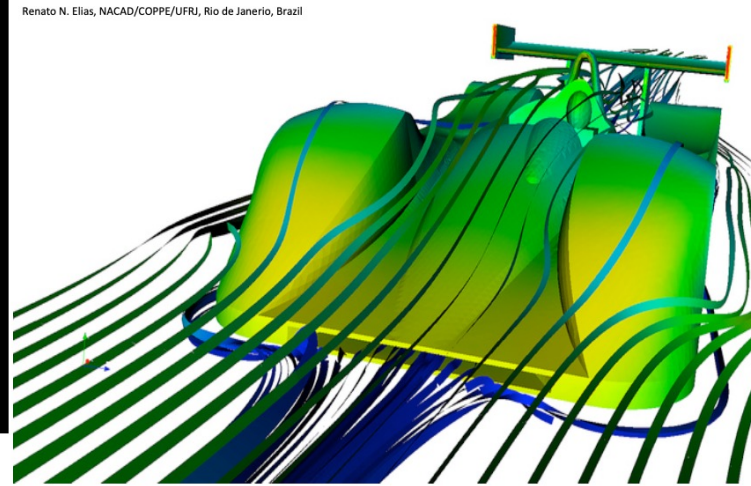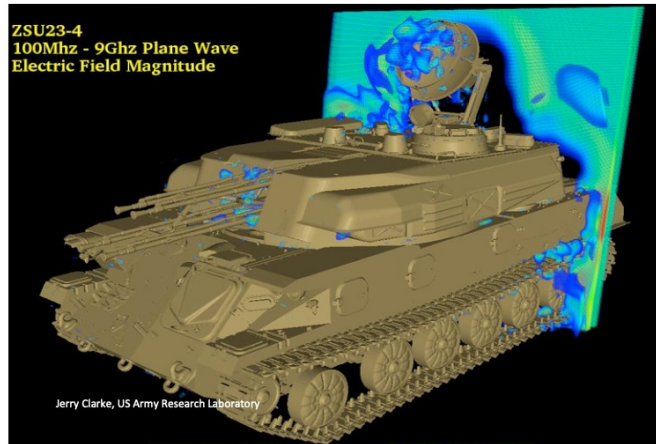| Date	Training Event	Speaker	Registration
Sunday April 14, 2024	Introduction to Machine Learning	Abdelghafour Halimi	Closed
Thursday April 18, 2024	Introduction to Deep Learning	Abdelghafour Halimi	Closed

Workshops Goals and Agenda

Workshop Goals

- Hands-on learning with ParaView
  - Introductory course
  - Interactive session!
- What is ParaView ?
  - Opensource, scalable, multi-platform visualization application
  - Support for distributed computations to process large datasets
    - ~ 6 billion structured cells
  - Commercial maintenance and support (Kitware Inc.)

What is ParaView?

ZSU23-4
100Mhz - 9Ghz Plane Wave
Electric Field Magnitude

Jerry Clarke, US Army Research Laboratory

Renato N. Elias, NACAD/COPPE/UFRJ, Rio de Janerio, Brazil

velocity Magnitude
15
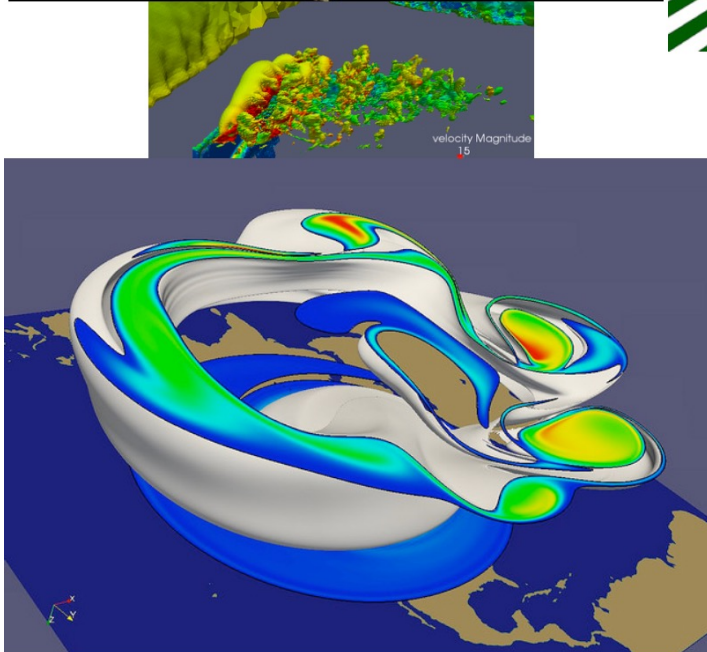
King Abdullah University of Science and Technology

