

Abstract Submitted
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Universality of spectrum of passive scalar variance at very high Schmidt number in isotropic steady turbulence¹ TOSHIYUKI GOTOH, Nagoya Institute of Technology — Spectrum of passive scalar variance at very high Schmidt number up to 1000 in isotropic steady turbulence has been studied by using very high resolution DNS. Gaussian random force and scalar source which are isotropic and white in time are applied at low wavenumber band. Since the Schmidt number is very large, the system was integrated for 72 large eddy turn over time for the system to forget the initial state. It is found that the scalar spectrum attains the asymptotic k^{-1} spectrum in the viscous-convective range and the constant C_B is found to be 5.7 which is larger than 4.9 obtained by DNS under the uniform mean scalar gradient. Reasons for the difference are inferred as the Reynolds number effect, anisotropy, difference in the scalar injection, duration of time average, and the universality of the constant is discussed. The constant C_B is also compared with the prediction by the Lagrangian statistical theory for the passive scalar. The scalar spectrum in the far diffusive range is found to be exponential, which is consistent with the Kraichnan's spectrum. However, the Kraichnan spectrum was derived under the assumption that the velocity field is white in time, therefore theoretical explanation of the agreement needs to be explored.

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