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Gyrokinetic Stability of DIII-D NCS Discharges, 1 G.M. STAEBLER, R.E. WALTZ, General Atomics, M. KOTSCHEN-REUTHER, IFS, University of Texas — The linear stability of negative central shear (NCS) discharges on DIII-D to kinetic toroidal drift ballooning modes is investigated. In particular the role of $E \times B$ shear and magnetic shear in the observed confinement improvement is studied. There are two types of core transport improvement observed in DIII–D NCS plasmas. If the magnetic shear is weak (positive or negative) the ion energy and momentum transport is improved above a power threshold. If the magnetic shear is strongly negative (strong NCS) the electron energy and particle transport are also improved. We find that the $E \times B$ rotation shear is the stabilizing mechanism for the ion heat and momentum transport. The dominant unstable mode is the ion temperature gradient mode which is made more unstable by the parallel velocity shear present in DIII-D with unbalanced neutral beam injection. This mode is stabilized by $E \times B$ shear. For the strong NCS case the large Shafranov shift in the negative shear region can stabilize high frequency electron temperature gradient modes (ETG) which are unaffected by the $E \times B$ shear. This may be the reason the electron thermal confinement improves more for strong NCS.

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