Abstract Submitted
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Linear and Nonlinear Response of a Rotating Tokamak Plasma to a Resonant Error-Field[1] RICHARD FITZPATRICK, IFS, University of Texas at Austin — An in-depth investigation of the effect of a resonant error-field on a rotating, quasi-cylindrical, tokamak plasma is preformed within the context of resistive-MHD theory. General expressions for the response of the plasma at the rational surface to the error-field are derived in both the linear and nonlinear regimes, and the extents of these regimes mapped out in parameter space. Torque-balance equations are also obtained in both regimes. These equations are used to determine the steady-state plasma rotation at the rational surface in the presence of the error-field. It is found that, provided the intrinsic plasma rotation is sufficiently large, the torque-balance equations possess dynamically stable low-rotation and high-rotation solution branches, separated by a forbidden band of dynamically unstable solutions. Moreover, bifurcations between the two stable solution branches are triggered as the amplitude of the error-field is varied. A low- to high-rotation bifurcation is invariably associated with a significant reduction in the width of the magnetic island chain driven at the rational surface, and vice versa. General expressions for the bifurcation thresholds are derived, and their domains of validity mapped out in parameter space.

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