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Self-organized edge density profile with turbulent pinch[1] BEN ZHU, MANAURA FRANCISQUEZ, BARRETT ROGERS, Dartmouth Coll — In many tokamak operations, plasma is only fueled by ionization of neutrals in the periphery which subsequently penetrate inward toward core and form a peaked density profile - a process commonly referred as density pinch. Although the Ware effect, and drift wave-/ITG-/TEM-based turbulent transport theory are proposed to explain density pinch in the core region ($r/a < 0.6$), the density pinch on the edge region remains barely explored to date. We present here an edge density pinch study based on the global 3D two-fluid edge turbulence code, GDB. GDB is a flux-driven electromagnetic model self-consistently evolving plasma density, temperature as well as the sheared flow profiles in both closed-flux surfaces and the SOL. In this study, the effective simulation domain is $0.8 < r/a < 1.1$ with a heat source located at $r/a < 0.8$ and a Gaussian particle source located in a relatively small region near the separatrix ($0.96 < r/a < 1.05$). An inward (up-gradient) particle flux in the closed flux region is observed once the particle source is turned on until the system reaches quasi-steady-state with a slightly peaked density profile. The final density profile seems insensitive to particle source profiles but largely depends on the other plasma parameters, e.g., plasma temperature.

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