Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Identification of characteristic ELM evolution patterns with Alfven-scale measurements and unsupervised machine learning analysis* DAVID R. SMITH, R.J. FONCK, G.R. MCKEE, U. Wisconsin-Madison, A. DIALLO, S.M. KAYE, B.P. LEBLANC, PPPL, S.A. SABBAGH, Columbia U. — Edge localized mode (ELM) saturation mechanisms, filament dynamics, and multi-mode interactions require nonlinear models, and validation of nonlinear ELM models requires fast, localized measurements on Alfven timescales. Recently, we investigated characteristic ELM evolution patterns with Alfven-scale measurements from the NSTX/NSTX-U beam emission spectroscopy (BES) system [1]. We applied clustering algorithms from the machine learning domain to ELM time-series data. The algorithms identified two or three groups of ELM events with distinct evolution patterns. In addition, we found that the identified ELM groups correspond to distinct parameter regimes for plasma current, shape, magnetic balance, and density pedestal profile [1]. The observed characteristic evolution patterns and corresponding parameter regimes suggest genuine variation in the underlying physical mechanisms that influence the evolution of ELM events and motivate nonlinear MHD simulations. Here, we review the previous results for characteristic ELM evolution patterns and parameter regimes, and we report on a new effort to explore the identified ELM groups with 2D BES measurements and nonlinear MHD simulations. [1] D. R. Smith et al, PPCF 58, 045003 (2016). *Supported by U.S. Department of Energy Award Numbers DE-SC0001288 and DE-AC02-09CH11466.

David Smith
U. Wisconsin-Madison

Date submitted: 15 Jul 2016 Electronic form version 1.4