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Magnetohydrodynamic stability of magnetars with ultra-strong fields PETER RAU, IRA WASSERMAN, Cornell University — We study the magnetohydrodynamic stability of a neutron star core threaded by magnetar-strength magnetic fields 10^{14}–10^{17} G, where quantum electrodynamical effects and Landau quantization of fermions are important. Using the canonical energy principle and the Euler–Heisenberg–Fermi–Dirac Lagrangian for a strongly magnetized fluid, we determine the local stability criterion for a fluid slab as a stand-in for a segment of a neutron star core, accounting for magnetic buoyancy and realistic species fraction gradient buoyancy. We find that, for sufficiently strong fields, the magnetized fluid can be unstable to magnetosonic instabilities, caused by the density-dependence of the magnetic H-field. This mechanism could thus be relevant in setting an upper limit on field strengths or determining stable field configurations in magnetar cores.

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