Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

On the correspondence between polymer-modified turbulence states and transitional states in Newtonian flows[1] YVES DUBIEF, School of Engineering, University of Vermont, Burlington, VT, CHRISTOPHER WHITE, Dept. of Mech. Eng., University of New Hampshire, Durham, NH — Polymer addition is known to reduce drag in wall-bounded flows up to an asymptotic state called maximum drag reduction (MDR). The definition of MDR is still largely empirical and its uniqueness is a matter of debate. Using direct numerical simulations, a correspondence is first established between MDR and a specific state of transition in boundary layer flow. A model is derived as a function of the flow topology of the transitional Newtonian flow and the FENE-P model. The model is then extended to natural convection where heat transfer reduction (HTR) and augmentation (HTA) are observed as a function of polymer length. Yet, HTR and HTA are topologically equivalent and again correspond to a transitional state of Rayleigh Benard convection flow. This suggests that polymer-modified turbulence may be predictable as a function of the polymer solution's properties and transitional states of the corresponding Newtonian flow.

[1]The wall-bounded turbulence work was performed as part of the 2010 CTR Summer Program, Stanford, CA.

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Date submitted: 10 Aug 2010 Electronic form version 1.4