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Excess-density-driven snakes in tokamaks[1] A.Y. AYDEMIR, Institute for Fusion Studies, The University of Texas at Austin, K.C. SHAING, Plasma and Space Science Center and Department of Physics, National Cheng Kung University, F.L. WAELBROECK, Institute for Fusion Studies, The University of Texas at Austin — "Snakes" refer to sinusoidal patterns observed on space-time plots of soft-X-ray signals in tokamak plasmas. They are generally attributed to persistent and localized density perturbations that form at a rational surface after pellet injection (Weller, JET 1987), and Parker, Alcator-C 1987), or impurity accumulation (Naujoks, ASDEX 1996, Delgado-Aparicio, C-Mod 2011). It is not clear whether all snake observations have a unique origin. A likely explanation is that material trapped inside an island driven by a temperature hole leads to the observed soft-X-ray signals (Wesson 1995). More recently, it has been suggested that they could be the result of saturated nonlinear internal kinks in low, or reversed-shear geometries (Cooper 2011). We have started an examination of some of these issues using ideas from neoclassical transport theory (Shaing 2007) in conjunction with various magnetohydrodynamic models. In a RMHD model, we demonstrated that excess-density-driven bootstrap current can stabilize a resistive $m = 1$ island at a small amplitude, leaving a radially and poloidally localized snake-like structure. Extension of this work to more sophisticated models that include diamagnetic effects, and possibly more realistic geometries, will be presented.

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