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Modeling Giant Sawtooth Modes in DIII-D using the NIMROD code[1] SCOTT KRUGER, THOMAS JENKINS, Tech-X Corp, ERIC HELD, Utah State University, JACOB KING, Tech-X Corp, NIMROD TEAM — Ongoing efforts to model giant sawtooth cycles in DIII-D shot 96043 using NIMROD are summarized. In this discharge, an energetic ion population induced by RF heating modifies the sawtooth stability boundary, supplanting the conventional sawtooth cycle with longer-period giant sawtooth oscillations of much larger amplitude. NIMROD has the unique capability of being able to use both continuum kinetic and particle-in-cell numerical schemes to model the RF-induced hot-particle distribution effects on the sawtooth stability. This capability is used to numerically investigate the role played by the form of the energetic particle distribution, including a possible high-energy tail drawn out by the RF, to study the sawtooth threshold and subsequent nonlinear evolution. Equilibrium reconstructions from the experimental data are used to enable these detailed validation studies. Effects of other parameters on the sawtooth behavior (such as the plasma Lundquist number and hot-particle β-fraction) are also considered. Ultimately, we hope to assess the degree to which NIMROD's extended MHD model correctly simulates the observed linear onset and nonlinear behavior of the giant sawtooth, and to establish its reliability as a predictive modeling tool for these modes.

[1]This work was initiated by the late Dr. Dalton Schnack. Equilibria were provided by Dr. A. Turnbull of General Atomics.

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