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Modeling resistive wall modes and disruptive instabilities with M3D-C1[1] NM FERRARO, SC JARDIN, D PFEFFERLE, PPPL — Disruptive instabilities pose a significant challenge to the tokamak approach to magnetic fusion energy, and must be reliably avoided in a successful reactor. These instabilities generally involve rapid, global changes to the magnetic field, and electromagnetic interaction with surrounding conducting structures. Here we apply the extended-MHD code M3D-C1 to calculate the stability and evolution of disruptive modes, including their interaction with external conducting structures. The M3D-C1 model includes the effects of resistivity, equilibrium rotation, and resistive walls of arbitrary thickness, each of which may play important roles in the stability and evolution of disruptive modes. The strong stabilizing effect of rotation on resistive wall modes is explored and compared with analytic theory. The nonlinear evolution of vertical displacement events is also considered, including the evolution of non-axisymmetric instabilities that may arise during the current-quench phase of the disruption. It is found that the non-axisymmetric stability of the plasma during a VDE depends strongly on the thermal history of the plasma.

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