Scaling law plays an important role in the research on statistics of turbulence. Not only can it provide support for model theory, but also guide people establish turbulent dynamic models and explain physical mechanism of turbulence from a statistical view.

Most existing studies on scaling law focus on isotropic turbulence and wall turbulence at moderate low Reynolds number. Because of the quick development of the computer and numerical simulation, we preliminarily study the scaling law in channel flow at high Reynolds number using the open direct numerical simulation (DNS) database.

By analyzing inertial subrange and the range where extended self-similarity (ESS) holds, we find that ESS holds in a wilder range than inertial subrange, which means that the self-similarity is also extended in high Reynolds number channel flow. A phenomenon called “dividing” is found in this paper and explained semi-quantitatively from the view of scale. The relative scaling exponents are calculated finally and compared with the classical theory and existing results. We also study their behavior when distance changes. In the viscous wall region, the exponents deviate violently with SL94, which indicates intense intermittency, while in the log-law region, the exponents are in good agreement with SL94 and show weak dependence on y+ .