

Abstract Submitted  
for the DFD11 Meeting of  
The American Physical Society

**Turbulent drag reduction by transverse wall oscillations** RASHAD MOARREF, MIHAILO R. JOVANOVIĆ, University of Minnesota — Skin-friction drag reduction by transverse wall oscillations has received significant attention in the last two decades. Both experiments and simulations have demonstrated that oscillations with properly selected amplitude and frequency can reduce turbulent drag by as much as 40 percent. For a turbulent channel flow, we develop a model-based approach to design oscillations that suppress turbulence. We show that judiciously selected linearization of the flow with control can be used to determine turbulent eddy viscosity in a computationally efficient way. The resulting correction to the turbulent mean velocity is then used to identify optimal frequency of oscillations, which is in close agreement with previously conducted experimental and numerical studies. This demonstrates the predictive power of our simulation-free approach to controlling turbulent flows.

Rashad Moarref  
University of Minnesota

Date submitted: 05 Aug 2011

Electronic form version 1.4