Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Modulation of fluid temperature fluctuations by particles in turbulence[1] IZUMI SAITO, TAKESHI WATANABE, TOSHIYUKI GOTOH, TATSUYA YASUDA, Nagoya Institute of Technology — Modulation of fluid temperature fluctuations by particles due to thermal interaction in homogeneous isotropic turbulence is considered. For simplicity, only thermal coupling between fluid and particle is considered, and momentum coupling is neglected. Application of the statistical theory in cloud turbulence study leads to the prediction that modulation of fluid temperature fluctuations by particles is described as a function of the Damkohler number, which is defined as the ratio of the turbulence large-eddy turnover time to the gas thermal relaxation time. Direct numerical simulations are conducted for two-way thermal coupling between fluid temperature field and point particles in homogeneous isotropic turbulence. The simulation results are shown to agree accurately with the theoretical prediction.

[1]MEXT KAKENHI 20H02066, 20H00225, JSPS KAKENHI 18K03925, THE NAITO FOUNDATION, HPCI hp 200072, JHPCN jh 200006, NIFS Collaboration Research program (NIFS20KNSS143), Nagoya University HPC Project 2020

Izumi Saito
Nagoya Institute of Technology

Date submitted: 01 Aug 2020 Electronic form version 1.4