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Gyrokinetic Simulation of Residual Stress from Diamagnetic Velocity Shears[1] R.E. WALTZ, G.M. STAEBLER, GA, W.M. SOLOMON, PPPL — Residual stress refers to the remaining toroidal angular momentum (TAM) flux (divided by major radius) when the shear in the parallel velocity (and parallel velocity itself) vanishes. Previously [1] we demonstrated with gyrokinetic (GYRO) simulations that TAM pinching from the diamagnetic level shear in the $E \times B$ velocity could provide the residual stress needed for spontaneous toroidal rotation. Here we show that the shear in the diamagnetic velocities themselves provide comparable residual stress (and level of stabilization). The sign of the residual stress, quantified by the ratio of TAM flow to ion power flow (M/P), depends on the signs of the various velocity shears as well as ion (ITG) versus electron (TEM) mode directed turbulence. The residual stress from these temperature and density gradient diamagnetic velocity shears is demonstrated in global gyrokinetic simulation of "null" rotation DIIID discharges by matching M/P profiles within experimental error.

[1] R.E. Waltz, G.M. Staebler, J. Candy, and F.L. Hinton, Phys. Plasmas **14**, 122507 (2007); errata **16**, 079902 (2009).

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