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ETH Zürich
Friday 11 October 2024
Time: 14:15
Location: HG E 3
followed by apéro
in ML Hall

Defining coherent structures for flow modeling: identification, dynamical significance and low-order representation

While a single definition for a coherent structure has been the topic of debate over many years, it can be agreed that the eye is drawn to certain motions that are persistent in space and time in a range of flows. Here we investigate flow-specific descriptions of coherence associated with specific scientific questions and practical applications. After discussing the identification and classification of important structure types, we outline building block models for each in wall-bounded turbulence. Simple theoretical rules governing the forcing that sustains the structures are compared with data-driven characterization of key nonlinear interactions. The results are used to outline a skeleton for coherent structures that, for example, can be used to improve the representation of the wall region in wall-modeled LES, as well as to understand sustaining mechanisms in wall turbulence in a manner amenable to reduced order modeling. As time permits, related investigations in other flow configurations and additional lab activities will be described.

Beverley McKeon is Professor of Mechanical Engineering and member of the Center for Turbulence Research (CTR) at Stanford University. She was formerly the Theodore von Karman Professor of Aeronautics at the Graduate Aerospace Laboratories at Caltech (GALCIT) and Deputy Chair of the Division of Engineering and Applied Science. She received M.A. and M.Eng. degrees from the University of Cambridge and a Ph.D. in Mechanical and Aerospace Engineering from Princeton University. Her research interests include interdisciplinary, equation- and data-driven approaches to modeling and manipulation of turbulent flows, fundamental experimental investigations of wall turbulence at high Reynolds number, and assimilation of experimental data for efficient low-order flow modeling. McKeon was the recipient of a Vannevar Bush Faculty Fellowship from the DoD in 2017, a Presidential Early Career Award (PECASE) in 2009 and an NSF CAREER Award in 2008, and is a Fellow of the APS and AIAA. She currently serves as co-Lead Editor of Phys. Rev. Fluids and on the editorial board of the Annual Review of Fluid Mechanics. She is Past Chair of the US National Committee on Theoretical and Applied Mechanics.

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