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A new two-dimensional eigenvalue solver for the electrostatic drift-wave instabilities in tokamaks

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The two-dimensional(2D) eigenvalue problem for the electrostatic drift-wave instabilities in tokamaks has been of great interest[1-2].

Using the translational invariance[3], a local electrostatic gyrokinetic eigenvalue code is developed for the drift-wave modes (ITG, TEM, ETG) in Fourier transformed space. For the application[4], this code is used for the linear stability analysis of the electrostatic drift wave in the electron thermal internal transport barrier in EAST.

Without the use of the translational invariance, the 2D eigenvalue problem is transformed into the (m,nq-m) coordinate system. The dependence of $v_{//}$ on the poloidal angle θ is ignored in the eigenvalue equations[5], and the toroidal coupling effect between adjacent poloidal harmonics is included. By using the finite difference method, the algebraic eigenvalue problem is constructed and solved numerically. The benchmark of the simulation results with the global gyrokinetic initial code NLT[6] will be reported.

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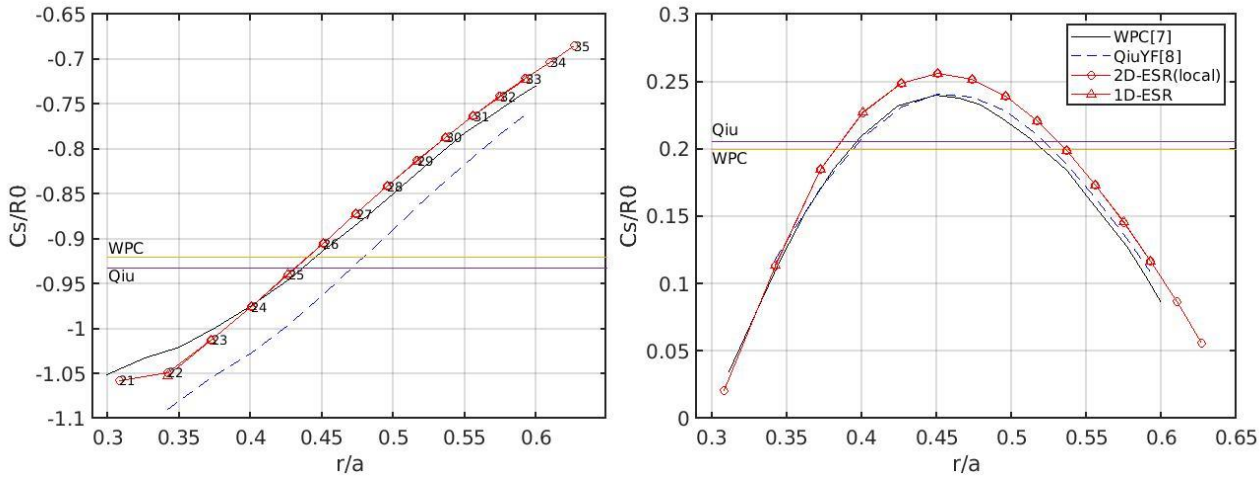

Figure 1. The local and global eigenvalues in CBC case for n=20.