Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

On the power law of passive scalars in turbulence[1] TOSHIYUKI GOTOH, TAKESHI WATANABE, Nagoya Institute of Technology — It has long been considered that the moments of the scalar increment with separation distance r obey power law with scaling exponents in the inertial convective range and the exponents are insensitive to variation of pumping of scalar fluctuations at large scales, thus the scaling exponents are universal. We examine the scaling behavior of the moments of increments of passive scalars 1 and 2 by using DNS up to the grid points of 4096^3. They are simultaneously convected by the same isotropic steady turbulence at$R_\lambda = 805$, but excited by two different methods. Scalar 1 is excited by the random scalar injection which is isotropic, Gaussian and white in time at law wavenumber band, while Scalar 2 is excited by the uniform mean scalar gradient. It is found that the local scaling exponents of the scalar 1 has a logarithmic correction, meaning that the moments of the scalar 1 do not obey simple power law. On the other hand, the moments of the scalar 2 is found to obey the well developed power law with exponents consistent with those in the literature. Physical reasons for the difference are explored.

[1]Grants-in-Aid for Scientific Research 15H02218 and 26420106, NIFS14KNSS050, HPCI project hp150088 and hp140024, JHPCN project jh150012

Toshiyuki Gotoh
Nagoya Institute of Technology

Date submitted: 28 Jul 2015 Electronic form version 1.4