Boulder Fluid Dynamics Seminar Series

Tuesday, April 29, 2014
3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center (DLC)
University of Colorado at Boulder

Can Turbulence Really Be Universal?

Lakshmi Prasad Dasi, *Colorado State University*

The key towards fully understanding the universality of turbulence lies with better understanding the problem of intermittency, particularly for the case of turbulent shear flows (TSFs). The intermittency problem specifically refers to the highly intermittent nature of the turbulent kinetic energy dissipation rate field. These intermittent fluctuations in energy dissipation are reflected in the fluctuations of the local dissipative scale (so called smallest turbulent eddy size) giving rise to the existence of sub-Kolmogorov eddies with large velocity scales. In this talk, I will discuss the statistical properties of the local dissipative scales though (a) a simple Monte-Carlo formulation of isotropic and anisotropic velocity fluctuations in space, and (b) time-resolved measurements of the TSF downstream of a backward facing step. We will argue through these simulations and measurements that intermittency does not obey a single universal statistical property. Instead, it appears to depend on the strength of the local mean deformation field, and therefore directly contradicting the notion of local isotropy. Nevertheless, these departures from isotropic expectations appear to be related only to the local mean-shear dissipation Reynolds number (based on the local mean turbulent kinetic energy dissipation rate and the local mean shear). The significance of this finding points to the possible existence of a family of universal small-scale structures of turbulence with the classical isotropic case being a special case corresponding to vanishing mean shear.

Right Heart Vorticity in Patients with Right Ventricular Diastolic Dysfunction

James Browning, *University of Colorado, Boulder*

Recent advances in cardiac magnetic resonance imaging have allowed for characterization of blood flow in the human right ventricle (RV) and right atrium (RA), including calculation of vorticity and circulation, and qualitative visual assessment of coherent flow patterns. An overview of the methods and results of a recent study of the qualitative and quantitative differences in RV and RA vorticity and coherent flow patterns between healthy human subjects and patients with right ventricular diastolic dysfunction will be presented.