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Angular Momentum Transport in Astrophysical Accretion Flows

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Accretion of plasma onto a central object is responsible for many of the most energetic phenomena observed in astrophysics; stars, planets, and galaxies are also formed via such accretion disks. I summarize the physics of angular momentum and energy transport in astrophysical disks. A linear instability of differentially rotating plasmas – the magnetorotational instability (MRI) – amplifies magnetic fields and gives rise to MHD turbulence in accretion disks. Magnetic stresses due to MHD turbulence transport angular momentum, allowing plasma to accrete. In addition, the gravitational potential energy of the inflowing plasma is converted into heat via the action of MHD turbulence – powering the radiation we see from accretion flows. I highlight recent work on the physics of a particular class of accretion flows onto black holes and neutron stars, in which the inflowing plasma is macroscopically collisionless and kinetic effects are crucial for the angular momentum and energy evolution of the accretion flow.