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Electron Inertia Effects in Hall-Driven Magnetic Field Penetration in Electron-Magnetohydrodynamics[1] ANDREW RICHARDSON, JUSTIN ANGUS, STEPHEN SWANEKAMP, JOSEPH SCHUMER, Naval Research Lab, PAUL OTTINGER, Independent Contractor through Engility — Magnetic field penetration in electron-magnetohydrodynamics (EMHD) can be driven by density gradients through the Hall term. Here we describe the effect of electron inertia on simplified one- and two- dimensional models of a magnetic front. Nonlinear effects due to inertia cause the 1D model to develop peaked solitary waves, while in 2D a shear-driven Kelvin-Helholtz like instability causes the front to break into a series of vortices which propagate into the plasma. The combination of these two effects means that in 2D, Hall driven magnetic field penetration will typically happen in the form of complex vortex-dominated penetration, rather than as a transversely-smooth shock front.

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