



Scientific Visualization 101

ParaView: An Introductory Hands-On Workshop

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Consivi KG, Austria, and
KAUST Visualization Core Lab

28 October 2025



Getting Started

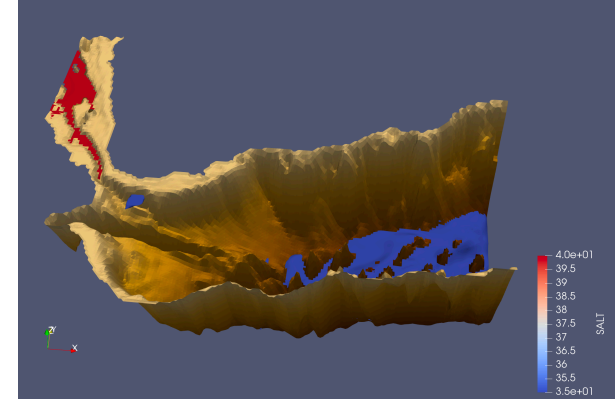
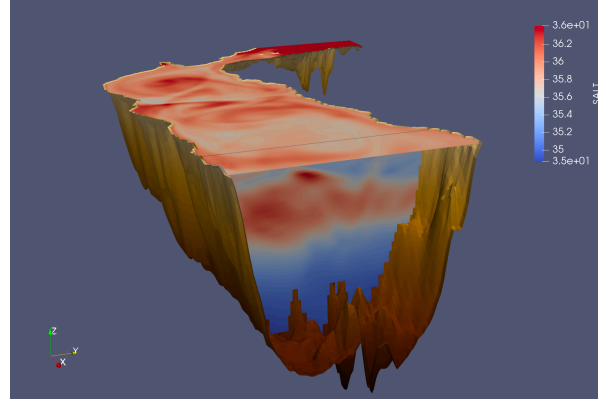
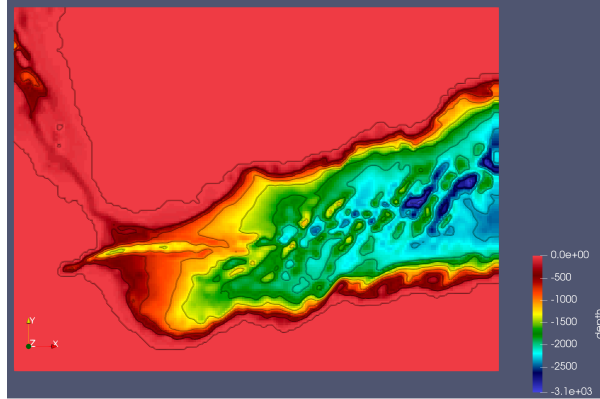
- Install ParaView (preferably v6.0.1)
 - Download: <https://www.paraview.org/download>
- Workshop Materials
 - Visualization Lab Wiki: <https://wiki.vis.kaust.edu.sa>
 - Training Page: <https://wiki.vis.kaust.edu.sa/training/overview>
 - Download data sets and slides:
<https://wiki.vis.kaust.edu.sa/training/scivis/2025/paraviewintro>

Introduction / Motivation

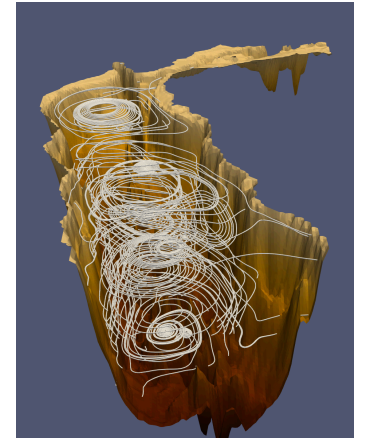
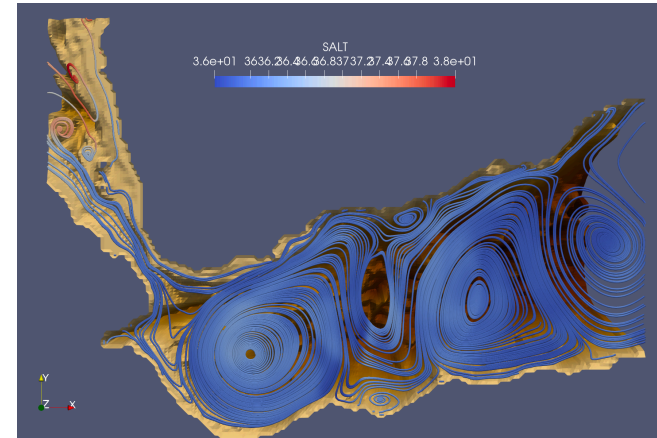
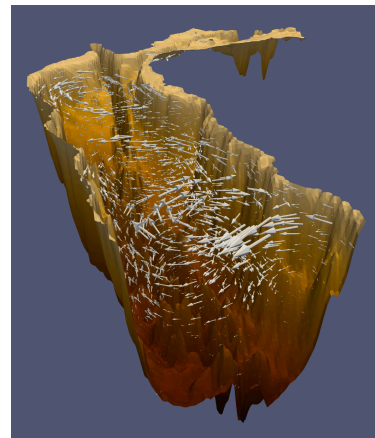
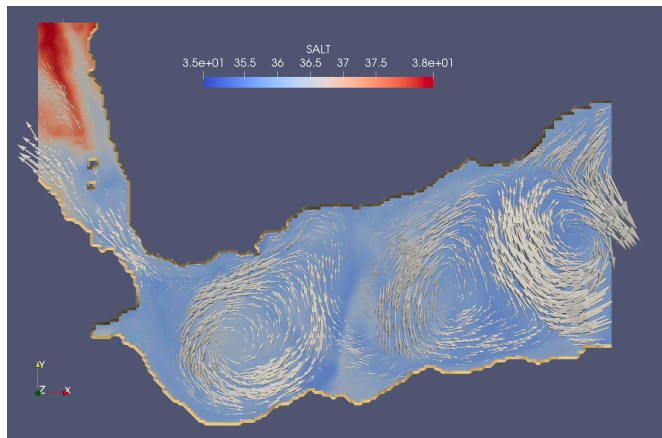


Hands on exercises in ParaView on some basic visualization techniques

- Scalar field visualization: colormaps, slicing, contouring



- Vector field visualization: arrow plots, streamlines



About the Data

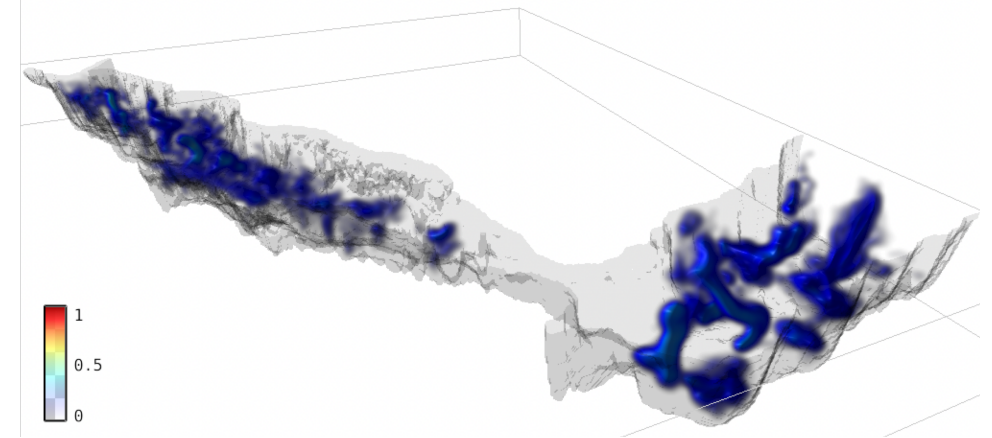
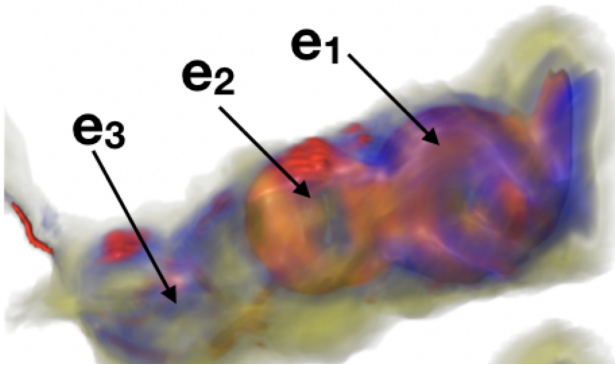


<https://kaust-vislab.github.io/SciVis2020/>

The data set consists of the bathymetry of the Red Sea and an ensemble (50 members) of time-dependent 3D flow and scalar fields on a regular grid (500x500x50, 60 time steps) covering one month of simulation time to study eddies in the Red Sea and the Gulf of Aden.

The size of the ensemble data in uncompressed NetCDF format is 1.5 TB (64 GB compressed).

We will use a small portion of it in this workshop (download from the workshop web page <https://wiki.vis.kaust.edu.sa/training/scivis/2025/paraviewintro>).





