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Edge rotation as governed by momentum transport due to neutrals[1] ISTVAN PUSZTAI, JOHN OMOTANI, TÜNDE FÜLÖP, Chalmers Univ. Techn. — Neutrals can strongly affect momentum transport even in relatively small concentrations due to their high cross-field mobility. We present a framework to calculate numerically the momentum transport due to charge-exchanging neutrals, in the closed field-line region. We couple a short mean-free-path solution of the neutral kinetic equation to neoclassical ions. We can then determine self-consistently the radial electric field and plasma rotation velocity, assuming that the neutrals dominate the momentum transport. We use the neoclassical solver PERFECT [Landreman et al 2014 PPCF 56 045005] to compute the ion distributions. Numerical solutions allow us to consider the full range of collisionalities; typical experimental parameters fall in the intermediate region that is not well described by analytical limits. We also compute the rotation velocities of minority impurity species, to facilitate experimental comparison of the results. We find that at a fixed collisionality, the important parameter determining the radial electric field and rotation is the major radius where the neutrals are localized. Therefore changes to the location of the peak neutral density, caused by altering the fuelling location or moving the X-point for example, should allow the rotation to be manipulated.

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