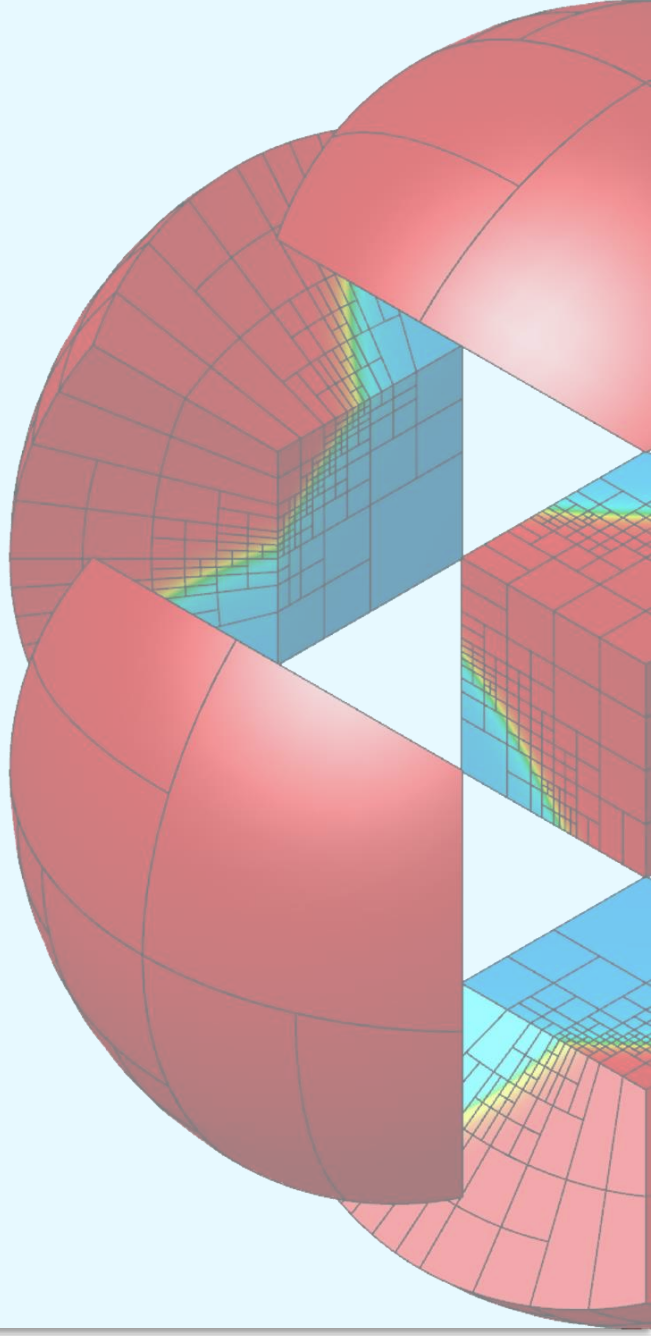
Simulation Contest



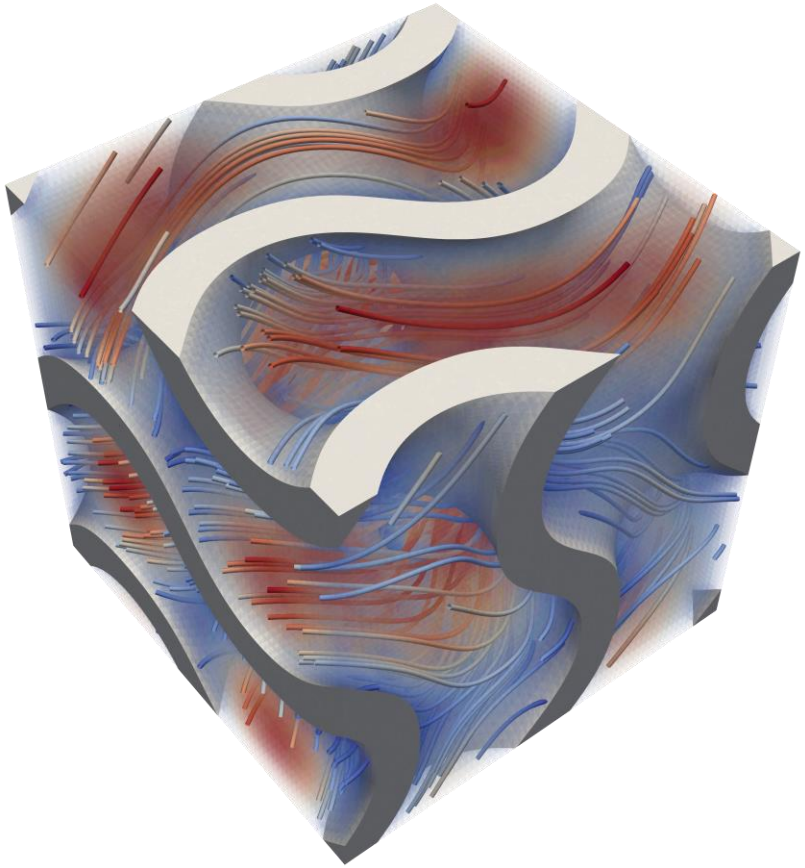
Simulation and Visualization Contest Winners!

- We held a contest for the most interesting simulations and visualizations.
- So many good entries that we broke it into 2 categories, still images and animations.
- Entries were judged on aesthetic qualities, novelty of the approaches, and the notability of the application.