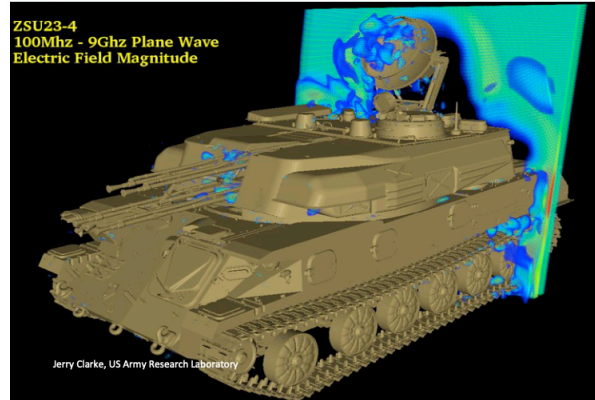
Workshops Goals and Agenda



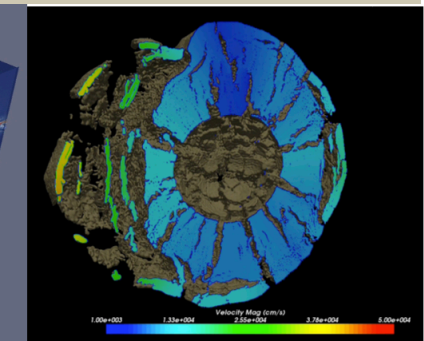
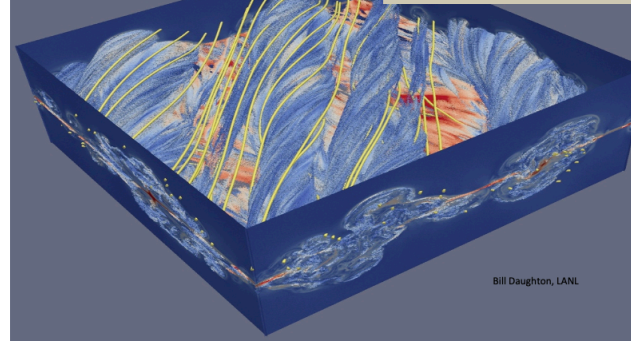
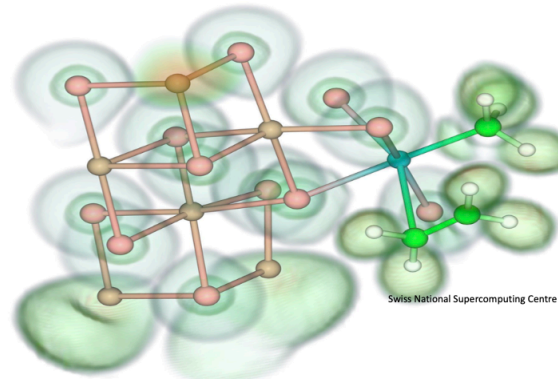
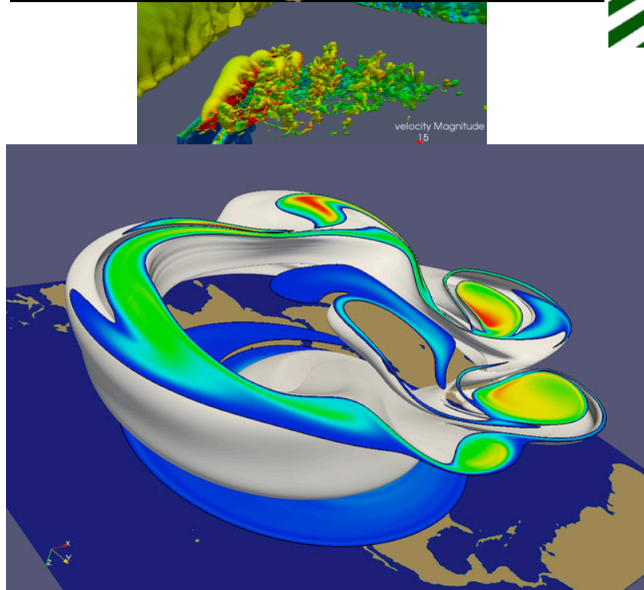
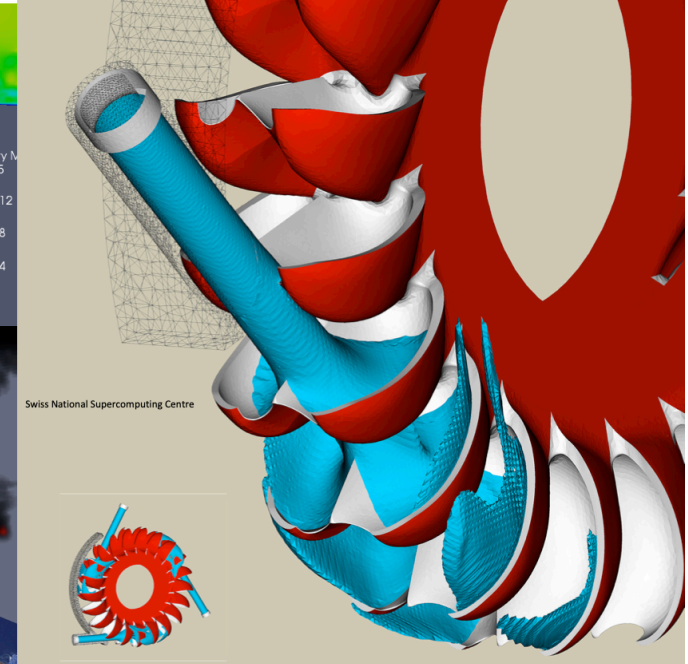
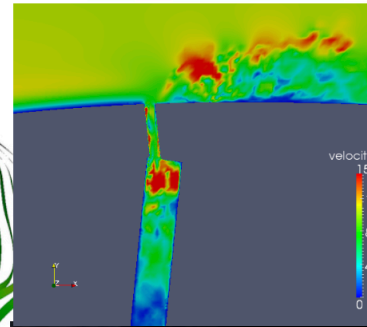
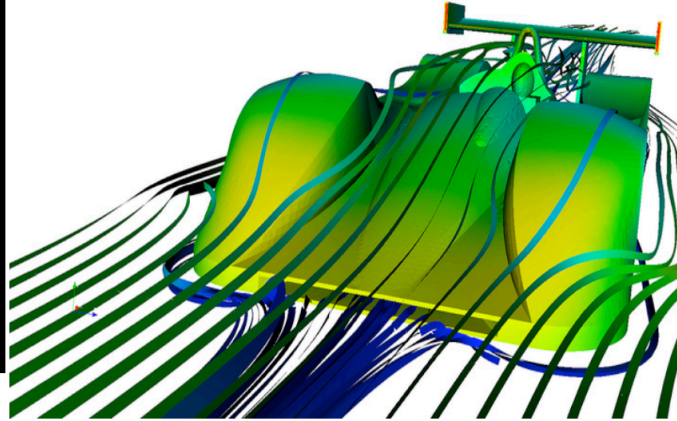
Workshop Goals

- Hands-on learning with ParaView
 - Introductory course
 - Slides / demonstrations
- What is ParaView ?
 - Opensource, scalable, multi-platform visualization application
 - Support for distributed computations to process large datasets
 - Commercial maintenance and support (Kitware Inc.)
- Why Paraview @KAUST
 - Available on all major computational resources at KAUST
 - Paraview on Ibex and Shaheen
 - Paraview @ KAUST Visualization Laboratory

What is ParaView?



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

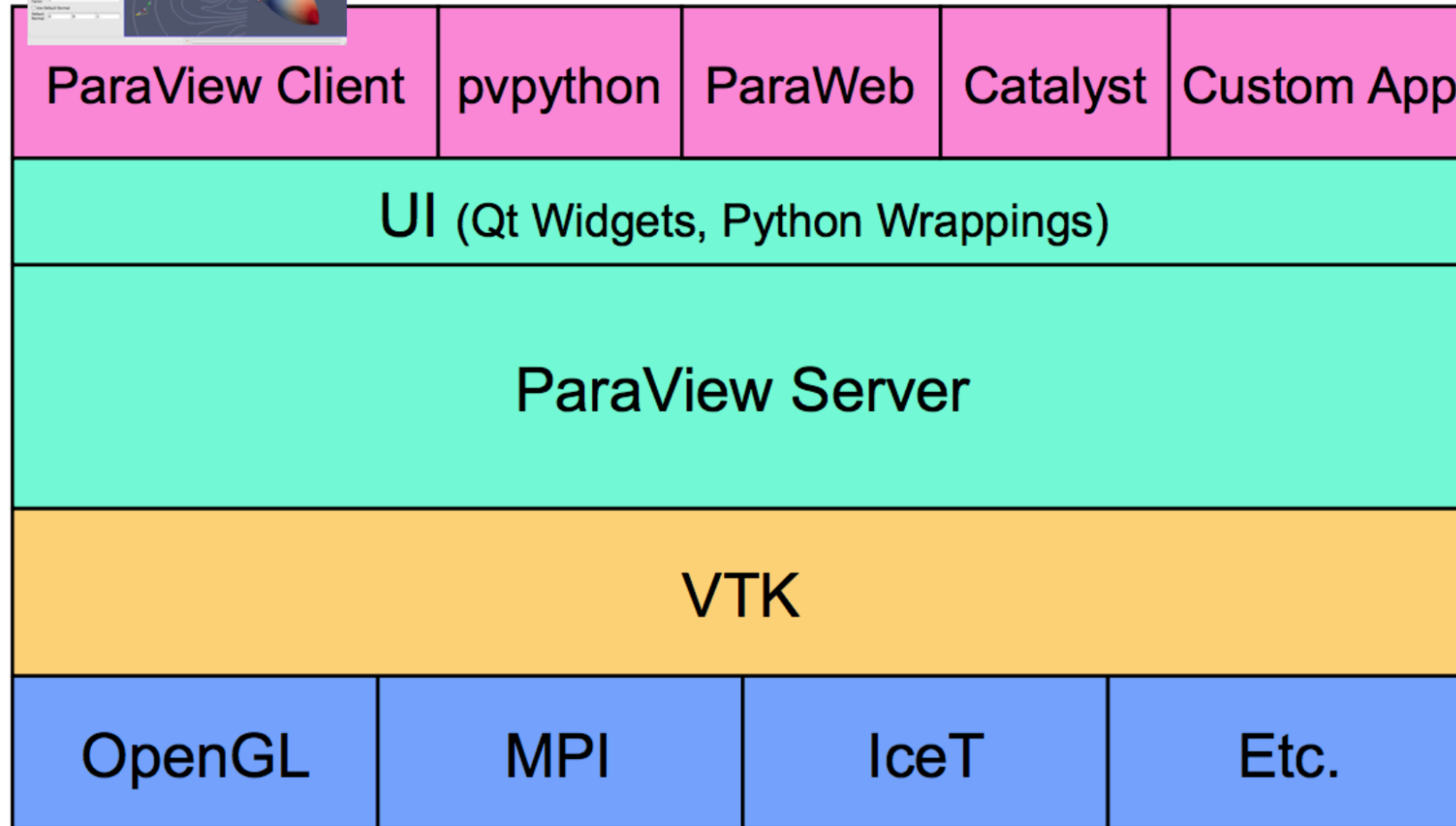
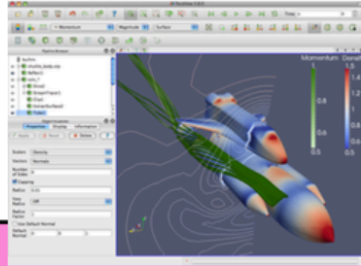


