APR08-2008-000240
Abstract for an Invited Paper
for the APR08 Meeting of
the American Physical Society

Launching Mechanisms of Astrophysical Jets[1]

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Accretion disks and astrophysical jets are used to model many active astrophysical objects, viz., young stars, relativistic stars, and active galactic nuclei. However, extant proposals on how these structures may transfer angular momentum and energy from disks to jets through viscous or magnetic torques do not yet provide a full understanding of the physical mechanisms involved. Global stationary solutions do not permit an understanding of the stability of these structures; and global numerical simulations that include both the disk and jet physics are often limited to relatively short time scales and small (and possibly astrophysically unlikely) ranges of viscosity and resistivity parameters that are instead crucial to define the coupling of the inflow/outflow dynamics. Along these lines we discuss existing self-consistent time-dependent simulations of supersonic jets launched from magnetized accretion disks, using high resolution numerical techniques. In particular we concentrate on the effects of the disk physical parameters, and discuss under which conditions steady state solutions of the type proposed in the self-similar models of Blandford & Payne can be reached and maintained in a self-consistent nonlinear stage.

[1]This work was supported in part by CMSO/NSF, US DoE grant BS23820, Italian PRIN 2005