UNIVERSITY OF MARYLAND

THE BURGERS PROGRAM FOR FLUID DYNAMICS
THE FLUID DYNAMICS REVIEWS SEMINAR SERIES

WALL-BOUNDED TURBULENCE AT HIGH REYNOLDS NUMBER

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DeWalt Seminar Room
2164 Glenn L. Martin Hall

Speaker

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ABSTRACT

Nearly all moving objects on Earth interact with fluids, often at high speeds, making high Reynolds number (Re) wall-bounded turbulent flows critically important in many technological applications. The multi-scale nature of turbulence demands both high spatial and temporal resolution for accurate study. Direct numerical simulation (DNS) is a method used to solve the Navier-Stokes equations—the governing equations of fluid flow—with sufficient resolution to capture all turbulence scales. However, DNS is extremely computationally intensive and limited by available resources. For example, DNS of incompressible turbulent channel flow at friction Reynolds numbers up to 5200 has required more than 500,000 processors to investigate high-Re wall-bounded turbulence. In this presentation, we will discuss the characteristics of high-Re wall-bounded flows, with a particular focus on the lifecycle of Reynolds stress in turbulent channel flows at high Reynolds numbers, supported by simulation results from turbulent Poiseuille and Couette flows.

BIO

Dr. Myoungkyu Lee is an Assistant Professor in the Department of Mechanical and Aerospace Engineering at the University of Houston, previously serving in the same role at the University of Alabama. He earned his Ph.D. in Mechanical Engineering from the University of Texas at Austin in 2015 and completed a postdoctoral position at the Institute for Computational Engineering and Sciences (ICES) there. In 2018, he joined the Combustion Research Facility at Sandia National Laboratories, focusing on combustion processes with strong thermal nonequilibrium. In 2023, Dr. Lee received a Department of Energy INCITE grant, enhancing his large-scale computational research efforts. He was also honored as an Early Career Presenter Fellow by the U.S. National Committee for Theoretical and Applied Mechanics in 2021 and was a Best Student Paper Finalist at SuperComputing 2013. His research interests include high-performance computing, flows with thermal and chemical nonequilibrium, and direct numerical simulations of wall-bounded turbulent and reactive flows.

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