Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Energetic Ion Interactions with Tearing Mode Stability[1]
MICHAEL HALFMOON, Univ of Tulsa, DYLAN BRENNAN, Princeton Univeristy — This study focuses on the interactions between energetic ions and pressure-driven, slow growing tearing modes in high beta tokamaks. Previous studies have shown that energetic ions interact with and affect the tearing mode stability, in a mechanism similar to those of ideal MHD instabilities and resistive wall modes. The 2/1 tearing mode is found to be damped or stabilized in the presence of energetic ions, with the most significant effects on the slow-growing resistive mode. To gain an understanding of the underlying physics of these effects, we have investigated a combination of reduced analytics and numerical simulations. In the reduced model, a high aspect ratio, step function equilibrium is investigated, where the dynamics of high-energy ions interacting with the tearing mode is implemented through integration over the pressure step. In the simulations, a series of experimentally relevant D-shaped equilibria with fixed monotonic safety factor and varying peaked pressure profiles is analyzed using the δf hybrid kinetic-mhd code in NIMROD. Results show a damping effect from the ions that is consistent between the reduced model and the simulations. The stabilizing effect is mainly due to trapped particle resonance, causing the tearing mode to have a finite frequency.

[1]US DOE Grant DE- SC0004125

Michael Halfmoon
Univ of Tulsa

Date submitted: 24 Jul 2015 Electronic form version 1.4