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स्नातक अध्ययन मंडल Board of Graduate Studies.

Visiting Student's Programme Seminar

Title: Role of the Vishniac Magnetic Helicity Flux in Mean-field Galactic Dynamos

Speaker: Ms. Gayathri Kalangadan
(NISER, Bhubaneshwar)

सार Abstract

Magnetic fields are crucial to the evolution of galaxies, but the mechanisms amplifying and sustaining large-scale fields remain unclear. In disc galaxies, the evolution of large-scale magnetic fields is explained through mean-field dynamo theory. This theory focuses on the mean magnetic field $\mathbf{B}$, while the role of random magnetic fields (**b)** is often overlooked. These smaller-scale fields serve as a helicity reservoir. Without effective fluxes to expel excess helicity, the buildup of magnetic helicity can suppress the α-effect, which is proportional to the mean kinetic helicity density. This process is known as catastrophic quenching. Helicity fluxes can counteract this by redistributing helicity. In this study, we incorporate one such helicityflux, the Vishniac flux, into numerical models for the first time, building on the analytical framework of Gopalakrishnan & Subramanian (2023). Using a numerical dynamical quenching model, we assess the Vishniac flux's role in the evolution of galactic magnetic fields. The results suggest the possibility of a magnetically driven dynamo mechanism under specific conditions, such as strong rotation and super-equipartition small-scale magnetic fields. This study highlights the potential role of helicity fluxes in sustaining large-scale magnetic fields and motivates further investigation into magnetic contributions to dynamo action.

गुरुवार Thursday 24, जुलाई July 2025

Time: 11:30 AM

प्रेक्षागृह Auditorium

सभी का स्वागत है All are welcome.