Source: Paraview Tutorial Slides
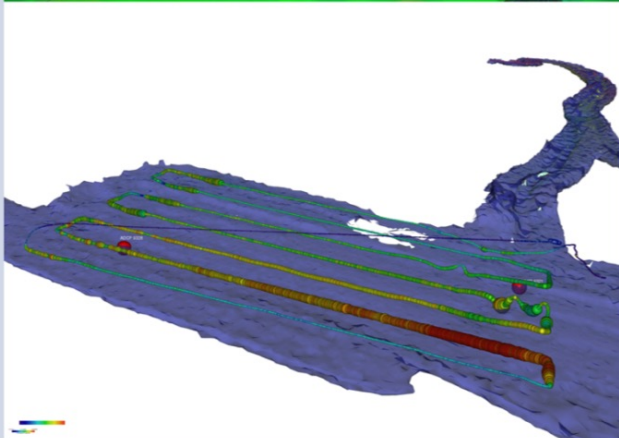
Swiss National Supercomputing Centre

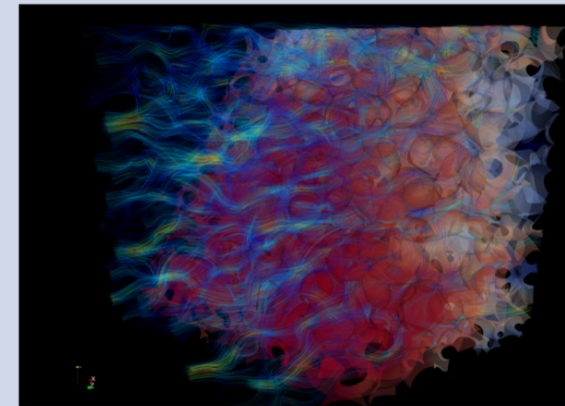Swiss National Supercomputing Centre

Bill Daughton, LANL

Lab Anatomy: Projects
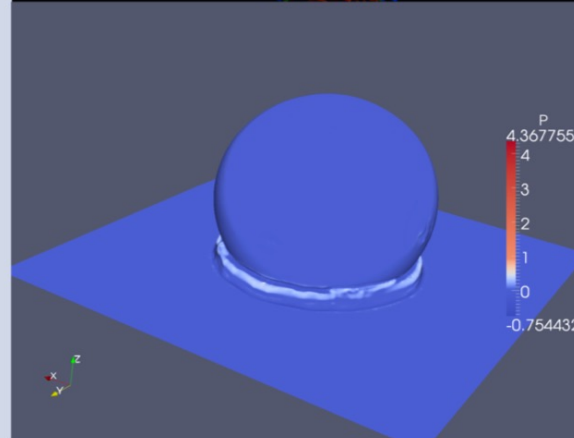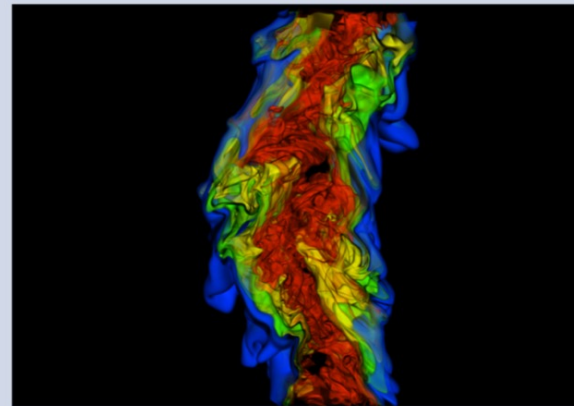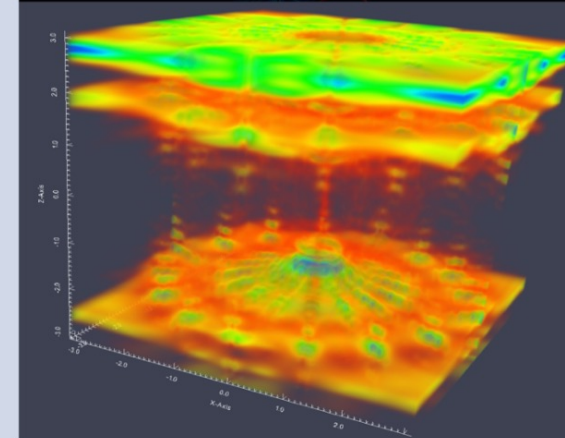
Today's Agenda

