Meeting: 1005, Newark, Delaware, SS 7A, Special Session on Frontiers on Complex Fluid Flows: Analytic and Computational Methods

1005-76-105 **Antony N Beris*** (beris@che.udel.edu), Department of Chemical Engineering, University of Delaware, Newark, DE 19716, and **Kostas D Housiadas**. *Direct Numerical Simulations of Viscoelastic Turbulent Channel Flows.*

Turbulent viscoelastic simulations are much more demanding than Newtonian simulations not only because they involve more dependent variables (the conformation tensor or, alternatively, the extra-stress tensor) but also because the time integration of the additional required equation, which is typically represented by FENE-P for a dilute polymer solution, is quite a difficult task. In addition, the structural polymer scales are too fine to be resolved. The use of some form of diffusivity in the constitutive model becomes a necessity.

In our work, we performed DNS using full spectral or pseudo-spectral techniques using an artificial diffusion in the constitutive model in order to simulate and better understand the phenomenon of polymer-induced drag reduction. Trying to achieve the best balance of accuracy and stability we have developed and implemented four different generations of algorithms. We will describe the structure of these algorithms; mention the most important features and focus of the advantages of each one together with the most crucial findings. Indicative first and higher order statistics will be presented. Finally, a brief rheology study (comparison between different constitutive models; effect of the rheological parameters) will be offered. (Received February 02, 2005)