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Effects of Hot Electrons on the Stability of a Closed Field Line Plasma. NATALIA KRASHENINNIKOVA, PETER CATTO, PSFC (MIT) — Motivated by the electron cyclotron heating being employed on dipole experiments, the effects of a hot species on stability in closed magnetic field line geometry are investigated. The interchange stability of a plasma of background electrons and ions with a fraction of hot electrons is considered. The species diamagnetic drift and magnetic drift frequencies are assumed to be of the same order, and the wave frequency is assumed to be much larger than the background drift frequencies. The background plasma is treated as a single fluid, while a fully kinetic description is employed for the hot species. It is found that geometrical effects significantly complicate the analysis. In general dipolar geometry, poloidal variations of electric and magnetic fields cause the dispersion relation to become an integro-differential equation, which without approximations can only be solved numerically. To examine the possibility of at least a partially analytic solution as well as to obtain an intuitive understanding of instabilities we examine a point dipole and consider the effects of hot electrons to be small and introduce them pertubatively. The dispersion relation is analyzed for the frequency range much smaller as well as of the same order as the hot electron magnetic drift frequency. Two regimes of pressure balance are examined: one dominated by hot electrons and another with the background and hot pressures being comparable.

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