Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

**Multiscale analysis of passive scalar transfer in compressible isotropic turbulence**[1] JIANCHUN WANG, MINPING WAN, CHENYUE XIE, QINMIN ZHENG, XIAONING WANG, JIAN TENG, LIAN-PING WANG, SHIYI CHEN, Southern University of Science and Technology, Shenzhen, Guangdong 518055, P. R. China — Inter-scale transfer of a passive scalar in stationary compressible isotropic turbulence is studied by numerical simulations at a Taylor Reynolds number of approximately 250, and at turbulent Mach numbers of 0.4 and 1.0. The -5/3 scaling behavior is identified for the fluctuation spectrum of passive scalar, with the Obukhov-Corrsin constant close to that of a passive scalar spectrum in incompressible turbulence. The average subgrid-scale (SGS) flux of passive scalar normalized by the total dissipation rate is close to 1 in the inertial range. It is shown by Helmholtz decomposition that the SGS flux of passive scalar is dominated by the solenoidal mode of velocity field. Moreover, the effect of local compressibility on the SGS flux of passive scalar is investigated by conditional averaging with respect to the filtered velocity divergence. A discrete approximate deconvolution model (DADM) is proposed to reconstruct the SGS flux of passive scalar from the filtered flow fields. Numerical results show that the SGS flux of passive scale reconstructed by DADM is in good agreement with the real SGS flux of passive scalar.

[1]This work was supported by NSFC Grants No. 11702127, No. 91752201, and No. 11672123; Grant No. JCYJ20170412151759222 and ZDSYS201802081843517; Grant No. 2016QNRC001.

Jianchun Wang
Southern University of Science and Technology

Date submitted: 01 Aug 2019 Electronic form version 1.4