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Two-Fluid Extensions to the M3D CDX-U Validation Study J. BRESLAU, W. PARK, S. JARDIN, Princeton Plasma Physics Laboratory, H. STRAUSS, Courant Institute, NYU, L. SUGIYAMA, MIT — As part of a cross-code verification and validation effort, both the M3D code [1] and the NIMROD code [2] have qualitatively reproduced the nonlinear behavior of a complete sawtooth cycle in the CDX-U tokamak, chosen for the study because its low temperature and small size puts it in a parameter regime easily accessible to both codes. Initial M3D studies on this problem used a resistive MHD model with a large, empirical perpendicular heat transport value and with modest toroidal resolution (24 toroidal planes). The success of this study prompted the pursuit of more quantitatively accurate predictions by the application of more sophisticated physical models and higher numerical resolution. The results of two consequent follow-up studies are presented here. In the first, the toroidal resolution of the original run is doubled to 48 planes. The behavior of the sawtooth in this case is essentially the same as in the lower- resolution study. The sawtooth study has also been repeated using a two-fluid plasma model, with the effects of the ω_i^* term emphasized. The resulting mode rotation, as well as the effects on the reconnection rate (sawtooth crash time), sawtooth period, and overall stability are presented. [1] W. Park, et al., Phys. Plasmas **6**, 1796 (1999). [2] C. Sovinec, et al., J. Comp. Phys. **195**, 355 (2004).

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