- Results will be featured on the MFEM webpage, and the winners will receive MFEM T-Shirts.

Runner up for Still Images

?

Runner up for Still Images



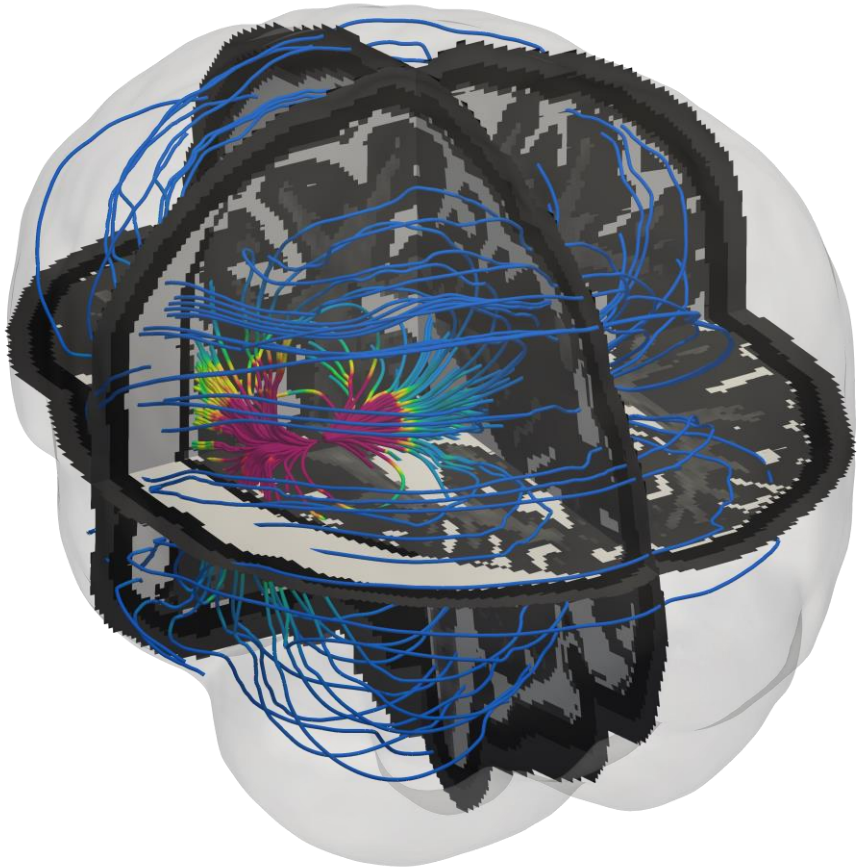
Flow through periodic Gyroid micro-cell, MFEM Navier mini-app with additional Brinkman penalization

Mathias Schmidt
LLNL

Winner for Still Images

?

