Alfven continuum and toroidal gap generation in global electromagnetic gyrokinetic simulations

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Basic Alfven wave properties are studied by global gyrokinetic simulation [1] employing fluid-kinetic hybrid model [2,3,4] which is based on an expansion of the electron response using a small parameter of the square-root of the electron-ion mass ratio. The model preserves the linear and the nonlinear wave-particle interactions. In the simulation, continuum damping of the shear Alfven wave is demonstrated. Due to the toroidal effects, the frequency gap [5,6,7] is generated. These results (capturing of the continuum and the gap frequency) are obtained with an initial value approach (in contrast to the conventional eigenmode analysis) incorporating the gyrokinetic Poisson equation in a global tokamak geometry. We plan to take two approaches to capture toroidicity induced Alfven eigenmodes (TAEs) *within* the frequency gap. One is to perturb the magnetic field at $t = 0$ with an expected eigenmode structure [8]. The other is to excite the instability by energetic particle drive whose velocity is comparable to the local Alfven velocity.

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