Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

New pinch for the ion toroidal rotation generated by a radial pressure gradient in a tokamak JUNGPYO LEE, MICHAEL BARNES, FELIX PARRA, MIT Plasma Science and Fusion Center — Previous work has described a turbulent pinch of toroidal angular momentum due to the Coriolis drift in a rotating frame. This pinch is only valid if the ion toroidal rotation is generated by a radial electric field only. It is well known that the ion rotation has two pieces: the one generated by the radial electric field and the other by the radial pressure gradient. We propose a new pinch mechanism for the piece of the rotation generated by the radial pressure gradient, which is important for a sub-sonic flow or the flow in the pedestal where the radial electric field and the pressure gradient are similar in size. The pressure gradient does not modify the particle orbits but imparts rotation to the plasma due to the finite orbit width effect (e.g. a neoclassical flow), while the radial electric field changes both the orbits and the rotation. We evaluate the pinch of the piece of the rotation generated by the pressure gradient using a nonlinear gyrokinetic analysis, and compare it with the pinch due to the piece of the rotation by the radial electric field that is well described by the Coriolis drift analysis. The parallel dynamics and the trapped electron responses are important to determine the size of the pinches for ion temperature gradient (ITG) driven turbulence.

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Date submitted: 19 Jul 2012 Electronic form version 1.4