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Researching fluids mechanics and combustion using computational fluid dynamics

Code: Nek5000 – open source

- Spectral element method
- Parallelized using MPI
- Primarily written in Fortran77
- Currently running on one of two workstations with either 6 or 16 cores and 32 or 64 GB of RAM

Case: Swirling jet

- Planning to add reactions and increase resolution

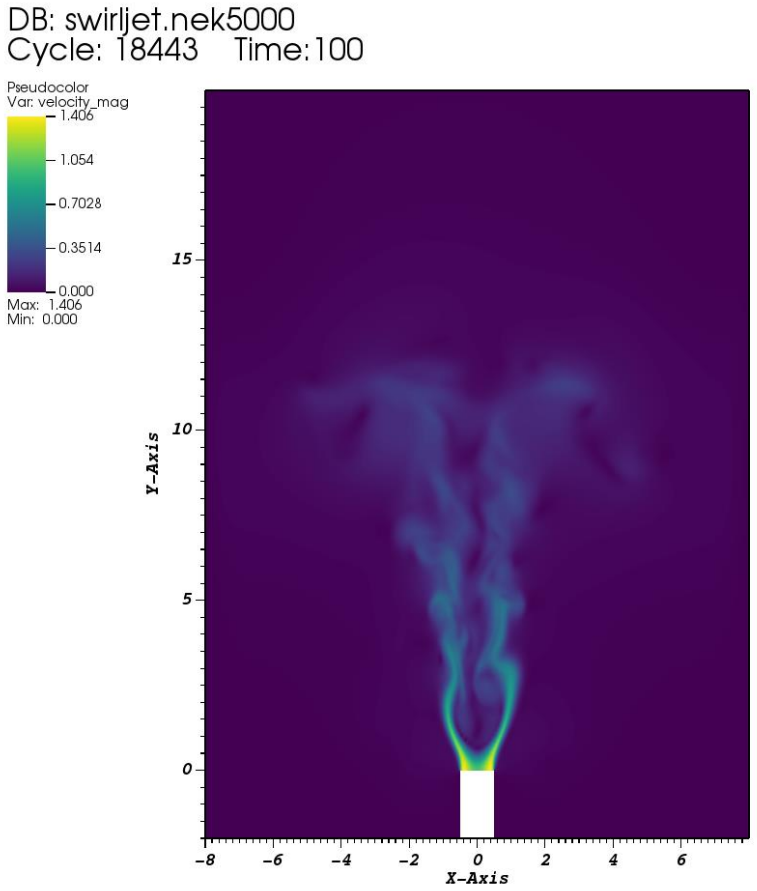

Figure 1. Pseudocolor plot of velocity magnitude
Re = 606, S = 1.42

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Large problem size

- > 130 million nodes
- > 430 GB of memory
- Similar published problems required over 100 cores for multiple weeks

Writing efficient plug-ins for Nek5000

- Reacting flow solver

Gaining familiarity with HPC for running Nek5000 and post-processing.

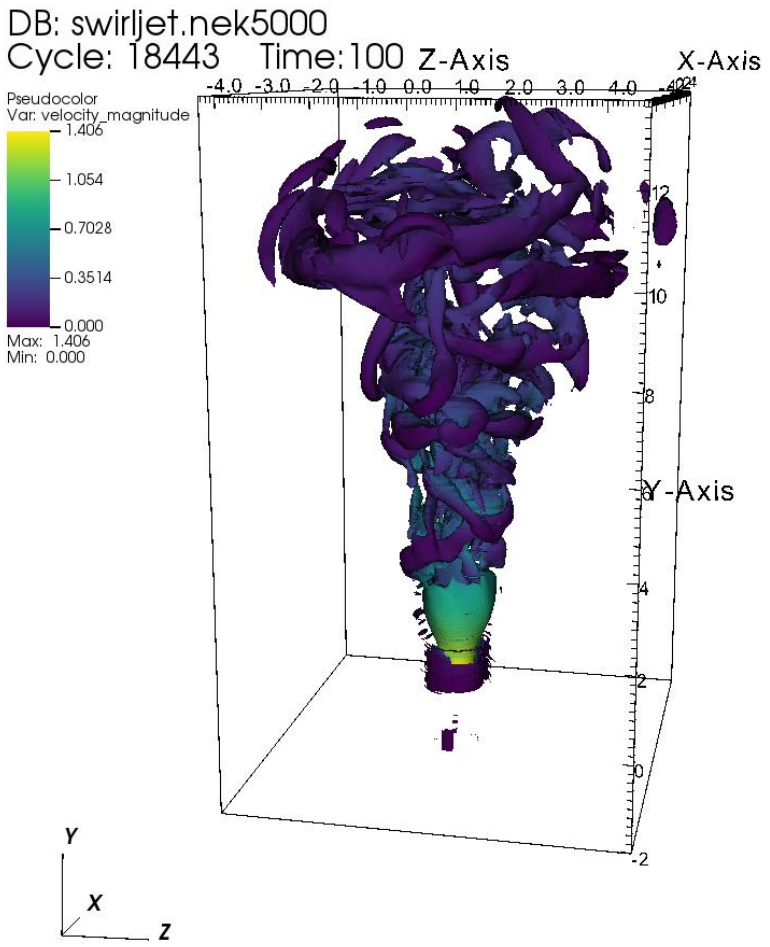

Figure 2. Isocontours of λ_2 colored by velocity magnitude
Re = 606, S = 1.42