| Time	Topic	Speaker
~10 min	Introduction	Thomas Theußl
~30 min	Scientific Visualization: Scalar Fields	Thomas Theußl
~5 min	— break —	-
~30 min	Scientific Visualization: Vector Fields	Thomas Theußl
~15 min	The ParaView GUI and Features	Thomas Theußl
on demand	Q&A / Discussion	all

Introduction / Motivation

Hands on exercises in ParaView on some basic visualization techniques
- Scalar field visualization: slicing, contouring, volume rendering
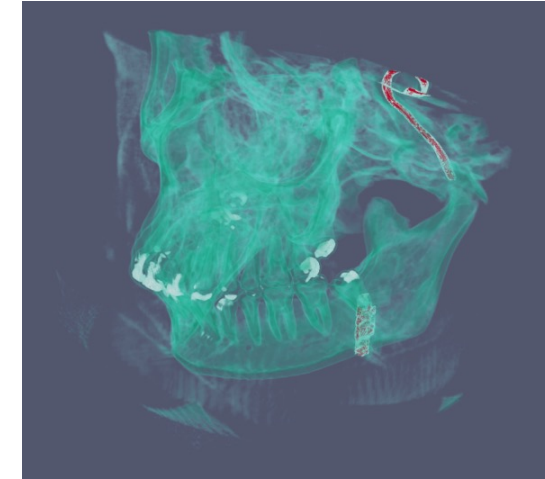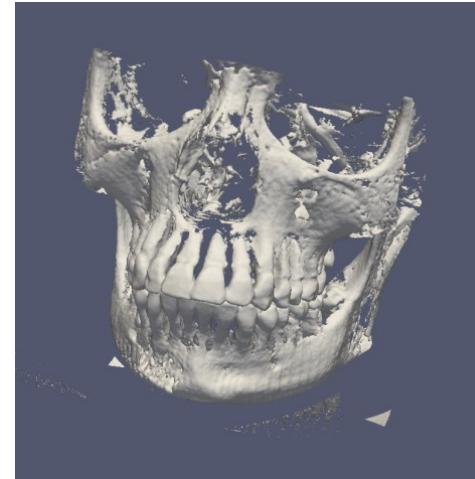
- Vector field visualization: arrow plots, streamlines, line integral convolution (LIC)
