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Trapped-Particle-Mediated Collisional Damping of Non-Axisymmetric BGK Modes in Electron Plasmas.[1] A.A. KABANTSEV, C.F. DRISCOLL, UCSD — Weak axial variations in magnetic or electric fields in Penning-Malmberg traps cause a small fraction of the electrons to be trapped locally, with a velocity-space separatrix between trapped and passing electrons. Collisional diffusion across this separatrix then causes surprisingly large transport and damping effects, including the damping of $m_\theta \neq 0$, $k_z = 1$ Trivelpiece-Gould (TG) plasma modes discussed here. These modes would exhibit strong ($\omega/\gamma_{\rm L} \sim 1$) Landau damping at low amplitudes; but they appear as long-lasting ($\omega/\gamma_{\rm NL} \sim 10^4$) BGK states when strongly excited by a downward-chirped frequency drive. We observe that trapped-particle-mediated (TPM) damping (scaling as $[\nu_{\rm ee}/\omega]^{1/2}$) generally dominates over traditional collisional damping (scaling as $\nu_{\rm ee}/\omega$) in limiting the lifetime of the BGK states. The TPM damping is readily enhanced by additional trapping barriers or by wiggle-induced resonant scattering across the trapping separatrix. For linear TG modes, this TPM damping would appear as a "baseline" for Landau damping.

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