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TH/4-2: Nonlinear Excitations of Zonal Structures by Toroidal Alfvén Eigenmodes

Thursday, 11 October 2012 14:00 (4h 45m)

Zonal flows and, more generally, zonal structures are known to play important self-regulatory roles in the dynamics of microscopic drift-wave type turbulences. Since Toroidal Alfvén Eigenmode (TAE) plays crucial roles in the Alfvén wave instabilities in burning fusion plasmas, it is, thus, important to understand and assess the possible roles of zonal flow/structures on the nonlinear dynamics of TAE. It is shown that zonal flow/structure spontaneous excitation is possible only near the lower accumulation point of the shear Alfvén wave continuous spectrum, including the proper trapped ion responses, causing the zonal structure to be dominated by the zonal current instead of the usual zonal flow. This work shows that including kinetic thermal ion treatment in the nonlinear simulations of Alfvénic modes is an important ingredient for realistic comparisons with experimental measurements, where the existence of zonal currents has been clearly observed.

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