Abstract Submitted
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Plasma flow evolution in response to resonant magnetic perturbation in a tokamak[1] P. ZHU, Huazhong University of Science and Technology, University of Wisconsin-Madison, X.-T. YAN, University of Science and Technology of China, W.-L. HUANG, Anhui University of Technoloy — Externally applied non-axisymmetric magnetic fields such as error field and resonant magnetic perturbation (RMP) are known to influence the plasma momentum transport and flow evolution through plasma response in a tokamak, whereas the evolution of plasma response itself strongly depends on the plasma flow as well. The nonlinear interaction between the two have been captured in the conventional error field theory with a "no-slip" condition, which has been recently extended to allow the "free-slip" condition. For comparison with simulations, we solve for the nonlinear plasma response and flow evolution driven by a single-helicity RMP in a tokamak, using the full resistive MHD model in the initial-value code NIMROD. Time evolution of the parallel flow or "slip frequency" profile and its asymptotic steady state obtained from the NIMROD simulations are compared with both conventional and extended nonlinear response theories. Good agreement with the extended theory has been achieved for plasma flow profile evolution in response to RMP in all resistive regimes, whereas the difference from the conventional theory with the "no-slip" condition diminishes as the plasma resistivity approaches zero.

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