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Nonlinear g-Mode of Line-tied Magnetic Flux Tubes near Marginal Stability P. ZHU, C.C. HEGNA, C. SOVINEC, University of Wisconsin-Madison — The nonlinear dynamics of the convective instability induced by gravity ("g-mode") of a line-tied magnetic flux tube near marginal stability is crucial to the understanding of the fast, large scale eruptions of flux tubes in a variety of plasma systems. Analytic calculations have predicted the presence of an explosive nonlinear phase of the instability [S. C. Cowley and M. Artun, Phys. Rep., 283, 185 (1997)]. However, explosive growth was not observed in recent direct MHD simulations [P. Zhu, A. Bhattacharjee, and K. Germaschewski, submitted (2005)]. Instead, the evolution of a line-tied flux tube driven by marginal g-modes is dominated by perpendicular convections of the flux tube at the density gradient scale from early to the intermediate nonlinear stage. The convection induced reconfiguration tends to move the system away from the marginal stable equilibrium where the previous detonation model may apply. In this work, a new perturbative nonlinear MHD model is being developed and compared with the NIMROD code to study the dynamics between the nonlinear line-bending and quasilinear reconfiguration in the development of g-mode of a line-tied magnetic flux tube near marginal stability. *Research supported by U.S. DoE under grant No. DE-FG02-86ER53218.

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