King Abdullah University of Science and Technology

Source: Paraview Tutorial Slides



ParaView Architecture



Today's Agenda



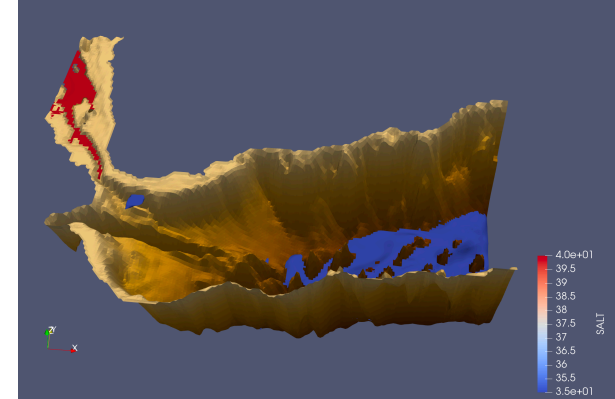
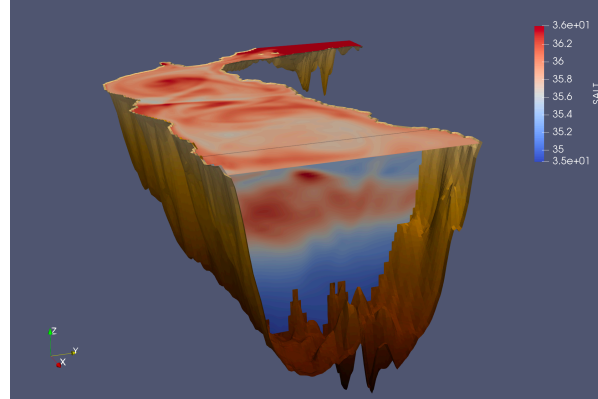
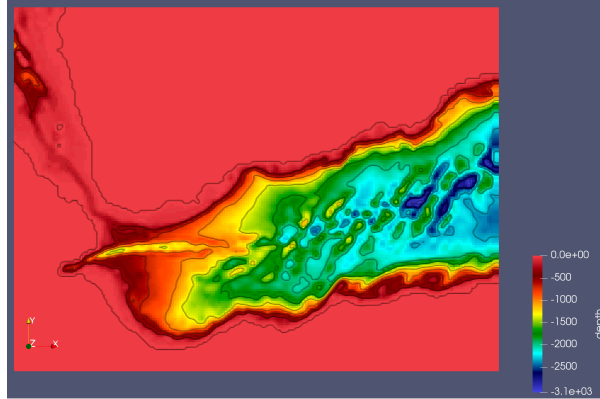
Time	Topic	Speaker
~10 min	Introduction	James Kress / Thomas Theußl
~30 min	Scientific Visualization: Scalar Fields	Thomas Theußl
~10 min	Coffee Break & Questions	
~30 min	Scientific Visualization: Vector Fields	Thomas Theußl
~10 min	Coffee Break & Questions	
~15 min	The ParaView <u>GUI</u> and Features	Thomas Theußl
on demand	Q&A / Discussion	all

Introduction / Motivation

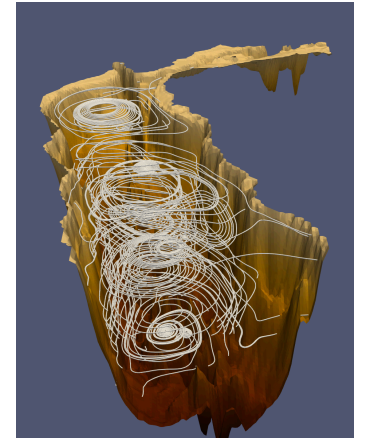
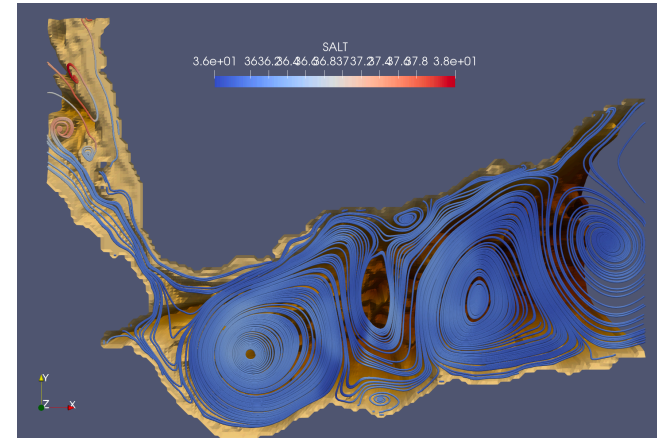
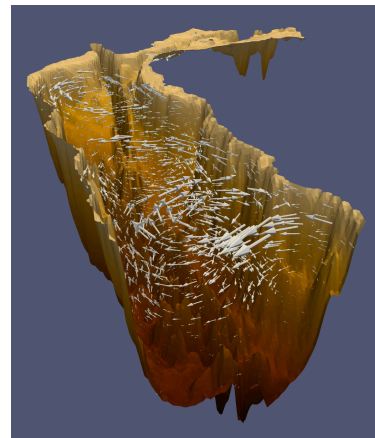
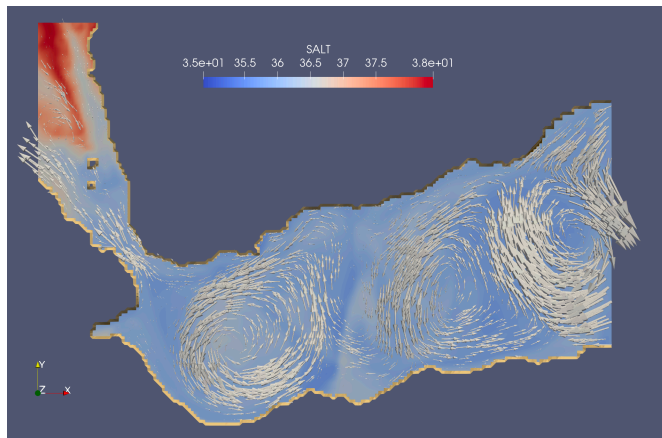


Hands on exercises in ParaView on some basic visualization techniques

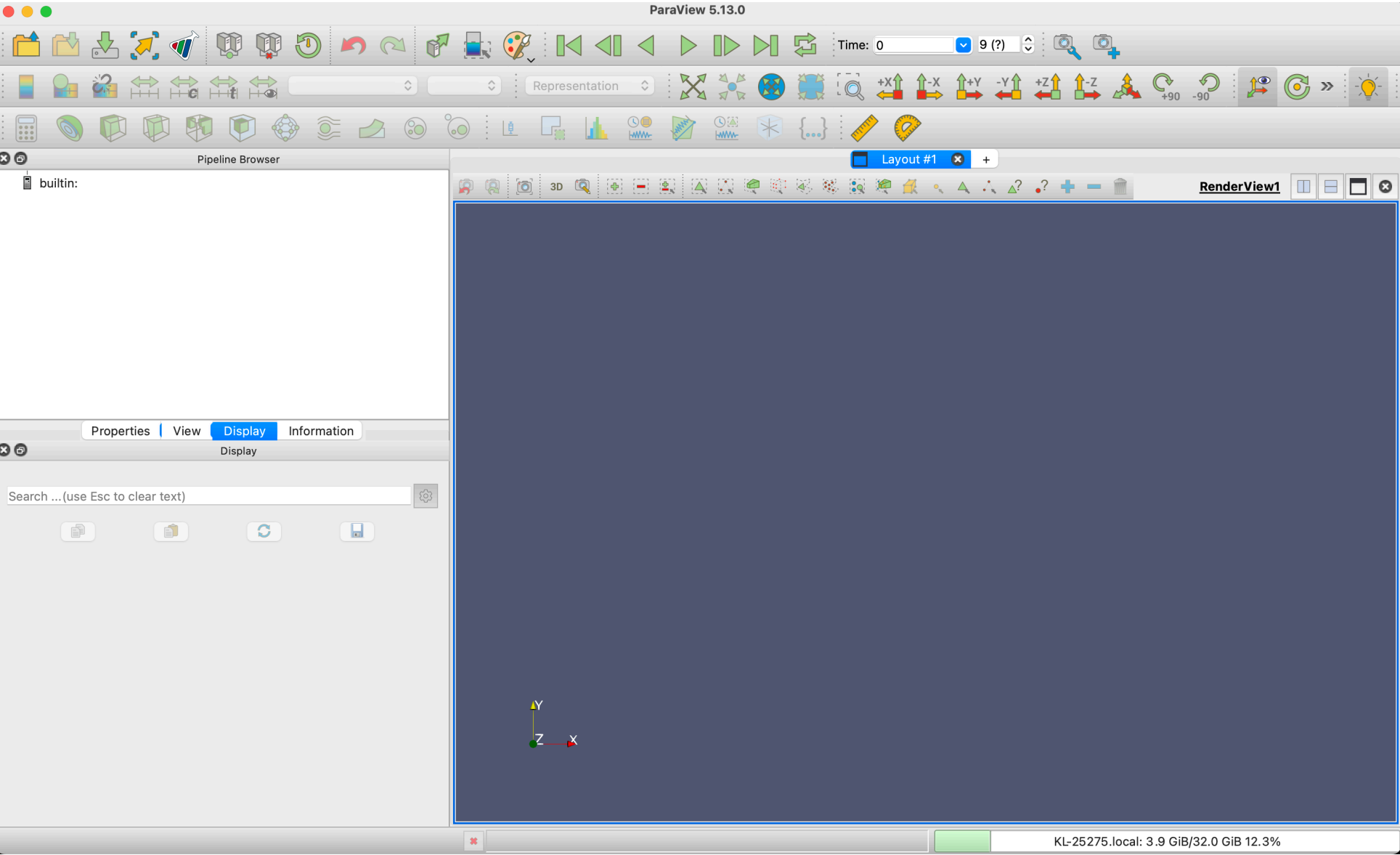
- Scalar field visualization: colormaps, slicing, contouring



