

Abstract Submitted
for the APR06 Meeting of
The American Physical Society

Sorting Category: L9. (C)

Observations from the CDX Nonlinear Sawtooth Study

J. BRESLAU, W. PARK, S. HUDSON, S. JARDIN, PPPL, H. STRAUSS, NYU — We present two separate sets of observations from modeling sawteeth in the CDX tokamak with the M3D code [1] as part of a cross-code benchmark. One is that, in addition to the internal kink, the starting equilibrium is linearly unstable to a range of high-n resistive ballooning-like modes [2], which can only be suppressed by the assumption of extremely high perpendicular heat transport. There is evidence that such transport is present in CDX itself, possibly induced by the edge modes [3], which would thereby saturate nonlinearly. Analysis of field line stochasticity as a mechanism for this saturation will be presented. The second topic is the finding that the sawtooth, though fundamentally a 1,1 mode, has considerable structure in the toroidal direction which is not easily resolved even with the retention of tens of mode numbers in the nonlinear run. The demands of a convergence study are therefore more stringent than might at first be supposed; implications for the development of predictive capability are discussed. [1] W. Park et al., Phys. Plasmas 6, 1796 (1999). [2] H.R. Strauss. Phys. Fluids 24, 2004 (1981). [3] B.A. Carreras and P.H. Diamond, Phys. Fluids B 1, 1011 (1989).

Prefer Oral Session
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Date submitted: 13 Jan 2006

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