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Bicoherence Analysis of Electrostatic Interchange Mode Coupling in a Turbulent Laboratory Magnetosphere[1] M.C. ABLER, A. SAPERSTEIN, J.R. YAN, M.E. MAUEL, Columbia University — Plasmas confined by a strong dipole field exhibit interchange and entropy mode turbulence, which previous experiments have shown respond locally to active feedback [1]. On the Collisionless Terrella Experiment (CTX), this turbulence is characterized by low frequency, low order, quasi-coherent modes with complex spectral dynamics. We apply bicoherence analysis [2] to study nonlinear phase coupling in a variety of scenarios. First, we study the self-interaction of the naturally occurring interchange turbulence; this analysis is then expanded to include the effects of driven modes in the frequency range of the background turbulent oscillations. Initial measurements of coupling coefficients are presented in both cases. Driven low frequency interchange modes are observed to generate multiple harmonics which persist throughout the plasma, becoming weaker as they propagate away from the actuator in the direction of the electron magnetic drift. Future work is also discussed, including application of wavelet bicoherence analysis, excitation of interchange modes at multiple frequencies, and applications to planetary magnetospheres.
[1] Roberts, Mauel, and Worstell, Phys Plasmas (2015).
[2] Grierson, Worstell, and Mauel, Phys Plasmas (2009).

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