Ideal and resistive edge stability calculations with M3D-C^1

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Abstract

Growth rates of edge localized modes for various benchmark equilibria, including a diverted equilibrium, are calculated using the non-ideal fluid code M3D-C^1. Growth rates calculated by M3D-C^1 in the ideal limit are found to agree with those calculated by ideal MHD codes. The effects of nonuniform density and resistivity profiles are explored, as well as the sensitivity of growth rates to the position of the ideal vacuum-plasma interface. Growth rates of the diverted equilibrium are found to be particularly sensitive to moving this interface inward from the separatrix, but less sensitive to extending the plasma region beyond the separatrix. The resistivity profile within the plasma is found not to affect growth rates significantly; however, growth rates may be greatly reduced by treating the outer region as a resistive plasma instead of an ideal vacuum. Indeed, it is found that for typical scrape-off layer (SOL) temperatures, the resistive SOL model behaves more like an ideal plasma than a vacuum.

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