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Reynolds Number Effects on Turbulent Characteristics of Taylor-Couette Flow JOONHWI PARK, NAOYA FUKUSHIMA, MASAYASU SHIMURA, MAMORU TANAHASHI, TOSHIO MIYAUCHI, Tokyo Institute of Technology — Laminar and turbulent Taylor-Couette flow is of great importance in a wide range of engineering applications, such as viscosity measurement devices, rotating machineries and reactors. In this study, we focus on turbulent Taylor-Couette flow with a fixed outer cylinder and a rotating inner cylinder. Direct numerical simulation (DNS) of turbulent Taylor-Couette flow has been conducted to investigate turbulent characteristics including Reynolds stress budget at Reynolds number from 8000 to 20000. Reynolds number, Re, is defined by gap width and rotating speed of inner cylinder. In this range of Re, turbulent characteristics are expected to change around Re=10000, referring to Wendt's empirical formula. Averaged torque from DNS agrees well with Wendt's empirical formula and torque transition is confirmed around Re=10000. Averaged azimuthal velocity normalized by friction velocity on inner/outer wall increases in logarithmic region with increase in Re. All components of Reynolds stress tensor also increase in all domain. The minute movement of center of Taylor vortices is observed spatially and temporally when Re is over 12000. Finally, Reynolds stress budgets are investigated to figure out Reynolds number effects on turbulent statistics in detail.

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