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Experimental observation of the dynamics of shear flow and self-regulating drift-wave turbulence in a cylindrical plasma device ZHENG YAN, GEORGE TYNAN, CHRISTOPHER HOLLAND, MIN XU, JONATHAN YU, STEFAN MULLER, University of California, San Diego — We present an experimental observation of the drift-wave/shear flow dynamical system in a cylindrical plasma device. The azimuthal velocity at the shear layer from the multi-tip Langmuir probe measurements shows a low frequency evolution. The turbulent potential, divergence of the turbulent Reynolds stress and the turbulent radial particle flux are also modulated at the same frequency. The turbulence energy and the flow energy are conserved. A detailed ion momentum balance analysis demonstrates that such slow evolving shear flow is sustained by the turbulent Reynolds stress against the collisional and viscous damping. A similar low frequency evolving shear flow is also observed from the fast-frame imaging analysis, which also demonstrates the existence of the shear flow decorrelation process. Taken together, an experimental validation of the theoretical picture of the shear flow dynamics is provided in this work.

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