

Eulerian and Lagrangian Structure Function's Scaling Exponents in Turbulent Channel Flow

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The relation between Eulerian structure function's scaling exponents and Lagrangian ones in turbulent channel flows is explored both theoretically and numerically. A nonlinear parametric transformation between Eulerian structure function's scaling exponents and Lagrangian ones is derived, following Landau and Novikov's frame work. This relation is then compared to some known experimental and numerical results, but mainly to our DNS (direct numerical simulation) results of a fully developed channel flow with $Re_\tau = 100$. The scaling exponents are evaluated in terms of the ESS (extended self-similarity) method, since the Reynolds number is too low to make the standard scaling laws applicable. The agreement between theory and simulation is satisfactory.

Key words: Turbulent Channel Flow; Intermittency; Scaling Exponents.