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Asymmetry of magnetic islands in sheared flow SILVANA NOWAK, ENZO LAZZARO, CHIARA MARCHETTO, Istituto di Fisica del Plasma CNR, Milan, Italy — In the present day tokamak plasma discharges, the plasma confinement and maximum operational plasma beta are strongly limited by the destabilization of neo-classical tearing modes (NTMs). These modes, stable at low beta, are excited by the bootstrap current loss within the island as a result of a local pressure flattening. The problem of islands stabilization has been largely investigated using schemes based on the electron cyclotron current drive. On the other hand, variations of the plasma pressure along the magnetic field may induce stabilization effects due to the ion neoclassical viscous forces for finite heat conductivity and inertial ion drift off the magnetic surfaces. Asymmetric deformation of magnetic islands may arise due to the effect of torque associated with the sheared viscous flow and are equivalent to an additional source of the longitudinal current. The deformation is described by a dependence of the island helical phase on the distance x from the rational surface. We reconsider reconnection, in rotating plasmas, allowing for deformed islands. Modifications of the Rutherford evolution equations are obtained taking into account the nonlinear ion inertia and the neoclassical viscosity that affect the longitudinal current and the island rotation frequency. As a consequence the critical island width for NTM onset changes and leads to significant effects on the estimate of value of the added rf power needed for the island control.

Enzo Lazzaro
Istituto di Fisica del Plasma CNR, Milan, Italy

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