- Vector field visualization: arrow plots, streamlines



Basic Interaction

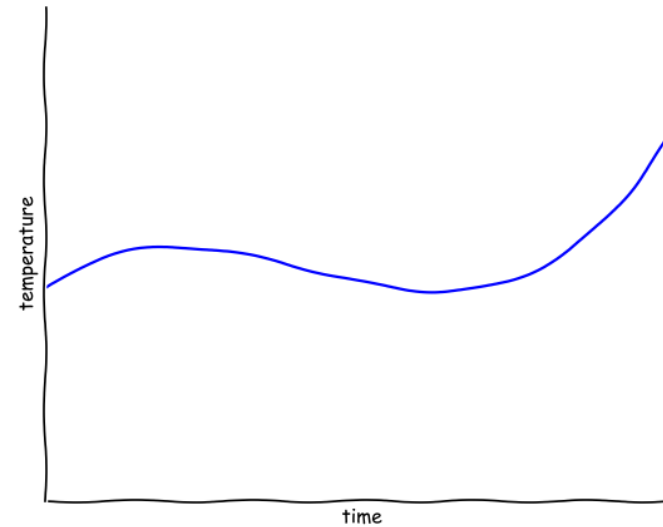




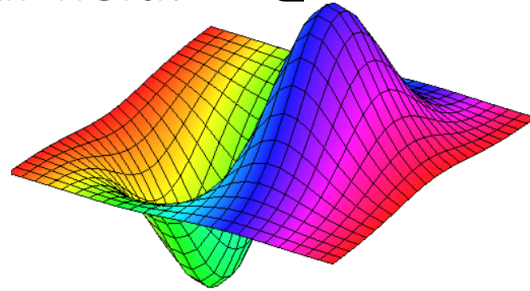
Scalar Field Visualization

Scalar Fields

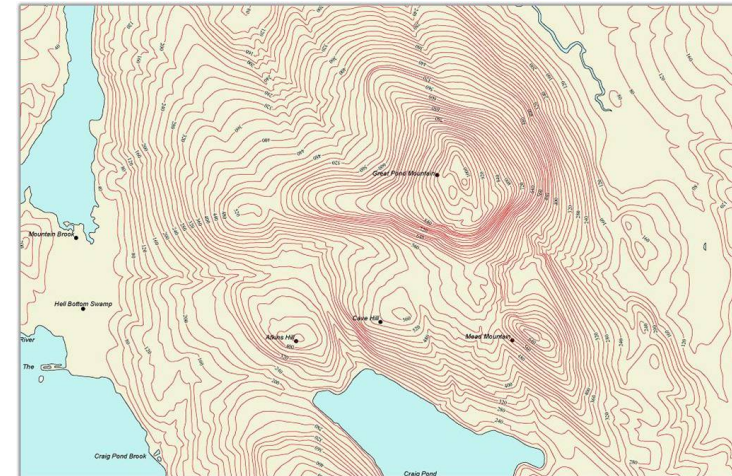
- 1D scalar field: $\Omega \subset \mathbb{R} \rightarrow \mathbb{R}$



- 2D scalar field: $\Omega \subset \mathbb{R}^2 \rightarrow \mathbb{R}$



- 3D scalar field: $\Omega \subset \mathbb{R}^3 \rightarrow \mathbb{R}$
i.e., salinity or temperature
in the Gulf of Aden

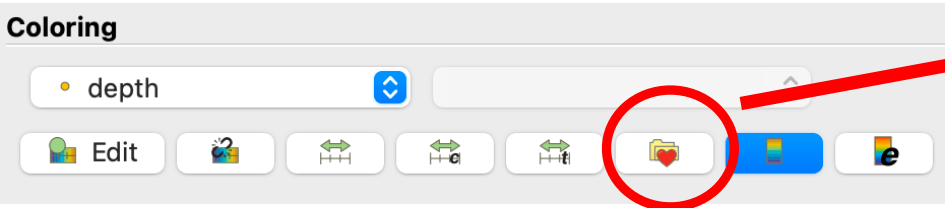


source: wikipedia

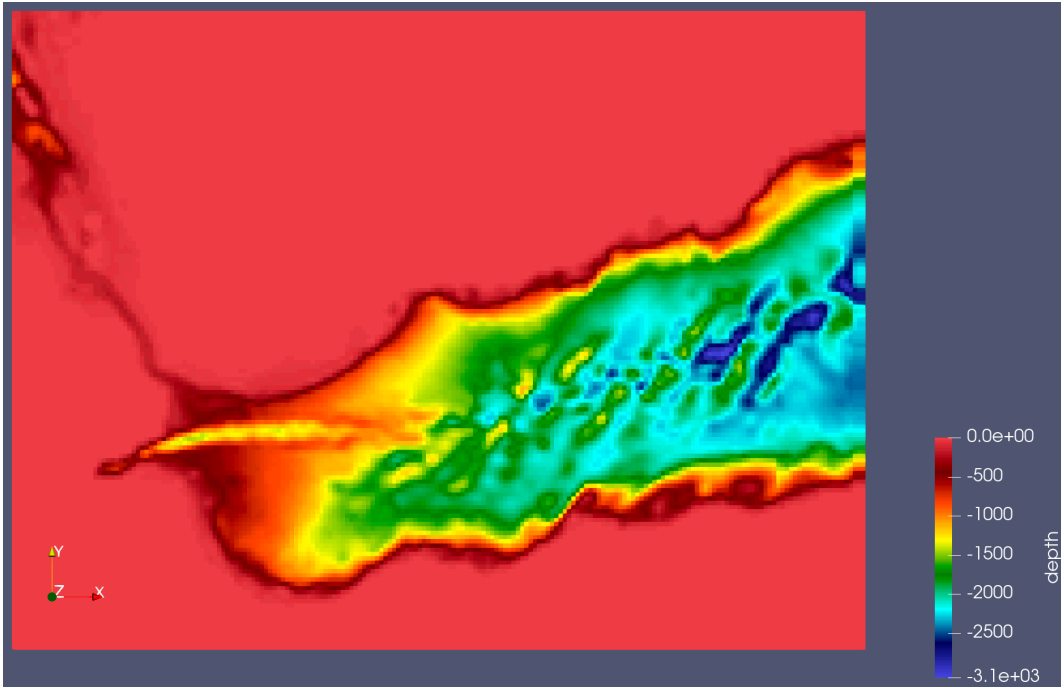
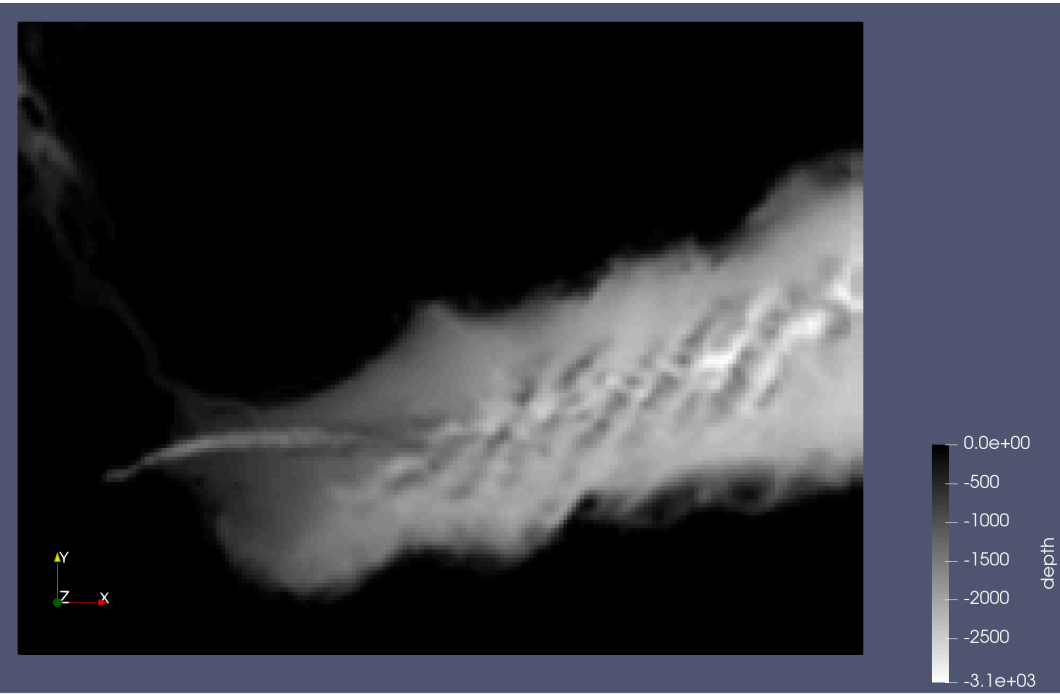