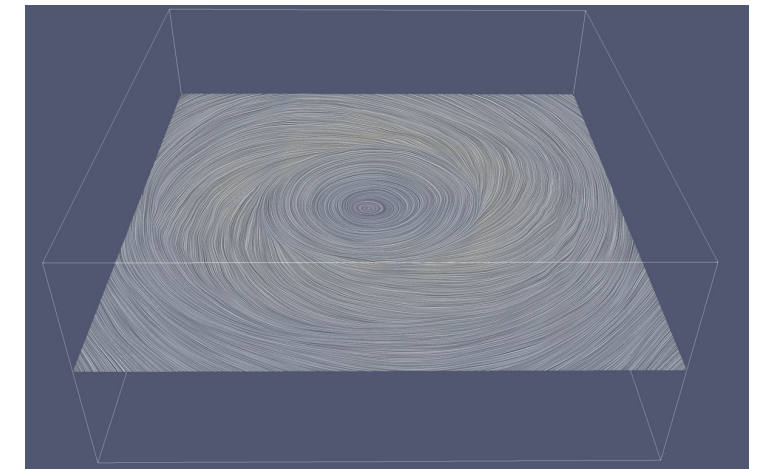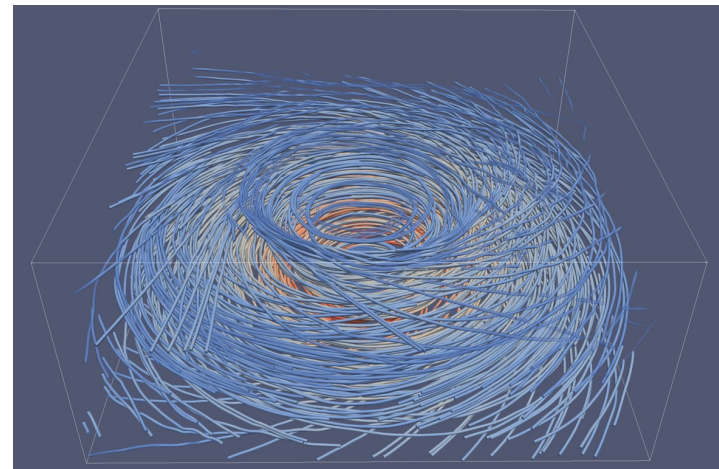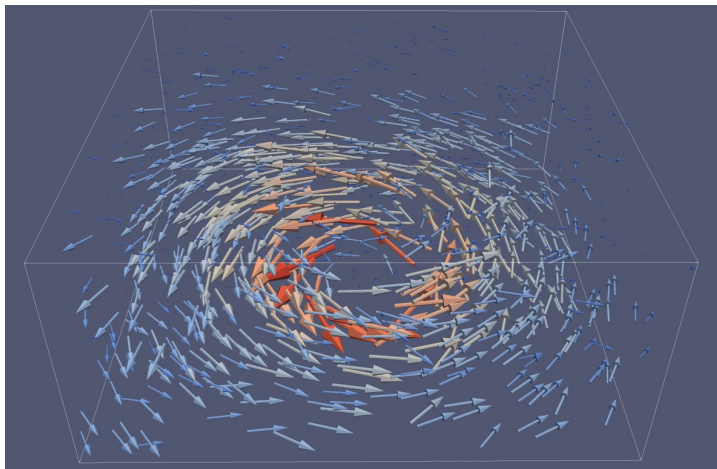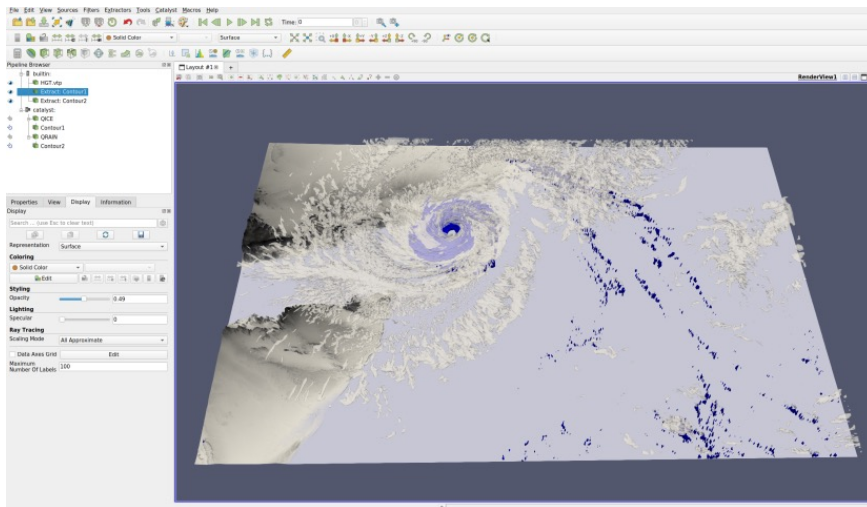
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Hands-On Session 0

- Starting ParaView

- Getting familiar with the GUI

- Loading data

- Getting information about the data

Hands-On Session 1

Scalar Visualization

- Slicing

- Contouring (iso-surfaces / level sets)

- Volume Rendering

Hands-On Session 2

Vector Field Visualization

- Arrow Plots

- Streamlines

- Line Integral Convolution (LIC)

Hands-On Session 3

The ParaView GUI and Features

- Screenshots and animations

- Multiple linked views

- Saving and loading states

- …

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