# ICTS Seminar

Title : A numerical study of MRI driven dynamo in radiatively inefficient accretion flows

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Date : Wednesday, January 16, 2019

Time : 02:00 PM

Venue : Amal Raychaudhuri Meeting Room, ICTS Campus, Bangalore

Abstract : The most successful model of accretion disc proposed by Shakura and Sunyaev (1973) assume that an emergent turbulent viscosity is responsible for the outward angular momentum transport. However, a convincing source of turbulence was unknown until Balbus and Hawley (1991) drew attention to a weak field instability, namely, magneto-rotational instability (MRI). While linear MRI guarantees outward angular momentum transport, its study in the non-linear regime is essential to explain observed luminosity, time variability, jets etc. We study the MRI driven turbulence in geometrically thick (H/R ~ 0.5) radiatively inefficient accretion flows (RIAFs) using 3D global ideal MHD simulations and a pseudo-Newtonian gravity. In saturation, we observe dynamo-generated large-scale magnetic fields, a necessary component to produce jets. The dynamo cycles observed in the geometrically thick RIAFs are intermittent, unlike the very regular cycles seen in the global thin disc (H/R << 1) simulations. The irregularity is due to the sub-Keplerian nature of the angular velocity (for which the shear parameter q = 1.7). We find signatures of two kinds of dynamos– one is the direct dynamo close to the mid-plane, and another being a Parker-type dynamo away from the mid-plane. Away from the mid-plane, the back reaction of the Lorentz force plays an important role in causing the suppression of kinetic helicity by the magnetic helicity of a similar magnitude. The effects of dynamical quenching are shown explicitly for the first time in global simulations of accretion flows.