CENTER FOR FLUID MECHANICS
AND
THE FLUIDS, THERMAL AND CHEMICAL PROCESSES GROUP
OF
THE DIVISION OF ENGINEERING
SEMINAR SERIES

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INERTIAL SCALING IN WALL-BOUNDED FLOWS AS AN INDICATOR OF "HIGH" REYNOLDS NUMBER

Self-similarity and scale separation, specifically in the form of an overlap region in the mean velocity (e.g. Millikan, 1938) and an inertial subrange (or at least self-similar scaling of the velocity spectra in that wavenumber region) are widely-accepted hypotheses in the study of turbulent flows. In this work we seek to improve the definition of "high Reynolds number", important for extrapolation of scaling results from laboratory conditions, by demonstrating the link between the two in wall-bounded flows: the oft-quoted equivalence of the mean velocity overlap in physical space, or ``inertial sublayer'', with the inertial subrange in wavenumber space.

The importance of both the mixing transition, or separation of viscous and turbulent energy-bearing scales (Dimotakis, 2000), and development of self-similar spectral scaling to similarity in physical space is demonstrated using high Reynolds number pipe flow data from the Princeton/ONR Superpipe.

TUESDAY – NOVEMBER 15, 2005
Barus & Holley, Room 190
4:00pm