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Equilibrium nonlinearity and combined stabilizing effects of magnetic field and plasma flow GEORGE N. THROUMOULOPOULOS, University of Ioannina, Greece, HENRI TASSO, Max-Planck-Institut fuer Plasmaphysik, Garching, Germany, GEORGE POULIPOULIS, University of Ioannina, Greece —
The nonlinear "cat-eyes" and counter-rotating-vortices hydrodynamic solutions are extended to the magnetohydrodynamic equilibrium equation with incompressible flow of arbitrary direction [1,2]. The extended solutions cover a variety of equilibria because four surface quantities remain free. Unlike to linear equilibria, the flow has a strong impact on isobaric surfaces by forming pressure islands located within the equilibrium vortices even for values of β (defined as the ratio of the thermal pressure over the external magnetic-field pressure) on the order of 0.01. Also, the axial ("toroidal") current density is appreciably modified by the flow. Furthermore, a magnetic-field-aligned flow of ITER relevance, i.e for Alfvén Mach numbers of the order of 0.01, and the flow shear in combination with the variation of the magnetic field perpendicular to the magnetic surfaces have significant stabilizing effects potentially related to the equilibrium nonlinearity. The stable region is enhanced by an external axial magnetic field.
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[2] G. N. Throumoulopoulos, H. Tasso, Phys. Plasmas **17**, 032508 (2010).

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