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Magnetic Fluctuation-Driven Intrinsic Flow in a Toroidal Plasma[1] D.L. BROWER, W.X. DING, L. LIN, UCLA, A.F. ALMAGRI, D.J. DEN HARTOG, J.S. SARFF, University of Wisconsin-Madison — Magnetic fluctuations have been long observed in various magnetic confinement configurations. These perturbations may arise naturally from plasma instabilities such as tearing modes and energetic particle driven modes, but they can also be externally imposed by error fields or external magnetic coils. It is commonly observed that large MHD modes lead to plasma locking (no rotation) due to torque produced by eddy currents on the wall, and it is predicted that stochastic field induces flow damping where the radial electric field is reduced. Flow generation is of great importance to fusion plasma research, especially low-torque devices like ITER, as it can act to improve performance. Here we describe new measurements in the MST reversed field pinch (RFP) showing that the coherent interaction of magnetic and particle density fluctuations can produce a turbulent fluctuation-induced kinetic force, which acts to drive intrinsic plasma rotation. Key observations include; (1) the average kinetic force resulting from density fluctuations, ~ 0.5 N/m^3, is comparable to the intrinsic flow acceleration, and (2) between sawtooth crashes, the spatial distribution of the kinetic force is directed to create a sheared parallel flow profile that is consistent with the measured flow profile in direction and amplitude, suggesting the kinetic force is responsible for intrinsic plasma rotation.

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