Colormaps

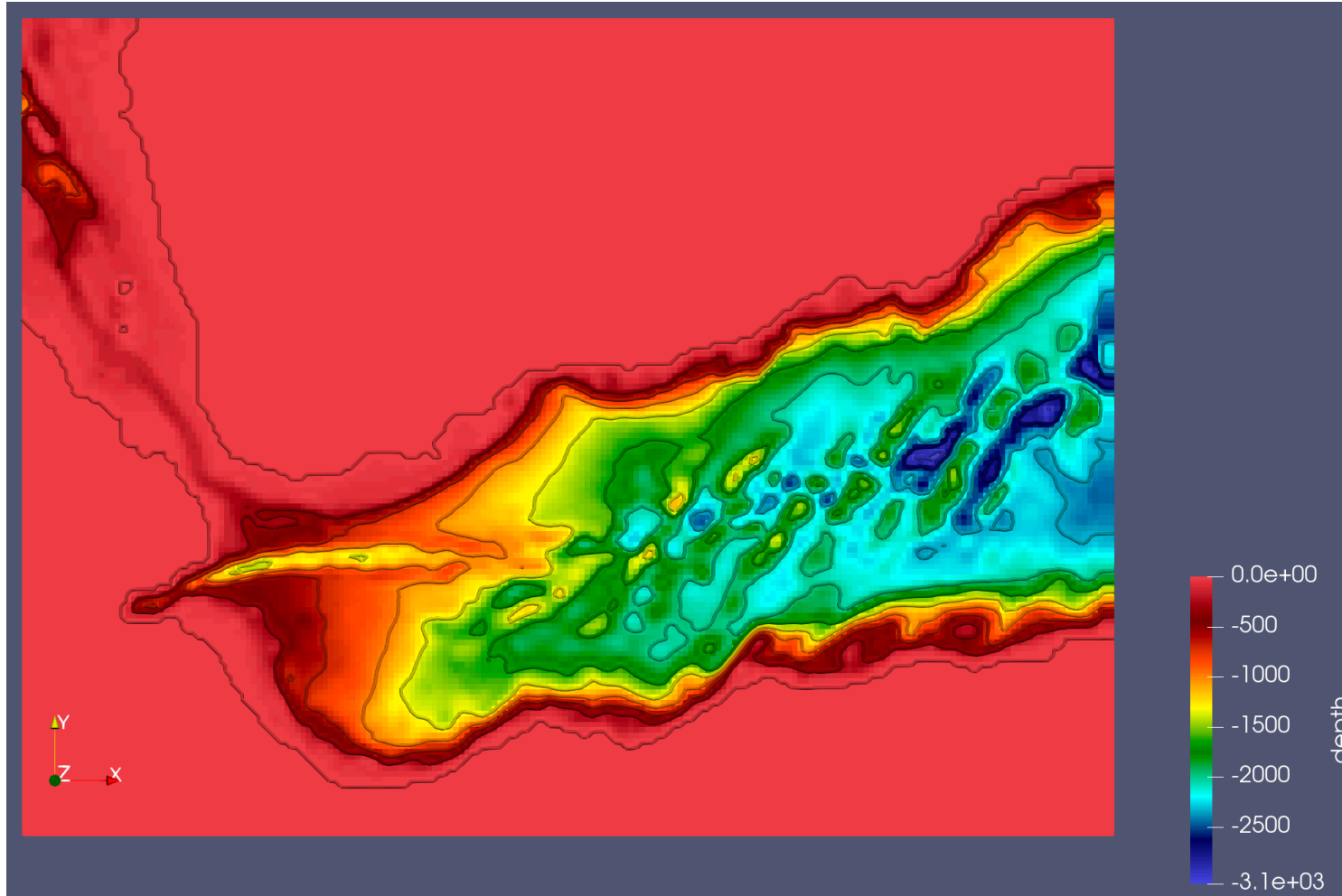
In the Display tab:



Choose preset



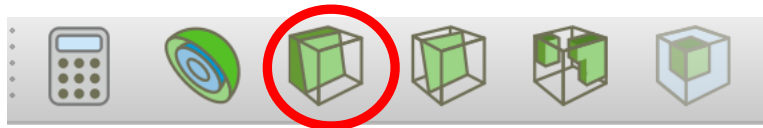
• Contouring in 2D



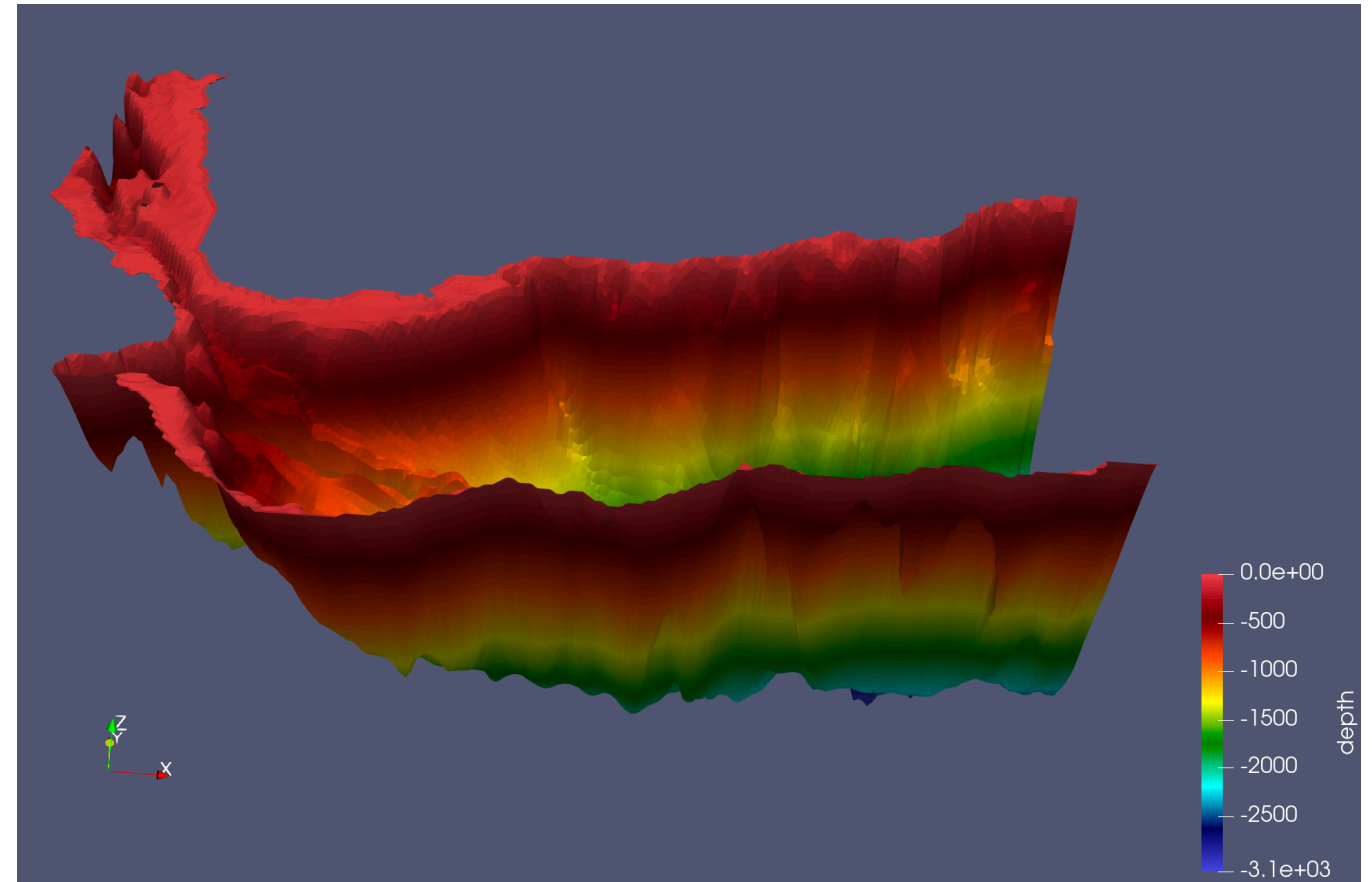
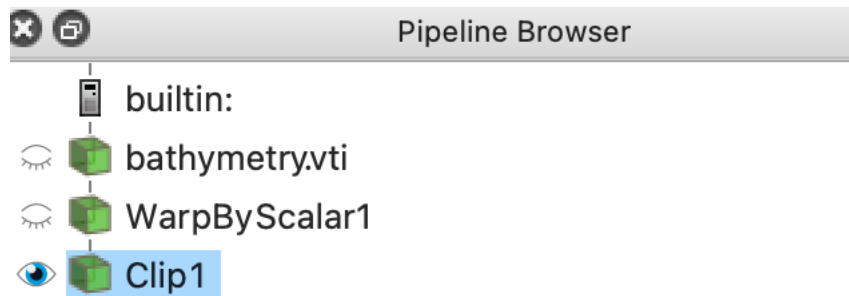
Height Field



