Abstract Submitted for the DFD16 Meeting of The American Physical Society

Entropy-viscosity based LES of turbulent flow in a flexible pipe ZHICHENG WANG, Massachusetts Institute Technology, FANGFANG XIE, Zhejiang University, MICHAEL TRIANTAFYLLOU, Massachusetts Institute Technology, YIANNIS CONSTANTINIDES, Chevron Energy Technology Company, GEORGE KARNIADAKIS, Brown University — We present large-eddy simulations (LES) of turbulent flow in a flexible pipe conveying incompressible fluid. We are interested in quantifying the flow-structure interaction in terms of mean quantities and their variances. For the LES, we employ an Entropy Viscosity Method (EVM), implemented in a spectral element code. In previous work, we investigated laminar flow and studied the complex interaction between structural and internal flow dynamics and obtained a phase diagram of the transition between states as function of three non-dimensional quantities: the fluid-tension parameter, the dimensionless fluid velocity, and the Reynolds number. Here we extend our studies in the turbulence regime, Re from 5,000 to 50,000. The motion of the flexible pipe affects greatly the turbulence statistics of the pipe flow, with substantial differences for free (self-sustained) vibrations and prescribed (forced) vibrations.

> George Karniadakis Brown University

Date submitted: 27 Jul 2016

Electronic form version 1.4