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Bifurcation to improved confinement driven by intrinsic rotation¹ FELIX PARRA, MICHAEL BARNES, EDMUND HIGHCOCK, ALEXANDER SCHEKOCHIHIN, Rudolf Peierls Centre for Theoretical Physics, University of Oxford, Oxford, UK, STEVE COWLEY, COLIN ROACH, Euratom/CCFE Fusion Association, Culham Science Centre, Abingdon, UK — We study the effect of sheared flow on the turbulent transport of energy and momentum employing the gyrokinetic flux tube code GS2. The results show two features, namely, (i) given the value of the heat flux, there is a maximum temperature gradient that is achieved for a finite velocity shear; and (ii) the ratio of turbulent momentum and energy diffusivities is constant for a wide range of flow shear values. Based on this knowledge, we investigate the equilibrium of a tokamak heated by neutral beams. Considering only turbulent transport, bifurcations to enhanced confinement are not possible because for given energy and momentum depositions there is only one solution. If neoclassical transport is included, under specific circumstances there are up to three simultaneous solutions. It is possible to transit to enhanced confinement solutions, but to do so it is necessary to decrease the energy input. We propose a new mechanism that drives bifurcations to enhanced confinement solutions based on new terms in the momentum equation. These new terms are also the drive of intrinsic rotation.

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