Stabilizing impact of β' on microturbulence

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The impact of high absolute value of the radial gradient of β ($|\beta'|$) on microstability is found to be stabilizing. The microstability analyses are performed by a linear gyrokinetic flux tube code, GS2, using computed magnetic equilibrium. All types of drift modes (ITG, TEM, ETG) are ultimately stabilized by high values of $|\beta'|$. Indeed, as in presence of a low or negative magnetic shear, the curvature and grad(B) drifts driving interchange-like instabilities are strongly reduced by high $|\beta'|$. Therefore, high values of $|\beta'|$ induce a temperature and density peaking leading to even higher $|\beta'|$. As in the case of the $\vec{E} \times \vec{B}$ shear stabilization, there is a possibility for entering a positive feedback loop. In the high β NSTX plasmas, high $|\beta'|$ are believed to be responsible for lower growth rates rather than the low aspect ratio. The stabilizing impact of high $|\beta'|$ might also be relevent in low β tokamak plasmas when a locally steep pressure gradient is obtained in internal transport barrier discharges.