Abstract Submitted
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Instability of plasma waves during relaxation of 2D turbulent flows[1] A.A. KABANTSEV, C.F. DRSICOLL, University of California San Diego — We observe strong excitation of novel low-frequency z-dependent plasma waves ($m_\theta = 0, k_z = 1$), occurring during the nominally 2D relaxation of turbulent initial conditions ($10 - 100$ interacting vortices) in strongly magnetized electron columns. This initial relaxation often results in "2D vortex crystal" states [1, 2]. Here we describe experiments showing the concomitant growth of ill-understood low-frequency plasma waves, probably due to "leakage" of 2D turbulent potential energy into z-dependent fluctuations. With plasma injection, the lowest regular Trivelpiece-Gould mode ($m_\theta = 0, k_z = 1$) is observed at $f_{TG}(t) \approx 2.8$MHz and exponential decay time $\tau_{TG} \sim 1$msec. Also, we observe rapid exponential growth of a novel low-frequency mode with $f_{LF}(t) \approx 0.3$MHz, nominally also with $m_\theta = 0, k_z = 1$. In a few milliseconds (several tens of rotation times at $B = 10$kG), the LF-mode becomes highly nonlinear, developing up to a dozen temporal harmonics. When a LF-harmonic resonates with the decaying TG-mode, LF-mode energy is transferred into the TG-mode, and both modes remain at moderate amplitudes until the 2D turbulent relaxation abates (hundreds of rotation times). The ill-understood f_{LF} is *independent* of B, even though the growth and duration times follow scale as B^1 from the 2D flows.

[1] K.S. Fine *et al.*, PRL **75**, 3277 (1995).
[2] D.Z. Jin and D.H.E. Dubin, PRL **80**, 4434 (1998).

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Andre Kabantsev
University of California San Diego

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