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Trapped-Particle-Mediated Collisional Damping of Non-Axisymmetric BGK Modes in Electron Plasmas.[1] C.F. DRISCOLL, A.A. KABANTSEV, UCSD — Weak axial variations in magnetic or electric fields in long cylindrical electron plasmas cause a small fraction of the electrons to be trapped axially. Collisional diffusion across the trapping separatrix then causes surprisingly large transport and damping effects, including the damping of $m_\theta = 1, 2, ...$, $k_z = \pm 1$ Trivelpiece-Gould (TG) plasma modes discussed here. These modes are Landau damped at low amplitudes, but they appear as long-lived BGK states ($-\gamma/\omega \sim 10^{-4}$) when strongly excited. We observe that trapped-particle-mediated (TPM) collisional damping (predicted to scale as $\gamma \propto (\nu_{ee}/\omega)^{1/2}$) generally dominates over traditional collisional damping (scaling as ν_{ee}/ω) in determining the lifetime of the BGK state. Experimentally, this TPM damping is readily enhanced by additional trapping barriers or by wiggle-induced resonant scattering. The frequencies and eigenfunctions of the BGK states show close agreement with linear theory, except for small, amplitude-dependent frequency shifts $f(A) = f_0[1 - a\ \ln(1 + bA)]$, similar to (stronger) shifts observed[2] for $m_\theta = 0$ BGK states.

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[2]J.D. Moody & C.F. Driscoll, Phys. Plas. **2**, 4482 (1995); W. Bertsche, J. Fajans & L. Friedland, Phys. Rev. Lett. **91**, 265003 (2003).

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