

ENERGY DISSIPATION RATE, VELOCITY CORRELATION FUNCTION AND STRUCTURE FUNCTIONS IN TURBULENT RAYLEIGH-BÉNARD CONVECTION WITH POLYMER ADDITIVES

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ABSTRACT

We report an experimental study of energy dissipation rate and velocity correlation function and structure functions in turbulent Rayleigh-Bénard (RB) convection with polymer additives in a convection cell with rough top and bottom plates. In a previous study, it was found that the global heat transport is enhanced in this cell when polymer concentration exceeds 120 ppm [1]. This interesting finding is our motivation for the local velocity measurement. We found that the local energy dissipation rate measured at cell center has similar dependence on polymer concentration as that of the global Nu. It is also found that the energy input from the integral scale is strongly affected by the polymer additives, suggesting an energy pileup near integral scale as a result of the polymer additives. We will discuss the relationship between energy dissipation rate and local heat flux and examine the behavior of velocity longitudinal correlation function and that of velocity structure function.

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References

- [1] Ping Wei, Rui Ni, and Ke-Qing Xia. Enhanced and reduced heat transport in turbulent thermal convection with polymer additives. *Phys. Rev. E*, **86**:016325, Jul 2012.