Winner for Still Images



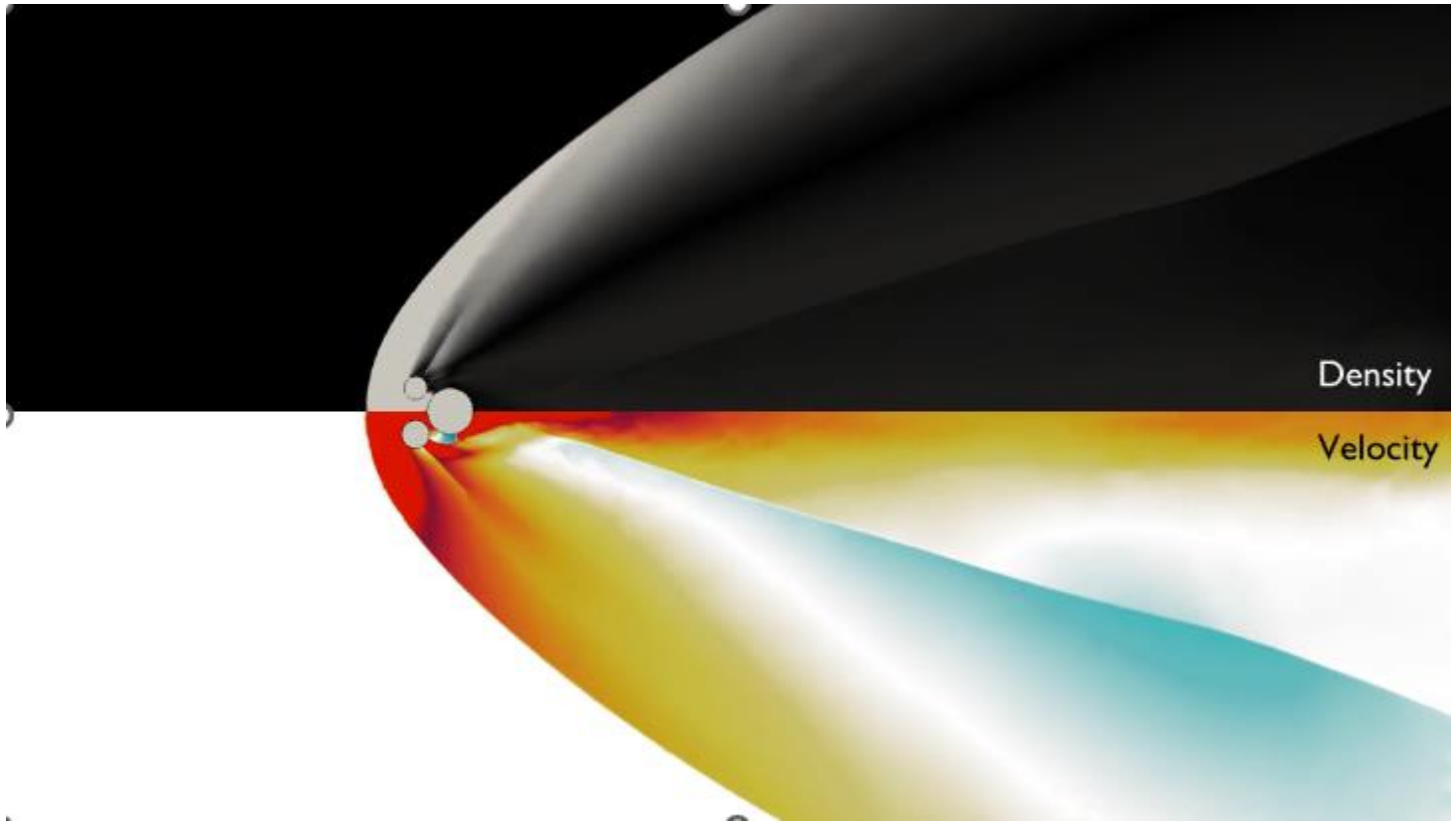
Streamlines of the electric field generated by a current dipole source located in the temporal lobe of an epilepsy patient. Finite element solution using a regular hexahedral grid implemented in MFEM. Visualization with ParaView.

