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Direct Numerical Simulation of Turbulent Pipe Flows subjected to Transverse Oscillations MARK CZAJKOWSKI, OLIVIER DESJARDINS, University of Colorado at Boulder — Fundamental effects of transverse oscillations on a turbulent pipe are being studied using direct numerical simulations (DNS). Previous studes of pipes subjected to oscillations around their central axis have shown a reduction in pressure drop. This study is a generalization of previous work to the case of an oscillation around an axis parallel to but not coinciding with the pipe centerline.The role of oscillation frequency, amplitude, and radius on the statistics of turbulent pipe flows, as well as bulk properties like pressure drop are investigated. Two key non-dimensional numbers are identified. The first relates the oscillation amplitude to a turbulent length scale (Taylor micro-scale); and the second number, a Strouhal number, compares the oscillation frequency to a turbulent time scale. These non-dimensional numbers, along with oscillation radius, are varied over a range of values, and DNS were performed using the arbitrarily high order accurate code NGA [Desjardins, et al., JCP 2008]. The resulting turbulent flows were analysed using a variety of turbulent statistics and compared to stationary and pipes rotating around their central axis.

Mark Czajkowski
University of Colorado at Boulder

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