Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Topological bifurcations of the axis and the alternating-hyperbolic sawtooth[1] CHRISTOPHER B SMIET, GERRIT J KRAMER, STUART R HUDSON, Princeton Plasma Physics Laboratory — An outstanding problem in sawtooth physics are the observations where q_0 stays around 0.7, which cannot be explained by the Kadomtsev model that predicts a reset to $q_0 = 1$. We present a sawtooth model where the crash is caused by stochastization of a core region through the transition of the magnetic axis into an alternating-hyperbolic X-point when q_0 reaches $2/3$, which is within measurement uncertainty of the oft-measured value of 0.7. This transition is revealed through the identification of the structure of the magnetic field line map around the axis with elements of the Lie group $\mathrm{SL}(2, \mathrm{R})$, which shows several transitions, one of which when $q_0 = 2/3$. We identify a fast-growing ideal $2/3$ mode localized on the axis that appears when $q_0 = 2/3$ which perturbs the magnetic field such as to drive the transition to the alternating-hyperbolic geometry and stochastization of the core region.

[1]Work supported by US DOE under DE-AC02-09CH11466,

Christopher Smiet
Princeton Plasma Physics Laboratory

Date submitted: 26 Jun 2020 Electronic form version 1.4