Abstract Submitted
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Nonlinear Ballooning Filament: Structure and Growth[1] P. ZHU, C.C. HEGNA, C.R. SOVINEC, University of Wisconsin-Madison — Experiments and simulations indicate the persistent presence of ballooning filamentary structures well into the nonlinear stage of edge localized modes (ELMs). Recent analytic theory developed for the nonlinear ballooning instability suggests that the solutions of the associated local linear ballooning mode equations continue to be valid solutions of the equations governing the intermediate nonlinear regime [1]. This implies that a perturbation that evolves from a linear ballooning instability will continue to grow exponentially at the same growth rate, and maintain its filament mode structure of the corresponding linear phase in the intermediate nonlinear stage. This may explain why in experiments and in simulations, particularly in the precursor and pre-collapse phases, the ELM filament, which is a nonlinear structure, strongly resembles the structure of a linear ballooning filament. The persistence of linear growth is consistent with previous findings for the nonlinear line-tied g-mode in slab geometry [2]. Comparison between the analytic theory and direct ideal MHD simulations will be discussed. [1] P. Zhu and C. C. Hegna, submitted to *Phys. Plasmas* (2008). [2] P. Zhu, C. C. Hegna, C. R. Sovinec, A. Bhattacharjee, and K. Germaschewski, *Phys. Plasmas*, **14**, 055903 (2007).

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Ping Zhu
University of Wisconsin-Madison

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