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Transitions in turbulent plane Couette flow with rotation¹ MATTHEW SALEWSKI², BRUNO ECKHARDT, Fachberiech Physik, Philipps-Universitate Marburg — The interplay of shearing and rotational forces in fluids significantly affects the transport properties of turbulent fluids such as the heat flux in rotating convection and the angular momentum flux in a fluid annulus between differentially rotating cylinders. A numerical investigation was undertaken to study the role of these forces using plane Couette flow subject to rotation about an axis perpendicular to both wall-normal and streamwise directions. Using a set of progressively increasing Reynolds numbers ($650 \le Re \le 5200$), our primary findings show the momentum transport for a given Re is a smooth but non-monotonic function of inverse Rossby number $(1/R_0)$. For lower turbulent Reynolds numbers, $Re \leq 1300$, a peak in momentum transport occurs at 1/Ro = 0.2; this peak is 50% higher than the non-rotating (1/Ro = 0) flux and is attributed to the turbulent Taylor vortices. However, as the shear is increased to Re = 5200, a second stronger peak emerges at 1/Ro = 0.03. The flux at the second peak is nearly 20% larger than the nonrotating flux compared to the Taylor vortex peak which is now only 16% larger. This finding contributes to the understanding of the torque maximum found in the high-turbulence Taylor-Couette experiments in Maryland, USA and Twente, NL.

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