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**Scaling of Lyapunov Exponents in Homogeneous, Isotropic DNS** NICHOLAS FITZSIMMONS, MYOUNGKYU LEE, NICHOLAS MALAYA, ROBERT MOSER, University of Texas Austin — In order to study the nature of the chaos in turbulence, we investigate Lyapunov exponents. These exponents measure the rate of separation of initially infinitesimally close trajectories in phase space. Lyapunov exponents are examined for two purposes: to investigate the scaling of the exponents with respect to the parameters of forced homogeneous isotropic turbulence, and to locate the chaotic features of turbulence. Specifically, we explore the scaling of the Lyapunov exponents with respect to the Taylor Reynolds number, $Re_\lambda$, and with respect to the ratio of the integral length scale and the computational domain. The latter is varied through manipulation of the Uhlenbeck Ornstein process, which forces the DNS. The exponents are measured by introducing a linear disturbance, evolving it with the linearized Navier-Stokes equation, and normalizing it at each step. Using this disturbance and the velocity field one calculates the instantaneous growth rate of the disturbance at each time step. We will show how these exponents may then be used to measure the predictability in turbulent flows and allow for the study of the instabilities of the chaotic field.

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