

Abstract Submitted
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The study on the self-consistent eigenfunction of resistive wall modes and perturbed equilibria including kinetic effects¹ ZHIRUI WANG, JONG-KYU PARK, JONATHAN MENARD, Princeton Plasma Physics Laboratory, YUEQIANG LIU, Culham Centre for Fusion Energy — It is known that the kinetic effects can play an important role in determining Resistive Wall Mode (RWM) stability as well as perturbed equilibria in tokamaks. The toroidal hybrid code Mars-K, which self-consistently incorporates drift kinetic effect into MHD formulation, has already shown that the kinetic resonance can substantially change RWM eigenfunction particularly near the plasma edge. These results imply in fact that the perturbed equilibria with external perturbations can be also largely modified by such kinetic effects. To understand the self-consistent solutions in both RWM stability and perturbed equilibria, first we performed the careful benchmark between Mars-K code in the fluid limit and IPEC code. We found an excellent agreement between the two codes in a simple tokamak as well as in a challenging NSTX equilibrium. Then the code associated with the potential energy analysis is applied to further study the modification of RWM eigenfunction and the shielding effect of perturbed equilibria due to kinetic effects. Furthermore, the undergoing development including the energy dependent collision operator into Mars-K kinetic calculation will be presented and the equivalence between the neoclassical toroidal torque and the kinetic potential energy will be discussed.

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