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Developing Notebook-based Flow Visualization and Analysis Modules for Computational Fluid Dynamics[1] GERMAN SALTAR, University of Puerto Rico - Mayaguez, ADITYA AIYER, CHARLES MENEVEAU, Johns Hopkins University — Visualization techniques are essential in identifying complex features and patterns in fluid flows. Three dimensional visualization has long been confined to high-end software. Recently, packages for Python have been developed to overcome this limitation. We seek to implement them in the realm of fluid mechanics using Jupyter notebooks. To this end, we make use of Python's K3D-jupyter package to generate 3D volume rendering from Large Eddy Simulation (LES) datasets. Using volume rendering, we were able to visualize velocity and concentration fields of oil droplets of varying sizes injected at the centerline of a turbulent jet influenced by a uniform crossflow. Alternately, uniformly random spheres modulated by the LES computed concentration field were generated to represent the Eulerian concentration field. Interactive features allowed the 3D structure of the jet to be probed and the turbulent structure's role in the oil's spatial distribution to be inferred. Additionally, we were able to implement the modules to visualize Direct Numerical Simulation (DNS) data obtained from the Johns Hopkins Turbulence Data Base (JHTDB). The capability of exporting the interactive plots as html files, which can be embedded into a website or online research article, facilitates distribution.

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