Tokamak Edge Transport Simulations with an $\mathbf{E}_r$ Model for Varying Collisionality Regimes[1] T.D. ROGNLIEN, M.V. UMANSKY, Lawrence Livermore National Lab — Edge-plasma transport codes typically utilize 2D fluid models supplemented by anomalous cross-field transport from plasma turbulence. In these collisional models, substantial vertical ion and electron gradient-B drifts as well as parallel current flow are present help determine the radial electric field, E_r. In the long mean-free path regime, the gradient-B and curvature drifts lead to periodic banana orbits, and the squeezing of the ion orbits to reduce the ion particle flux. An algorithm is proposed and demonstrated that provides a smooth transition between known results in these regimes. For the collisional regime, a simple model describes the sensitivity of E_r to radial and poloidal particle-flows and sources. The impact of the different collisionality regimes on plasma profiles is illustrated for assumed anomalous transport coefficients. This model can be further calibrated by developing kinetic edge codes.

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