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Self-consistent model of nonlinear mirror mode structures[1] CHRIS CRABTREE, BRUNO COPPI, MIT, LIU CHEN, UC-Irvine — Mirror mode structures have been observed for decades in both laboratory and space plasmas. They are characterized by predominately magnetic compressional perturbations, *i.e.* $\delta B_{\|}$, a plasma pressure response 180° out of phase with the magnetic perturbation, high plasma pressure ($\beta = 8\pi n T_{\perp}/B^2 \sim 1 - 100$), and a perpendicular temperature $T_{\perp}$ sufficiently higher than the parallel temperature $T_{\|}$ such that the linear instability criterion is satisfied. We consider a bi-Maxwellian homogeneous plasma with uniform external magnetic field and a population of electrons whose energy is well below that of the ions but which can reduce any parallel electric fields to negligible levels. We construct a self-consistent model of mirror mode structures by separating the plasma response into two components: i) a bulk population, which responds linearly and 180° out of phase with the compressional magnetic perturbation, and ii) a beam population, whose individual nonlinear particle dynamics are dictated by the adiabatic invariance of the magnetic moment and the mirror force. The system is closed by considering total pressure balance. Numerical simulations of the resulting model are presented and the saturation mechanism is examined in detail.

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