Prediction of Turbulent Fluid Flow through Novel Diagnostics and Machine Learning

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Abstract: Significant challenges remain in the physics of turbulent fluid flow due to strong nonlinearities. We are fortunate to live in a time with a growing slate of diagnostics including optics, acoustics, IR, and magnetic sensors among with many others. These allow a new data-rich environment for strongly nonlinear flows. New sensors, data science, and machine learning are allowing prediction tools and classification systems with surprising abilities. I'll discuss examples of these involving superfluid helium, liquid sodium, and turbulent rotating fluid flows, together with some forward looking options to solve real world problems.

Short Bio: Daniel Perry Lathrop received a B.A. in physics from the University of California at Berkeley in 1987, and a Ph.D. in physics from the University of Texas at Austin in 1991. He then served at Yale University as a postdoctoral fellow, research affiliate, and lecturer, and as Assistant Professor at Emory University. He joined the University of Maryland in 1997, the year he received a Presidential Early Career Award from the National Science Foundation. Dr. Lathrop is now Distinguished Teacher Scholar, Professor of Physics, Professor of Geology, Fellow of the American Physical Society and Fellow of the American Association for the Advancement of Science. He received the Stanley Corrsin Award in 2012 from the American Physical Society for his work in quantum fluids. He is also an Affiliate Professor in the Department of Electrical and Computer Engineering and the Department of Mechanical Engineering. His research in the Nonlinear Dynamics group at Maryland focuses on high-speed machine learning electronics (including radio signal intelligence), turbulent fluid flows, geomagnetism and novel fluid flow measurements using optics and acoustics. Dr. Lathrop was also Director of the Institute for Research in Electronics and Applied Physics from 2006 to 2012, and served as the Associate Dean for Research for the College of Computer, Mathematical and Natural Sciences from 2012 to 2015. He serves as the Chair of the UMD Export Control and International Compliance committee assisting on risk reduction.