Gyrokinetic ion/fluid electron simulation of nonlinear evolution of multiple Reverse Shear Alfven Eigenmodes YANG CHEN, University of Colorado at Boulder, GUO-YONG FU, Zhejiang University, China, SCOTT PARKER, University of Colorado at Boulder — We report simulation of simultaneous excitation of multiple Reverse Shear Alfven eigenmodes in DIII-D plasmas (discharge 142111), using the gyrokinetic ion/fluid electron hybrid model of GEM. Thermal ions and beam ions are gyrokinetic, electrons are fluid with finite-mass correction in the Ohm’s law. The vorticity equation is solved instead of the quasi-neutrality condition. This improves numerical stability. We extend previous single- \( n \) nonlinear simulation \(^1\) to simultaneous excitation of toroidal modes with \( n = 0 \) and \( 2 < n < 15 \). Both the zonal \( n = 0 \) mode and the \( n = 8 \) mode are observed to be force driven by the linearly dominant \( n = 4 \) mode coupled to itself, with a growth rate twice that of the \( n = 4 \) mode. The zonal mode (including the surface averaged \( \phi \) and \( A_\parallel \)) significantly reduces the initial saturation level of the \( n = 4 \) mode. Evolution of all the other modes are also dominated by nonlinear coupling to the \( n = 4 \) mode. The mechanism of zonal structure generation will be examined by comparing various terms in the vorticity equation, including the Reynolds stress, the magnetic stress and the beam ion nonlinear effect.

\(^1\)Chen et. al. Phys. Plasmas 20, 012109 (2013)

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