Ben Zwick
University of Western Australia

Runner up for Animations

?

Runner up for Animations



Single phase compressible Euler simulation using a DG discretization to describe supersonic (Mach 2.5) flow around cylindrical obstructions. The simulation leverages Synthetik's newly developed code for highly compressible flows.

Tim Brewer
Synthetik Applied Technologies

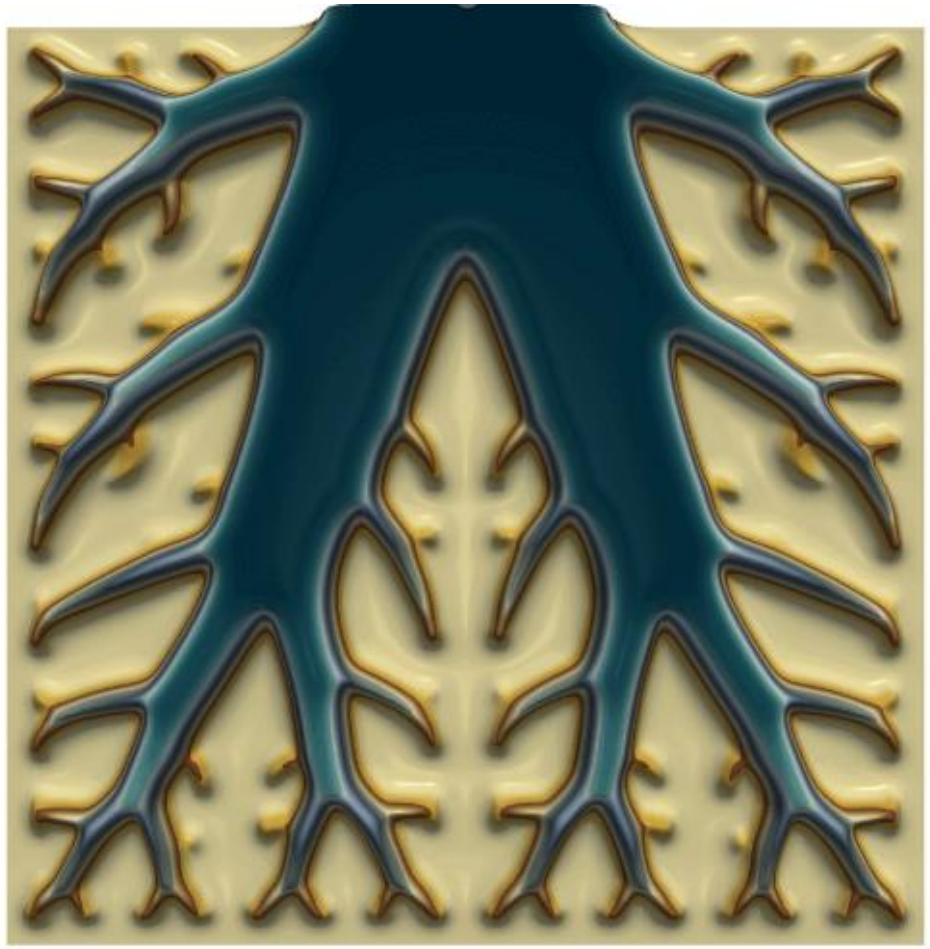
Winner for Animations

?

Winner for Animations

Split Decision!

