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Experiment-Model Comparisons of Turbulence, Transport, and Flows in a Magnetized Linear Plasma Using a Global Two-Fluid Braginskii Solver[1] M. GILMORE, D.M. FISHER, R.F. KELLY, M.W. HATCH, University of New Mexico, B.N. ROGERS, Dartmouth College — Ongoing experiments and numerical modeling of the dynamics of electrostatic turbulence and transport in the presence of flow shear are being conducted in helicon plasmas in the linear HelCat (Helicon-Cathode) device. Modeling is being done using GBS, a 3D, global two-fluid Braginskii code that solves self-consistently for plasma equilibrium as well as fluctuations. Past experimental measurements of flows have been difficult to reconcile with simple expectations, such as azimuthal flows being dominated by Er x Bz rotation. Therefore, recent measurements have focused on understanding plasma flows, and the role of neutral dynamics. In the model, a set of two-fluid drift-reduced Braginskii equations are evolved using the Global Braginskii Solver Code (GBS). For low-field helicon-sourced Ar plasmas a non-negligible cross-field thermal collisional term must be added to shift the electric potential in the ion momentum and vorticity equations as the ions are unmagnetized. Significant radially and axially dependent neutral profiles are also included in the simulations to try and match those observed in HelCat. Ongoing simulations show a mode dependence on the axial magnetic field along with strong axial variations that suggest drift waves may be important in the low-field case.

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