Formation of Hydrodynamic Jets from Protostellar Accretion Disks with Turbulent Viscosity

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In the vicinity of a massive object of various scales (ranging from young stars to galactic nuclei), mass flow creates a spectacular structure combining a thin disk and collimated jet. Despite a wide range of scaling parameters (such as Reynolds number, Lundquist number, ionization fractions, Lorentz factor, etc.), they exhibit a remarkable similarity that must be dictated by a universal principle. A generalized Beltrami condition has been formulated as a succinct representation of such a principle (Shatashvili & Yoshida 2011). The singularity at the center of the Keplerian rotation forces the flow to align with the "generalized vorticity" (including the effect of localized density and finite dissipation) which appears as an axle penetrating the disk (jet is a Beltrami flow). Based on the Beltrami flow model, an analytical expression of a disk-jet system has been constructed by the method of similarity solution. To support accretion's observable high rate the realistic turbulent processes are considered. To find solutions for Hydrodynamic Jets from Protostellar disks the local viscosity of concrete phenomenological models is used. In future a more detailed study and generalization of this problem for particular Protostellar discs is planned.

References

[1] N. L. Shatashvili, Z. Yoshida, AIP Conf. proceedings **1392**, 73 (2011)