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Ejection of Toroidal Angular Momentum by Plasma Edge Modes[1]

M. LANDREMAN, L. SUGIYAMA, B. COPPI, MIT — The ejection of angular momentum by modes in the plasma edge [1] can affect plasma rotation. Large ELM crashes are capable of ejecting significant amounts of toroidal angular momentum from a rotating plasma, depending on the rotation profile. Numerical studies have been carried out using the extended MHD code M3D for DIII-D-like plasmas. The initial work considers a toroidally rotating, axisymmetric MHD plasma that is ideally unstable to ELMs in the absence of rotation. It compares the effects of different rotation profiles $v_\phi = R\Omega(\psi)$ on the ELM and the momentum ejection. During the strong nonlinear phase, a ballooning-type ELM instability carries plasma across the magnetic field into the open field line region, while the initial closed plasma magnetic field structure remains relatively well contained. Angular momentum is carried with the plasma and the loss can be relatively large if the edge plasma rotation is large. The smaller change in the edge temperature gradient, also observed in experiment, is consistent with the relatively good confinement of the magnetic field lines. [1] B. Coppi, Nucl. Fusion 42, 1 (2002)

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