From Simulation to Visualization

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Case study on Cyclone Chapala

- Cyclone Chapala formed over the Arabian Sea from the 28th of October – 3rd of November 2015
- 2nd strongest tropical cyclone on record in the Arabian Sea
- Analyze phenomenon, understand it’s impact by visualizing the cyclone

Simulation

- Weather Research and Forecasting (WRF) model
- 1100x1000x34 regular grid with 138 time steps
- Focused on velocity field and scalar fields for cloud, graupel, ice, rain, snow, and vapor (~292 GB)
- Particle advection to capture dynamic nature of the phenomenon
- Started with 25M particles of which 16.3 M left the simulation area during advection
- The last time step at 137 ended up with 8.7 M points
Visualization in Avizo

- Point cloud rendering (dust particles) to depict the flow field
- Volume rendering for cloud, vapor, snow, and rain
- Iso-surface for graupel
- Formation of particle layers
- Visualization in a Virtual reality environment
Visualization in Virtual Reality Environment
Visualization in Unity

- Unity is a game engine that was used to deliver a portable and easy-to-use visualization application
- Cloud, snow, ice, rain were extracted as surfaces from Avizo
- Point cloud was imported by a Unity point cloud plugin (Point Cloud viewer)
- A user friendly GUI was implemented
Visualization in Unity
Putting it all together

Simulation data → NetCDF tool converter, python → ParaView

Particle advection, CSV → Avizo → MeshLab → Unity

Visualization Laboratory: King Abdullah University of Science and Technology
- Implement the data that is provided to us in various different ways

- We can visualize the data in any form, from a phone app to a very high quality immersive environment

- Due to researchers various requests we must be versatile in our lab and always be prepared with ingenious solutions
Thank You

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