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DNS of turbulent co- and counterrotating Taylor Couette flow up to Re=30,000 BRUNO ECKHARDT, HANNES BRAUCKMANN, Philipps-Universitaet Marburg — We study global and local torque fluctuations in turbulent Taylor-Couette flows for shear Reynolds numbers Re_S up to 3×10^4 at various mean rotations for radius ratios $\eta = 0.71$ and 0.5 and $\Gamma = 2$. Convergence of simulations is tested using three criteria of which the agreement of dissipation values estimated from the torque and from the volume dissipation rate turns out to be most demanding. The typical spatial distribution of the different convective and viscous contributions to the local current are identified and PDF's of local current fluctuations calculated. The results agree with experimental observations after an additional spatial average to account for finite resolution. Simulations realising the same shear $Re_S \geq 2 \times 10^4$ show a maximum in torque for moderate counter-rotation. For lower values $Re_S \leq 4 \times 10^3$ the torque features a maximum for a stationary outer cylinder. For stronger counter rotation the flow develop intermittently fluctuating boundary layers near the outer cylinder. We demonstrate the phenomenon in direct numerical simulations and propose a theoretical model for the critical value in the rotation ratio that agrees well with the observations.

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