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BRIDGING FUNDAMENTAL TURBULENCE AND ENGINEERING SIMULATIONS IN COMPLEX FLOWS

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ABSTRACT

Turbulence remains a central challenge in computational fluid dynamics, involving complex multiscale interactions relevant to both fundamental physics and engineering applications. While data-driven approaches have gained attention, progress continues to rely on physics-based understanding, modelling, and high-fidelity simulations.

This mini-symposium brings together contributions on fundamental and applied aspects of turbulent and complex flows. The focus is on the interplay between physical insight and modelling, spanning transition, intermittency, and high-Reynolds-number turbulence, and their implications for predictive simulations. The scope covers turbulent flows in complex fluids such as non-Newtonian and viscoelastic systems, as well as multi-physics problems including reacting and multiphase flows. It also includes DNS studies on wall-bounded turbulence over smooth and rough surfaces, with relevance to transport and flow behaviour. Studies on turbulent heat transfer, flow control, and turbulence modelling, including RANS, LES, and hybrid approaches are also within scope. Data-driven methods are welcome as complementary tools when they enhance physical understanding or modelling capabilities.

The mini-symposium aims to connect fundamental turbulence research with engineering-scale simulations, promoting an integrated understanding of turbulent and complex flows.