Final Project

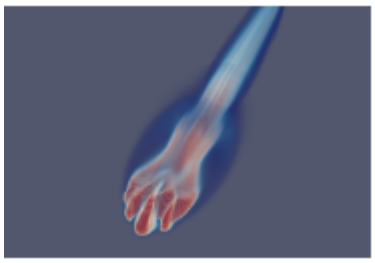
CSC9005 : Data Visualization
June 10, 2020

1 Project and dataset overview

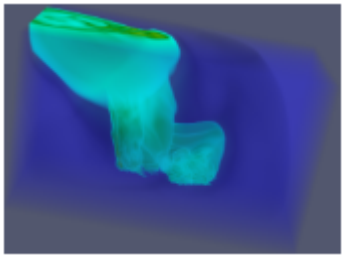
- The dataset and the document are available (here).
- The data are generated from a simulation of the potential impact if an asteroid falls into the deep ocean water. The available datasets are generated from different initial simulation parameter (e.g. asteroid size, incoming angle and airbust or not). Each combination of initial simulation parameters produces a dataset with multiple time steps and each time step contains at least four attributes (prs, tev, v02, v03). All time steps generated by one specific combination of initial parameters are called a "ensemble member". The website provides 7 ensemble members generated from 7 different combinations of initial simulation parameters.
- General goal of your project is to answer the following scientific questions by visualizing the dataset.
- **Hint**:
  - Read the data document and play with the data by Paraview first. This can give you a good insight of datasets to answer the questions.
  - You are suggested to use "300x300x300 Four Scalars Resolution" in datasets, but to use datasets with higher resolution or more attributes is encouraged.

2 General guideline

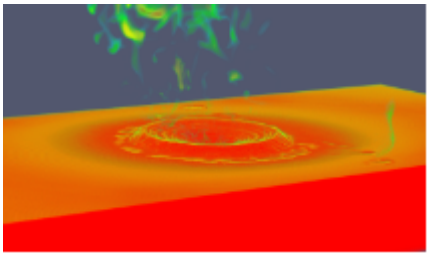
- To answer the questions below, you can use any visualization techniques that include but are not limited to D3 plots, slicing, isosurface and volume rendering. You can use one of the techniques or a combination of them to visualize the data. Your choice and design should be based on whether enough evidence is presented to support your answer. You should discuss your choice and design.
- Visualization and Verification: Regardless how you arrive at your answers, you should include enough images similar to what you produced in the (optional) homework 5 to support your answer.
- Pick up at least 3 questions below to answer:
  - Task 1 : When does the airburst happen? Please pick up an ensemble member with airburst to answer this question. When the airburst happen, the asteroid is splitted into multiple pieces. Figures (a) is an example, the asteroid is splitted into at least three smaller rocks and you cannot observe a complete sphere any more.
  - Task 2 : The asteroid will influence the temperature in the region around the asteroid trajectory. When does the size of region with abnormal temperature caused by the astroid reach its maximum and start to shrink? Please pick up an ensemble member with airburst to answer this question. Figures (b) is an example which shows the temperature (tev) attribute. The region with abnormal temperature (green region) can be observed.
  - Task 3 : When does the asteroid hit the water surface? Please pick up an ensemble member without airburst to answer this question.
  - Task 4 : When is the tsunami (wave rim) generated and start to propagate? Please pick up an ensemble member without airburst to answer this question. Figures (c) is an water rim example. We can observe the water wave rim.
- Task 1 and 2: Please download the ensemble member with airburst, e.g. "yC31"
- Task 3 and 4: Please download the ensemble member without airburst, e.g. "yA31"



(a) Airburst happened example.



(b) Temperature attribute example.



(c) Water rim example.

- **Hint**:
  - You should consider which attribute(s) are best to answer each question.
  - Combining multiple visualization technique may be better than using single visualization technique alone.

3 Submission

- You need to **turn in a final report** that provides answers to the questions of your choice.
- For each answer, you need to **provide enough evidences** (images, animations, paraview/vtk output, statistical plots etc) to support your finding. In the report, you also need to describe your effort generating those evidences including data selection, processing, and the visualization algorithms used etc.
- If you have **tried something that did not quite work out**, you can also put them in the report to show your effort and document why they did not work and how you eventually get the right answer.
- Finally, **submit any code** that you have used to generate the evidence on Moodle.