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A Model of Energetic Ion Effects on Pressure Driven Tearing Modes in Tokamaks M. R. HALFMOON, Univ of Tulsa, D. P. BRENNAN, Princeton University — Previous analysis of toroidal confinement experiments has shown that energetic ions interact with and affect MHD mode stability, which has been modeled and simulated for ideal MHD instabilities and resistive wall modes [1]. In addition, the 2/1 tearing mode was found to be damped or stabilized by energetic ions, with significant effects on the slow growing resistive mode. This study focuses on the mode-particle interactions between energetic ions and pressure-driven, slow growing tearing modes which have been shown to be driven unstable in experiments as pressure increases [2]. Using a reduced analytic description of a high aspect ratio tokamak equilibrium with a fixed total current and variable magnetic shear; we add in the effects of high energy particles as a modification to the perturbed pressure [1]. We find the importance of global magnetic shear (s=1/q dq/dr) on the particle precession drift frequency, which determines whether or not the energetic particle population resonates with the mode. We find that for $s>s_{crit}$ at the radial position of the pressure jump, particles have a stabilizing effect on the 2/1 tearing mode. However, we find that for $s<s_{crit}$, particles drive mode development. 1. B. Hu, and R. Betti, "Resistive wall mode in collisionless quasistationary plasmas." Physical Review Letters 93.10 (2004): 105002. 2. D.P. Brennan, et al "Energetic particle effects on n = 1 resistive MHD instabilities in a DIII-D hybrid discharge," Nucl. Fusion 52, 033004 (2012).

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