Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

A Hybrid Statistics/Amplitude Approach to the Theory of Interacting Drift Waves and Zonal Flows[1] JEFFREY PARKER, JOHN KROMMES, Princeton University — An approach to the theory of drift-wave–zonal-flow systems is adopted in which only the DW statistics but the full ZF amplitude are kept. Any statistical description of turbulence must inevitably face the closure problem. A particular closure, the Stochastic Structural Stability Theory (SSST), has been recently studied in plasma[2] as well as atmospheric-science contexts. First, the predictions of the SSST are examined in the weakly inhomogeneous limit, using the generalized Hasegawa–Mima model as a simple example. It is found that the equations do not admit a complete solution, as the characteristic ZF scale cannot be calculated. To address that deficiency, an analysis is performed of a bifurcation from a DW-only state to a DW–ZF state in the Hasegawa–Wakatani model in order to gain analytical insight into a nonlinear DW–ZF equilibrium, including prediction of the charactistic scale. The calculation permits discussion of the relative importance of eddy shearing and coupling to damped eigenmodes for the saturation of the self-consistently regulated turbulence level.

[1]Work supported by U.S. DOE Contract No. DE-AC02-09CH11466 and by a U.S. DOE Fusion Energy Sciences Fellowship.
[2]B. F. Farrell and P. J. Ioannou, Phys. Plasmas **16**, 112903 (2009).

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Date submitted: 13 Jul 2012 Electronic form version 1.4