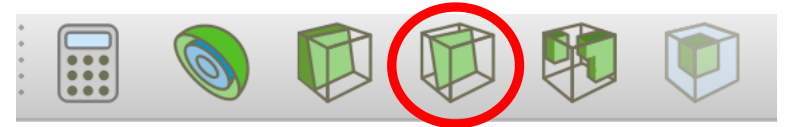
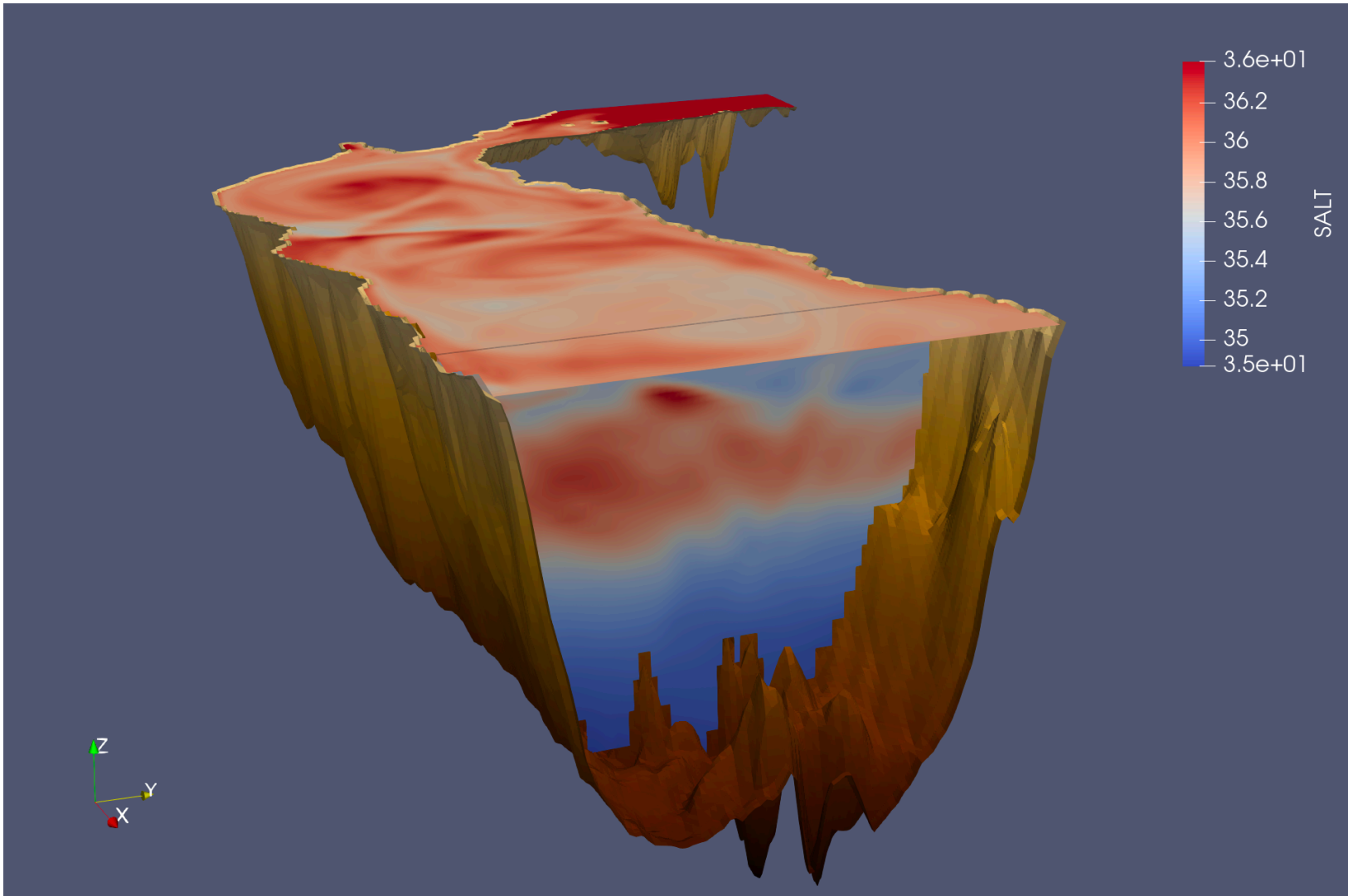
- Filters->Alphabetical->Warp By Scalar
- Set 'Scale Factor' (I use 0.00125 here)
- Click Apply



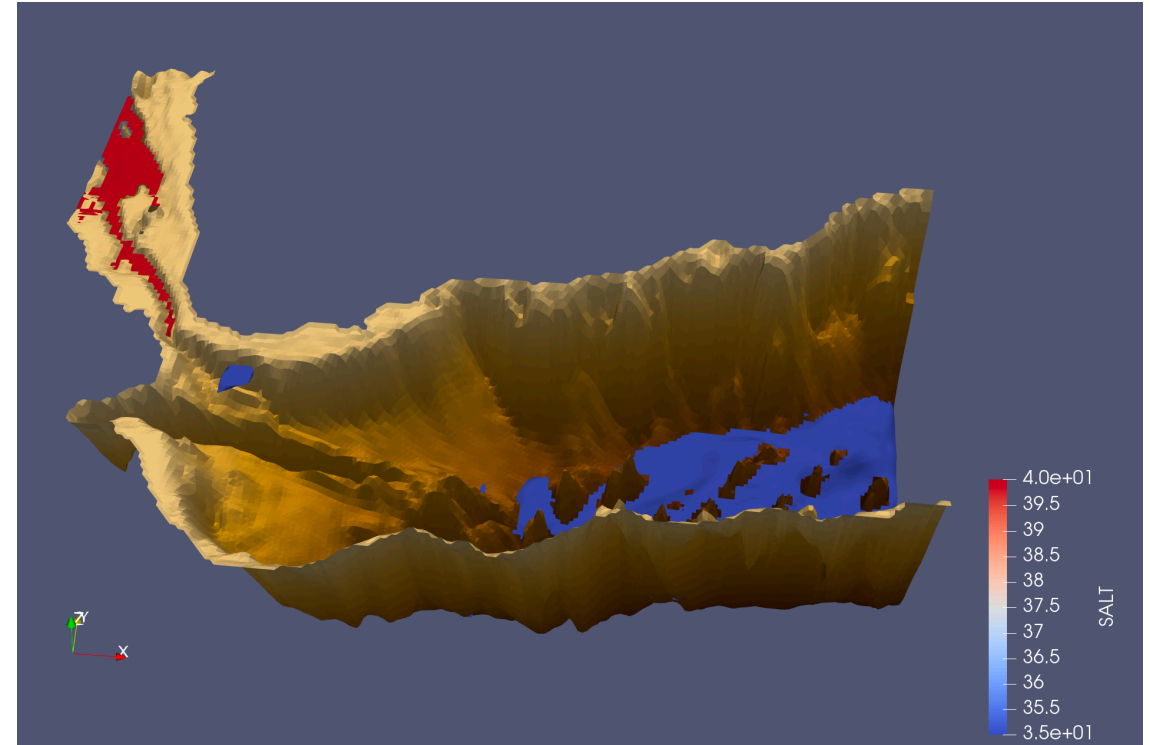
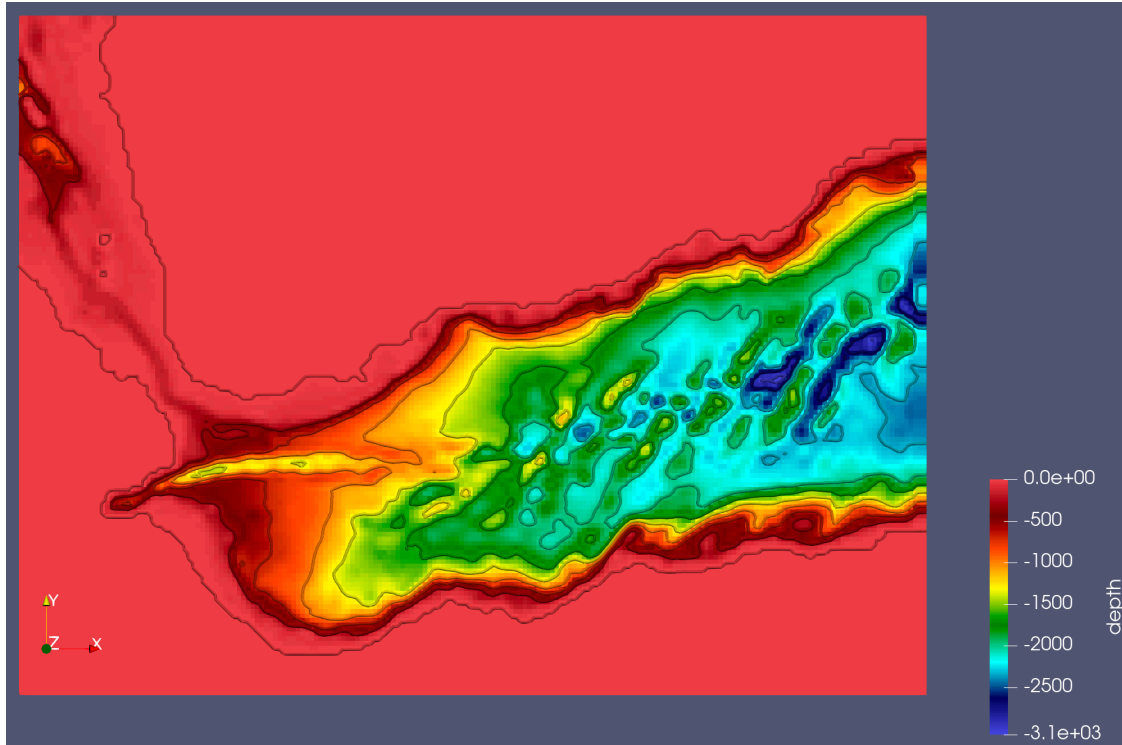
Clip



