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Formation and saturation of zonal flows via turbulent momentum transport in a basic magnetized plasma experiment GEORGE TYNAN, JONATHAN YU, ZHENG YAN, CHRIS HOLLAND, STEFAN MULLER, MIN XU, Center For Energy Research, OZGUR GURCAN , PATRICK DIAMOND, Center for Astrophysics and Space Science — A radially sheared azimuthal plasma fluid flow is observed in a cylindrical magnetized helicon plasma device with no external sources of momentum input and is sustained against collisional dissipation by the turbulent Reynolds stress. Measurements show that the cross-phase between turbulent velocity components determine the detailed shape of the Reynolds stress profile and the resulting time averaged shear layer profile. Recent work also shows the a-periodic formation of radially outward going plasma transport events which are born near the shear layer and which are associated with the slow evolution of the background plasma fluctuations. The results show a clear demonstration of turbulent-driven shear flows via momentum transport, and suggest that such shear flows may become unstable and thereby generate outward going radial transport events.

George Tynan
UCSD Center For Energy Research

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