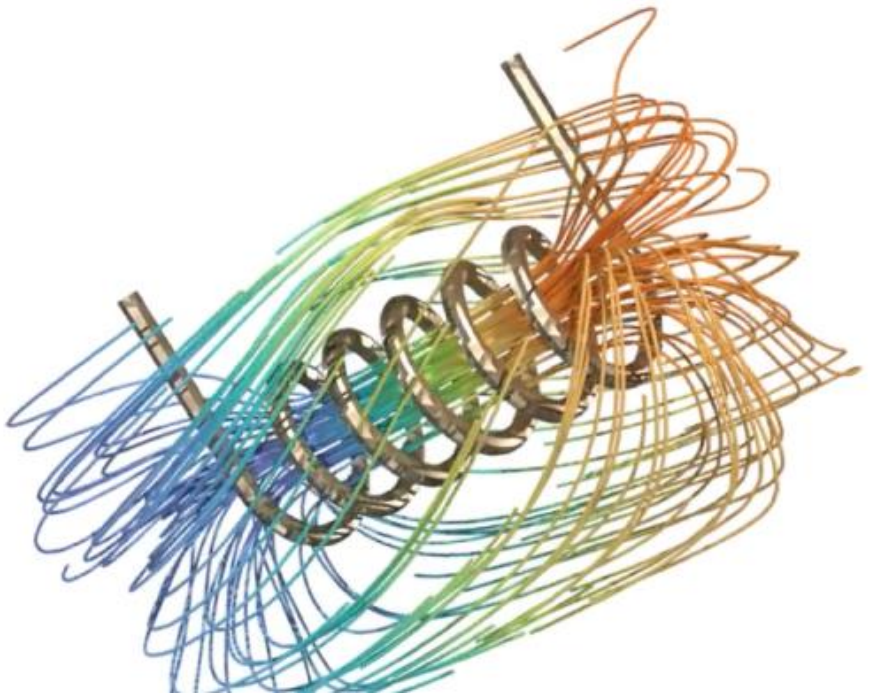
Winner 1 for Animations



The animation presents a topology-optimized heat sink obtained with a new algorithm developed by the team in LDRD 22-ERD-009. The objective is to minimize the thermal energy in a domain with constant internal heating. In this problem, there is only one exit point for heat to escape, namely, at the central region of the upper boundary. The amount of material in the heat sink is constrained, and the problem requires a binary design. Witness that the solution appears almost organic, in some ways, like the roots of a tree that grow to maximally absorb water. Thus, we see, at least visually, the logic in this natural design solution and possible connections between channeling heat and channeling of other scalar fields.

Tobias Duswald (Brendan Keith, Socratis Petrides and Boyan Lazarov)
CERN/TUM, BROWN UNIVERSITY, LLNL

