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Intrinsic momentum generation in diverted tokamak edge by interaction between turbulence and neoclassical particle dynamics
JANGHOON SEO, Korea Advanced Institute of Science and Technology, Daejeon, Korea, C.-S. CHANG, S.-H. KU, PPPL, J.-M. KWON, National Fusion Research Institute, Daejeon, Korea — Fluid Reynolds stress from turbulence has usually been considered to be responsible for the anomalous toroidal momentum transport in tokamak plasma. Experiment by S. H. Müller et al. [Phys. Rev. Lett. **106**, 115001 (2011)], however, reported that neither the observed edge rotation profile nor the inward momentum transport phenomenon at the edge region of an H-mode plasma could be explained by the fluid Reynolds stress measured with reciprocating Langmuir-probe. The full-function gyrokinetic code XGC1 is used to explain, for the first time, Müller et al's experimental observation. It is discovered that, unlike in the plasma core, the fluid Reynolds stress from turbulence is not sufficient for momentum transport physics in plasma edge. The "turbulent neoclassical" physics arising from the interaction between kinetic neoclassical orbit dynamics and plasma turbulence is key in the tokamak edge region across the plasma pedestal into core.

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