

## Residual vortex flow in magnetic island

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There has been growing interest on the roles of ExB shear flow on the interplay between magnetic island and microturbulence in magnetized fusion plasmas. While magnetic island is typically thought to be undesirable due to confinement degradation in the island region, experimental observations [1,2] and simulations [3,4] have shown that island-induced shear flow can significantly suppress microturbulence and turbulent transport around the island. Fluid and gyrokinetic simulations [4-6] have further revealed that microturbulence can generate vortex flow, which has the same structure with the island and can regulate the turbulence. A recent theoretical study [7] has shown anisotropic feature of the vortex flow shearing, giving new insight for interpretation of experimental observations. Meanwhile, there has been no analytic work on the evolution of the vortex flow. In this work, we extend gyrokinetic theory of residual zonal flows in tokamak [8,9] to show that there exists undamped residual vortex flow after a fast collisionless relaxation. The residual vortex flow level is found to be magnetic surface dependent.

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