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Numerical Simulations of Hot Vertical Displacement Events[1] K.J. BUNKERS, C.R. SOVINEC, Univ. of Wisconsin-Madison — Loss of vertical positioning control in tokamaks leads to instability where hot confined plasma rests against the chamber wall. Resistive-MHD modeling with the NIMROD code [Sovinec, et al., JCP 195, 335] is applied to model these events. After divertor-coil current is perturbed, resistive diffusion through the non-ideal wall sets the timescale as the simulated tokamak evolves from a diverted equilibrium to a limited configuration. Results show that plasma outflow along opening magnetic surfaces, just outside the confinement zone, approaches the local ion-acoustic speed. The projection of the plasma flow velocity into the surface-normal direction ($\mathbf{n} \cdot \mathbf{V}$) near the surface exceeds the local $\mathbf{E} \times \mathbf{B}$ drift speed; near surfaces $\mathbf{n} \times \mathbf{E}$ is approximately the same as $\mathbf{n} \times \mathbf{E}_{\text{wall}}$ in the nearly steady conditions. The safety factor of flux surfaces that remain intact is approximately constant over the evolution time, which is much shorter than the plasma resistive diffusion time. Assessment of external-kink stability and initial findings from 3D nonlinear computations are presented.

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