Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Heat transport by rotating Rayleigh-Bnard convection in cylindrical cells with various aspect ratios[1] JIN-QIANG ZHONG, HAO-YUAN LU, JUN-QIANG SHI, Tongji University — Rotating convection has been of interest for decades, yet there exists no generally accepted scaling law for heat transfer behavior in the geostrophic turbulence regime. We present high-precision measurements of the Nusselt number Nu as functions of the Rayleigh number Ra and the Ekman number Ek using cylindrical cells with various aspect ratio Γ. For a given Γ data for Nu(Ra, Ek) in the geostrophic regime can be represented through one single power function $Nu{=}(Ra/Ra_c)^{\gamma}$, where $Ra_c{=}8.7Ek^{-4/3}$ is the critical Ra for the onset of convection. However, our experimental and numerical results reveal that the exponent γ increases steeply with increasing Γ, leading to various parameter scaling for the transition towards the geostrophic regime. The present study may provide hints to reconcile previous results of the heat-transport scaling relationship in geostrophic turbulence.

[1]This work was supported by NSFC-Grant 11572230, 11772235 and 11561161004.

Jin-Qiang Zhong
Tongji University

Date submitted: 29 Jul 2019 Electronic form version 1.4