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Development of drift ballooning transport model for tokamak edge plasmas T. RAFIQ, A.H. KRITZ, G. BATEMAN, A.Y. PANKIN, Lehigh U. — A model is developed for transport driven by drift resistive ballooning modes (RBMs). These modes are expected to have a significant role in the lower temperature edge regions of Ohmic and L-mode discharges. A unified theory that includes both resistive and electron inertial ballooning modes is derived using a two fluid model for electron and ion plasmas. The derivation includes finite beta and diamagnetic effects, parallel electron and ion dynamics, electron inertia, transverse particle diffusion, perpendicular gyro-viscous stress terms, electron and ion equilibrium temperature gradients and temperature perturbations. Electron trapping and impurity perturbations are ignored for simplicity. Transport coefficients driven by RBMs are computed using a quasi-linear theory. A prediction for the saturation level is obtained by balancing the resistive ballooning mode growth rate against the nonlinear $\mathbf{E} \times \mathbf{B}$ convection. The dependence of the modes as a function of various plasma parameters is explored. It is anticipated that transport associated with this RBM model will become a component of a multi-mode transport model for use in predictive modeling of tokamak discharges.

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