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Effects of Increasing Edge Current Density on Pedestal Instabilities[1] P. ZHU, C.C. HEGNA, C.R. SOVINEC, University of Wisconsin-Madison — Recent resistive MHD computations find stabilizing effects of the edge parallel current density on the low-n instabilities localized in the tokamak pedestal region. Here n is the toroidal mode number. Stabilization is prominent when the magnetic shear of high edge current density region becomes negative. A moderate stabilizing effect of the edge current density has also been observed in regimes of weakened positive magnetic shear. The reduced or reversed magnetic shear is self-consistently generated with an increase in current density. In these computations, the region between the foot of pedestal and the conducting wall is described as in a "cold-halo" model, where the plasma has a much lower temperature, Spitzer conductivity and current density. Both the hot plasma inside the pedestal region and the cold plasma in the halo region are governed by the same set of resistive MHD equations. These results appear to be consistent with previous analytic theory on peeling modes, even though the theory was based on the ideal MHD model where the hot plasma inside pedestal is considered as a free boundary fluid surrounded by an external vacuum. We further investigate the effects of edge current density ramping on the nonlinear evolution of edge localized instabilities in simulations.

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