Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Simulation and Theoretical Study of Spontaneous Excitation of Convective Cells by Kinetic Alfven Waves[1] YU LIN, Auburn University, FULVIO ZONCA, ENEA, C.R. Frascati, LIU CHEN, Zhejiang University — It has been recently demonstrated that, generally, electrostatic (ES) and magnetostatic (MS) convective cells (CCs), or zonal flows, can be excited simultaneously by kinetic Alfven waves (KAWs) [1]. In this paper, spontaneous excitations of electrostatic as well as magnetostatic convective cells by KAWs are investigated through hybrid simulations, and the results are compared with the analytical theory based on the nonlinear gyrokinetic equations. In the hybrid simulation, ions are treated as fully kinetic particles, and electrons are treated as a massless fluid. It is found that finite ion-Larmor-radius (FILR) effects play a crucial. Furthermore, ES and MS convective cells are intrinsically coupled and must be treated on an equal footing. Excellent agreement is obtained for mode structure and generation rate of convective cells by KAW, demonstrating that ESCC and MSCC are indeed coupled, and that spontaneous CC excitation is suppressed at long wavelength, showing the crucial destabilizing role of FILR effects in the excitation via modulational instabilities.

[1] F. Zonca and L. Chen, "Spontaneous excitation of convective cells by kinetic Alfven waves." Presented at the 2014 International Sherwood Fusion Theory Conference, San Diego, California, March, 2014.

[1]This work is supported by US DoE, NSF, ITER-CN, and NSFC grants.

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Date submitted: 22 Jul 2015 Electronic form version 1.4