Slicing



• Contouring in 2D and 3D



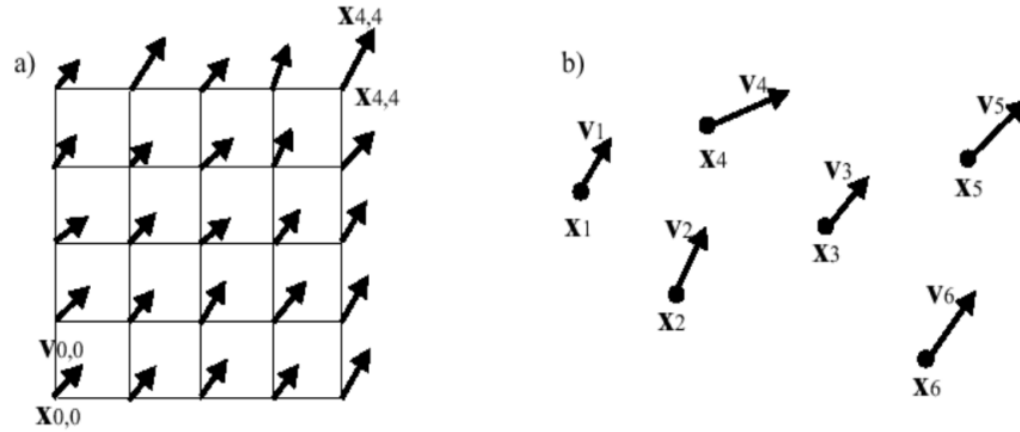


Vector Field Visualization

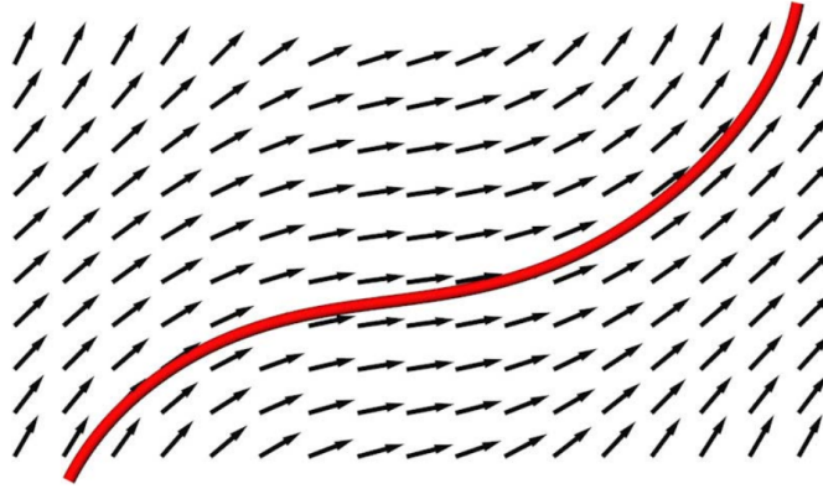
Vector Field Visualization Techniques



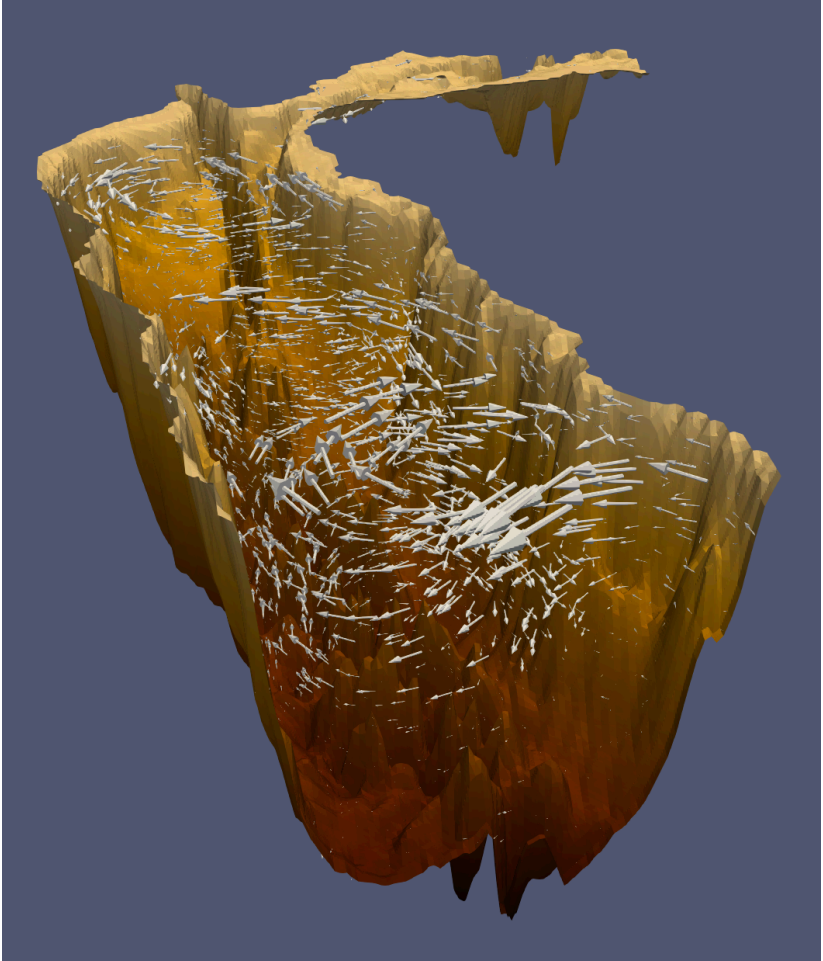
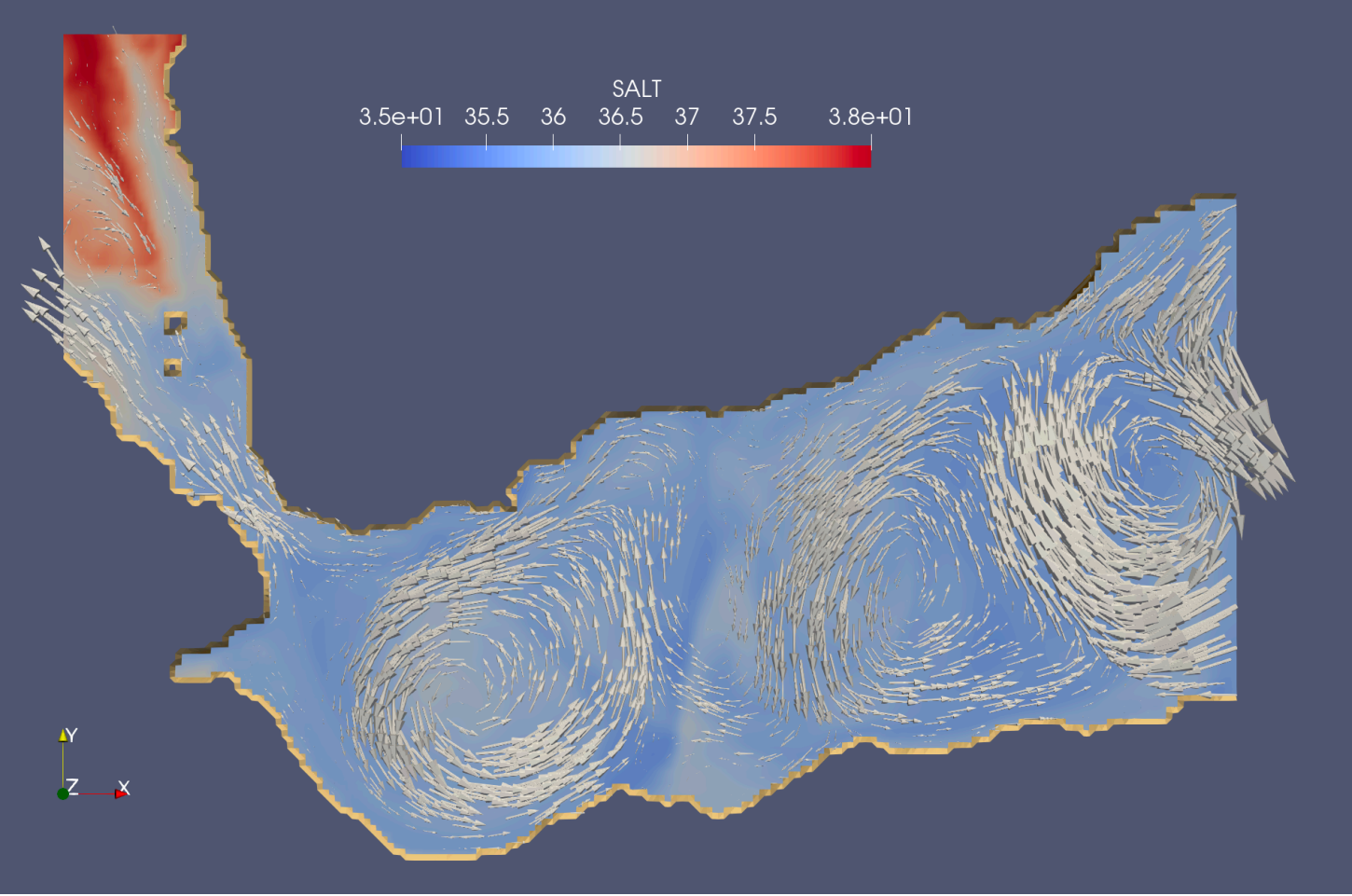
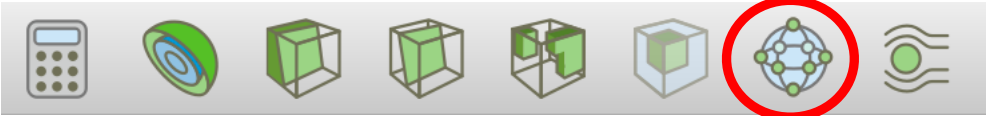
- Arrow plots