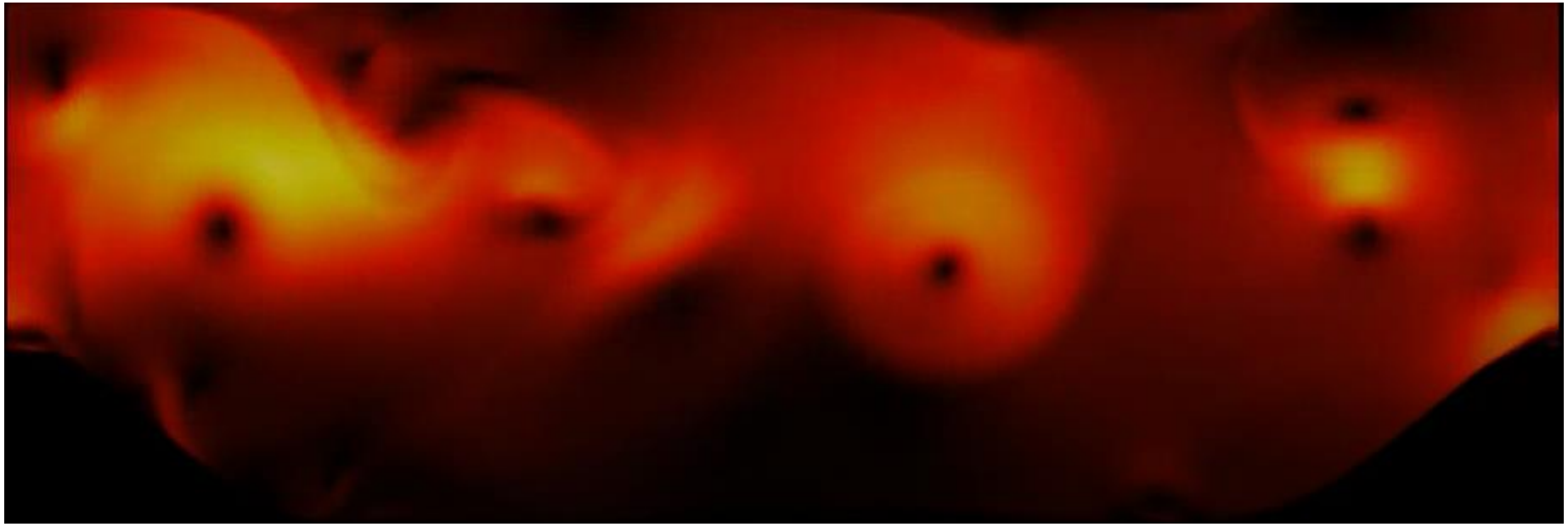
Winner 2 for Animations



Magnetic diffusion problem solved to compute the magnetic field induced by current running through copper wire in air. The problem is solved using the A-phi formulation, using GPU-accelerated low-order-refined solvers in H1 and H(curl). The magnetic field is represented as a Raviart-Thomas finite element vector field in H(div).

