FLUX-DRIVEN SIMULATIONS OF SELF-GENERATED RADIAL ELECTRIC FIELDS AND TRANSITION TO IMPROVED CONFINEMENT REGIME

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Abstract

The evolution of plasma profiles and radial electric fields in the edge of tokamaks during a transition to an improved confinement regime is explored in an unfavorable configuration based on self-consistent, flux-driven simulations of reduced Braginskii models with ion pressure dynamics. The edge plasma response to the heating power is explored by varying the heat source strength. The energy transfer from turbulent to mean flows is induced by the large-amplitude fluctuations as the power input becomes sufficiently strong. It is found that ion pressure fluctuations play an important role in the generation of the Reynolds power. Consequently, the plasma spontaneously forms radial electric fields localized at the edge, which reduces the radial correlation and amplitudes of edge fluctuations. An edge temperature pedestal also forms while the density profiles remain nearly unchanged, featuring an I-mode-like regime.