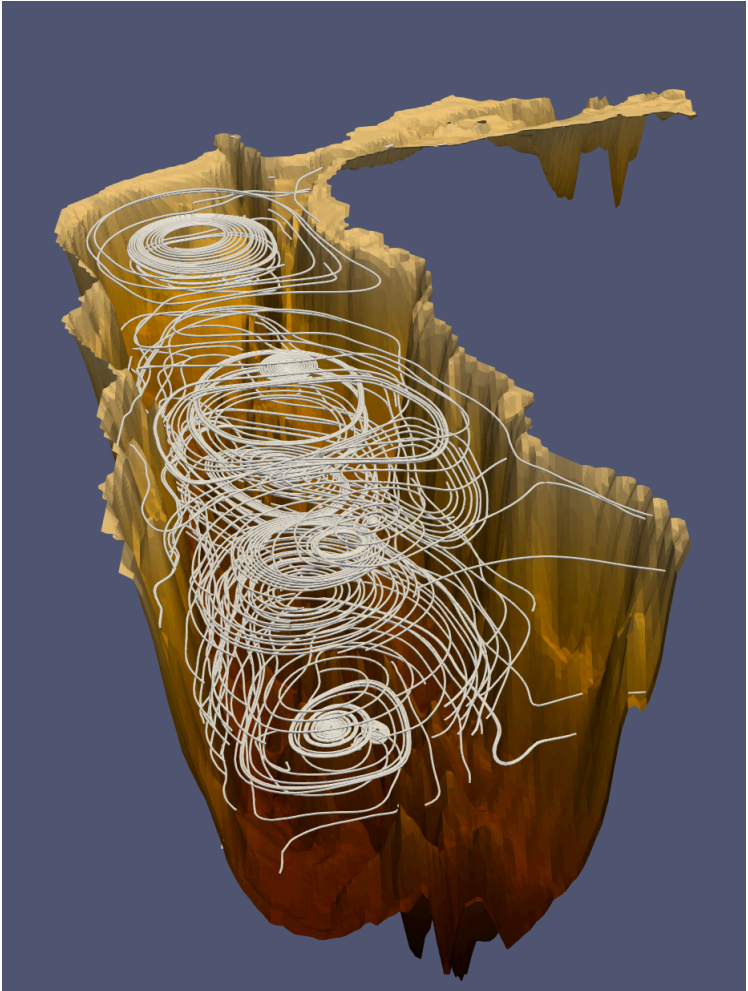
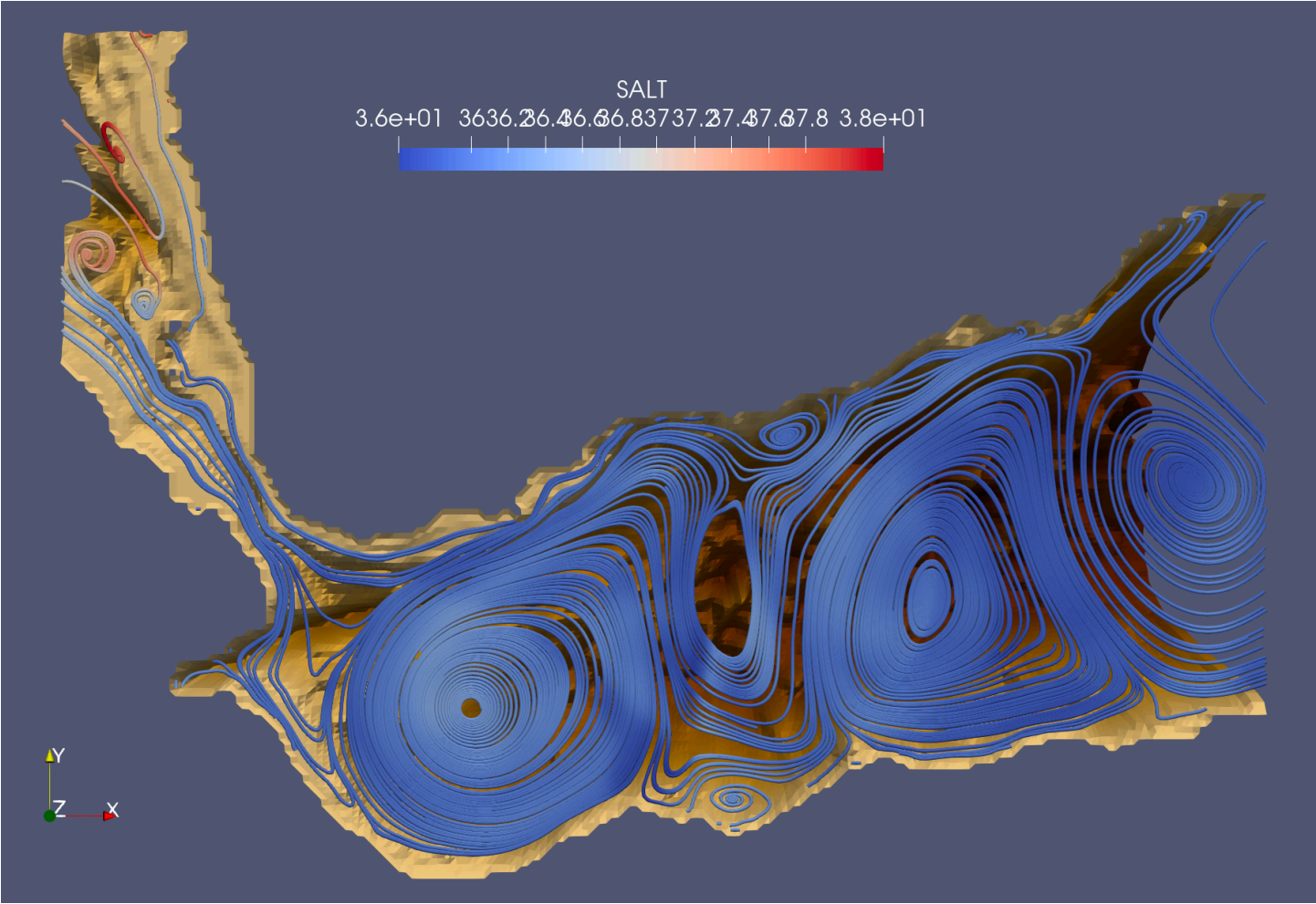
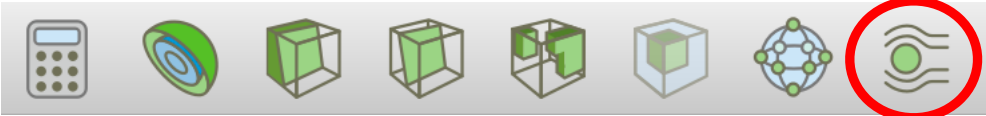
- Streamlines



Arrow Plots



Streamlines





The ParaView GUI and Features



The ParaView GUI and Features

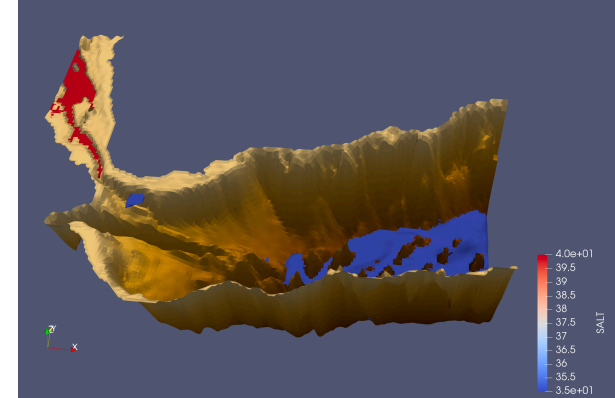
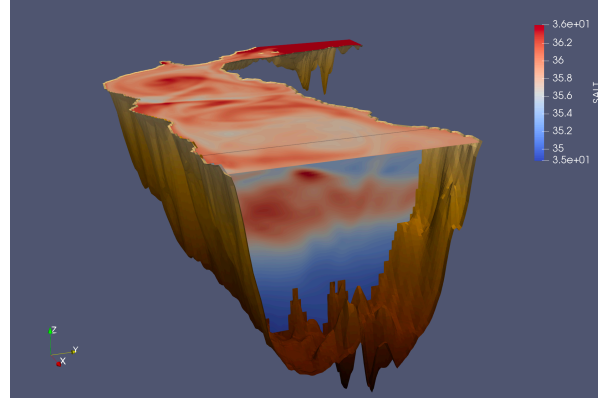
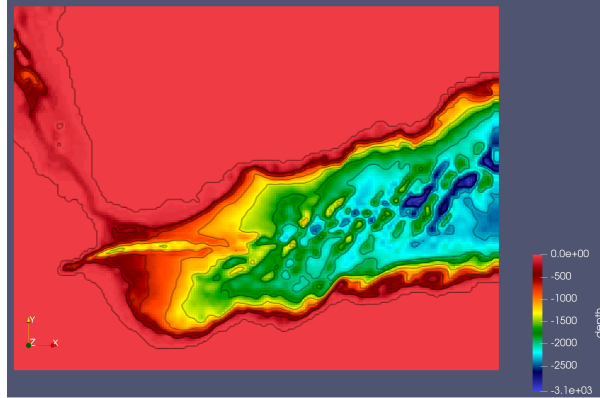
- Screenshots
- Saving and loading states
- Multiple linked views
- ...

Summary / Conclusion



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