3D-VisSys: Developing an Interactive 3D Weather Visualization System for Maryland-DC Region

Intern: Lance Uymatiao **Mentors:** Malar Arulraj & Veljko Petković

cisess
Cooperative Institute for Satellite
Earth System Studies

Objective:
- Demonstrate the use of open-source visualization tools for supporting weather applications.
- Develop an interactive web-based platform to visualize rainstorm.

Data:
Multi-Radar/Multi-Sensor (MRMS)
- Three-dimensional reflectivity factor.
- Surface Precipitation Rate

Methods:
- Create interactive 2D and 3D maps of MRMS data
- Develop a web-based platform to distribute the results to users

Techniques used:
Various processing techniques were used to make the application as fast as possible, despite computational challenges:

- **Scheduled Downloading** implemented to routinely download 30+ files hourly in the background.
- **Mean Pooling** used to reduce browser render load, reducing ~4M data points to ~186k per hourly graph.
- **Multiprocessing** reduced processing time by 90%, originally taking around 180 secs per 3D plot.

Technology Stack:
Python (Flask, Pandas, Numpy, Plotly)
JavaScript (jQuery) and Bootstrap

Volume-based and 2D stacked reflectivity graphs for 8/3/2023 at 16:04 UTC

Results
- The created visualizations are interactive: users can zoom-in, rotate and hover over the map to see the geographical location.

A Flask-based web application is under development and will continue in Fall 2023!