Ion temperature profile stiffness: non-linear gyrokinetic simulations and comparison with experiment

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Recent experimental observations at JET show evidence of reduced ion temperature profile stiffness at low magnetic shear (s) in the presence of flow shear. Non-linear gyrokinetic simulations are performed, aiming to investigate the physical mechanism behind the observations. The sensitivity of profile stiffness to the variations of plasma parameters experimentally observed when transitioning to the low-stiffness regime is assessed. It is found that non-linear electromagnetic effects, even at low β_e, can significantly reduce the profile stiffness, although not by a degree sufficient to explain the experimental observations. The effect of toroidal flow shear itself is not predicted by the simulations to lead to a significant reduction in flux due to significant parallel gradient velocity destabilisation. For the majority of discharges studied, the simulated and experimental ion heat flux values do agree within reasonable variations of input parameters around the experimental uncertainties. However, no such reasonable agreement is obtained for the discharge with the highest logarithmic ion temperature gradient. The simulated stiffness level is thus higher than observed for this regime, when assuming pure toroidal rotation.