Multidisciplinary Simulation, Estimation, and Assimilation Systems
Seminar Series

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Objective Eulerian Coherent Structures in Fluids

Abstract: Short-term variability in coherent features of unsteady fluid flows is of prime interest in fields ranging from flow control through environmental assessment to search and rescue operations. Available methods for the identification of the instantaneously most influential flow structures, however, are generally frame-dependent and heuristic, which limits the reliability of the results they provide. In this talk, we discuss a rigorous global variational theory of objective Eulerian Coherent Structures (OECSs), which uncovers the correct instantaneous material skeleton of an unsteady fluid flow in a frame-invariant fashion. We show applications to detecting unsteady flow structures objectively in satellite-based and radar-inferred ocean surface velocity fields. We find that these structures remain generally hidden to traditional, non-objective Eulerian flow analysis.

Biography: George Haller received his Ph.D. in Applied Mechanics at the California Institute of Technology in 1993. He then spent a year as postdoc at the Courant Institute of Mathematical Sciences at New York University, prior to joining the Division of Applied Mathematics at Brown University as Assistant Professor in 1994. In 2001, he left Brown University as Associate Professor to join the Department of Mechanical Engineering at the Massachusetts Institute of Technology, where he became Professor in 2005. While still a professor at MIT, he became the first director of Morgan Stanley's Mathematical Modeling Center in Budapest, which he headed for three years. He then joined the Department of Mechanical Engineering at McGill University in 2009, serving as Department Chair till 2011. He is currently Professor of Nonlinear Dynamics at ETH Zurich. Professor Haller has served on the editorial boards of the SIAM Journal for Mathematical Analysis, the Journal of Nonlinear Science, the Journal of Discrete and Continuous Dynamical Systems and the Zeitschrift für Angewandte Mathematik und Physik (ZAMP). His honors include a Manning Assistant Professorship at Brown University, an Alfred P. Sloan Research Fellowship, an Albert Szent-Gyorgyi Fellowship, an ASME Thomas J.R. Hughes Young Investigator Award, an Honorary Doctorate from the Budapest University of Technology and Economics and a Faculty of Engineering Distinguished Professorship at McGill University.
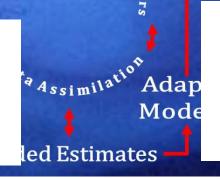
Tuesday, Jan. 24, 2017
11:00AM; Rm. 5-314

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Hosts:
Thomas Peacock
http://web.mit.edu/endlab/index.html
Themis Sapsis
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