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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 ϕ and $A_{\|}$) 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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