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Coupling between Intrinsic Rotation and Turbulence-Driven Residual Stress in the TEXTOR Tokamak

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Direct measurements of residual stress (force) have been executed at the edge of the TEXTOR tokamak using multi-tip Langmuir and Mach probes, together with counter-current NBI torque to balance the existing toroidal rotation. Substantial residual stress and force have been observed at the plasma boundary, confirming the existence of a finite residual stress as possible mechanisms to drive the intrinsic toroidal rotation. In low-density discharges, the residual stress displays a quasi-linear dependence on the local pressure gradient, consistent with theoretical predictions. At high-density shots the residual stress and torque are strongly suppressed. The results show close correlation between the residual stress and the Er×B flow shear rate, suggesting a minimum threshold of the ErxB flow shear required for the k// symmetry breaking. These findings provide the first experimental evidence of the role of ErxB sheared flows in the development of residual stresses and intrinsic rotation.

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