Will Pazner
Portland State

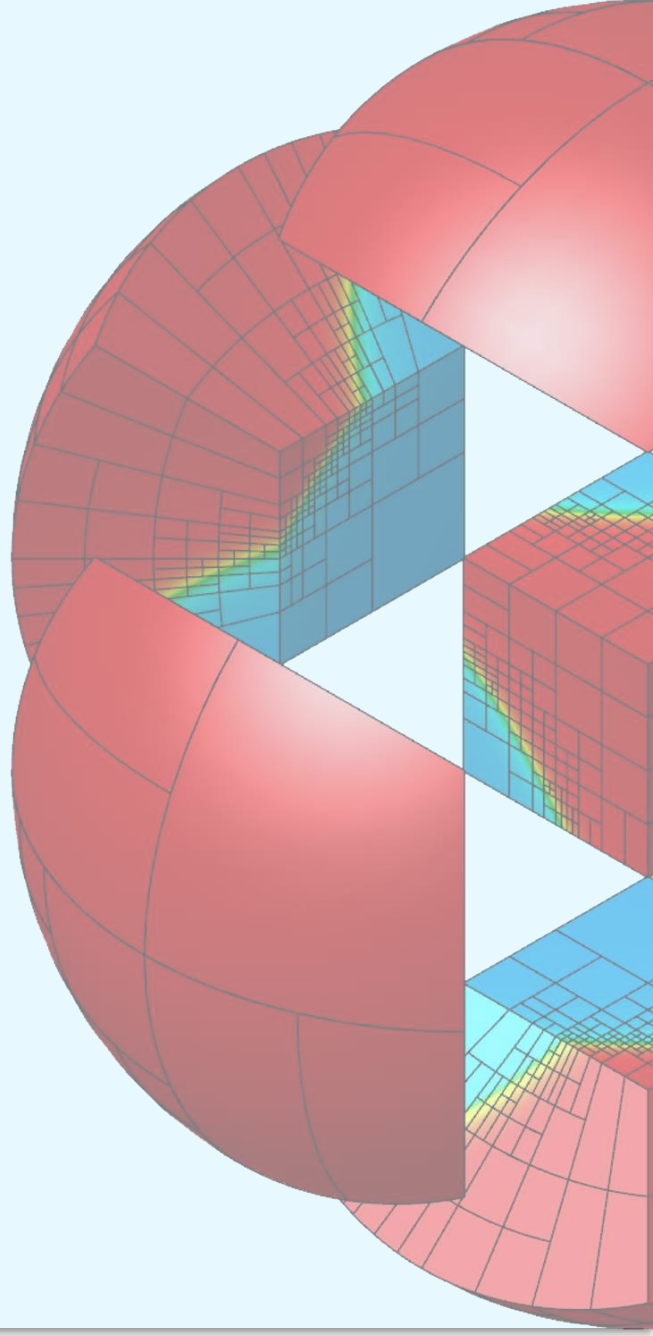
Honorable Mention



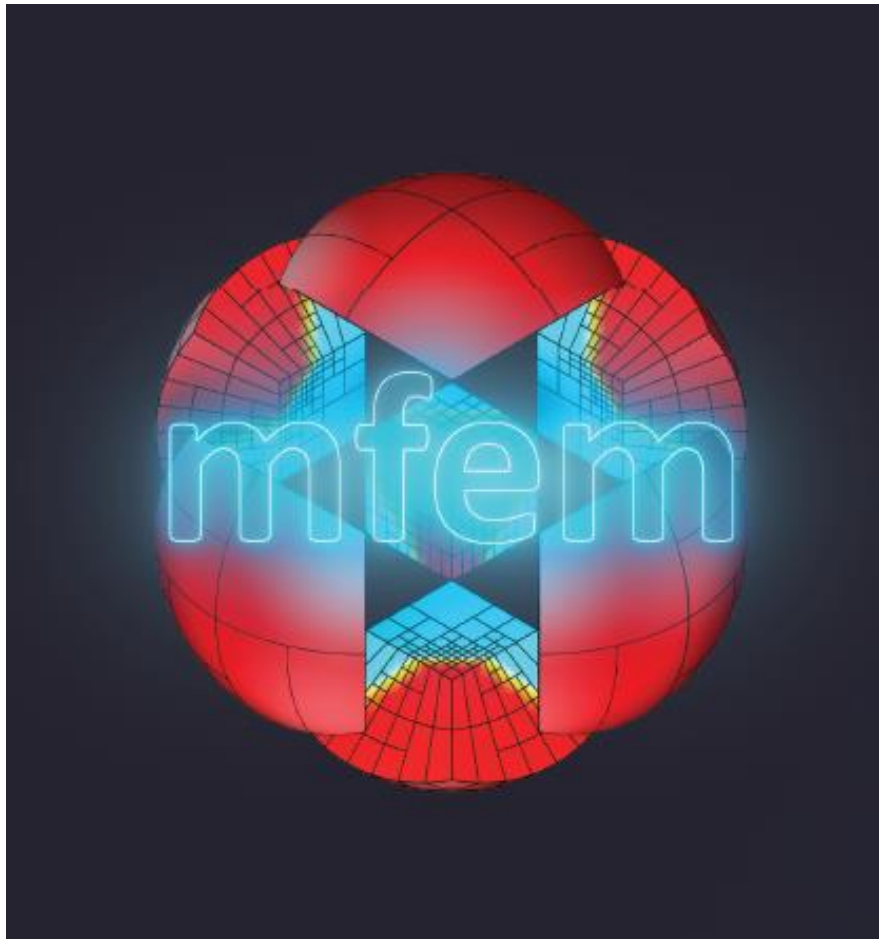
Turbulent Incompressible Navier-Stokes LES flow through a periodic hill, H1 p=4, Re=5000

Julian Andrej
LLNL

Wrapup



MFEM Resources



- Github:
  - Repo - https://github.com/mfem/mfem
  - Issues - https://github.com/mfem/mfem/issues
  - Group - https://github.com/orgs/mfem/teams/everyone
- mfem.org:
  - Front page – https://mfem.org
  - Workshops – https://mfem.org/workshop
- Publications:
  - MFEM: A Modular Finite Elements Library, Computers and Mathematics with Applications, June 2020
  - https://mfem.org/publications
- Planning a seminar series, stay tuned!
- Contact us:
  - Near term Slack - https://mfemworkshop.slack.com
  - Long term Github issues - https://github.com/mfem/mfem/issues

See you all next year!

Gratitude

- Applause for the speakers
- Special thanks to the workshop planning committee: Tzanio Kolev, Will Pazner, Socratis Petrides, Ketan Mittal, and Holly Auten.
- Thank you all for attending.

Thank you from the MFEM team at LLNL!

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