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The Magnetothermal Instability in Dilute Accreting Plasmas
TANIM ISLAM, Ecole Normale Superieure/University of Virginia — In dilute accreting astrophysical plasmas, such as around Sagittarius A*, even an extremely weak magnetic field can lead to large heat fluxes and viscous stresses along field lines that can destabilize a differentially rotating or thermally stratified plasma. These are referred to as the magnetoviscous instability (MVI) (Balbus, ApJ 616, 857 (2004)) and the magnetothermal instability (MTI) (Balbus, ApJ 616, 857 (2001)), respectively. In addition, the lack of radiation in these dilute flows requires that energy generated from gravitational infall of matter must be transported or dissipated (Balbus & Hawley, Reviews of Modern Physics 70, 1 (1998)). This motivates our analysis of the kinetic MTI for a plasma with Keplerian rotation profile and outwardly decreasing temperature in the kinetic and fluid regimes. We demonstrate that the instability can transport angular momentum and thermal energy outwards. We also demonstrate that the kinetic MTI reduces to the fluid MTI (Islam & Balbus, in preparation) at collision frequencies faster than the sound crossing time of the fastest growing modes, where collisionless damping is suppressed (Sharma et. al., ApJ 596, 1121 (2003)).

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