Abstract Submitted
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Applying the new HIT results to tokamak and solar plasmas THOMAS JARBOE[1], DEREK SUTHERLAND, AARON HOSSACK, BRIAN NELSON, KYLE MORGAN, HANSEN CHRIS, THOMAS BENEDETT, CHRIS EVERSON, JAMES PENNA, University of Washington — Understanding sustainment of stable equilibria with helicity injection in HIT-SI has led to a simple picture of several tokamak features. Perturbations cause a viscous-like force on the current that flattens the λ profile, which sustains and stabilizes the equilibrium. An explanation of the mechanism is based on two properties of stable, ideal, two-fluid, magnetized plasma. First, the electron fluid is frozen to magnetic fields and, therefore, current flow is also magnetic field flow. Second, for a stable equilibrium the structure perpendicular to the flux surface resists deformation. Thus toroidal current is from electrons frozen in nested, rotating resilient flux surfaces. Only symmetric flux surfaces allow free differential current flow. Perturbations cause interference of the flux surfaces. Thus, perturbations cause forces that oppose differential electron rotation and forced differential flow produces a symmetrizing force against perturbations and instability. This mechanism can explain the level of field error that spoils tokamak performance and the rate of poloidal flux loss in argon-induced disruptions in DIII-D. This new understanding has led to an explanation of the source of the solar magnetic fields and the power source for the chromosphere, solar wind and corona.

[1]Please place in spheromak and FRC section with other HIT posters

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