



भारतीय ताराभौतिकी संस्थान  
**INDIAN INSTITUTE OF ASTROPHYSICS**  
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स्नातक अध्ययन मंडल **Board of Graduate Studies.**

STUDENT SEMINAR  
(Part of Comprehensive Examination)

**Speaker: Mr. Shashank Gairola**

**शीर्षक Title: Hierarchical Star Formation in Nearby Spirals**

**सार Abstract**

Molecular clouds fragment under the action of gravity and supersonic turbulence. This results in a hierarchical structuring of molecular gas within galaxies and the stellar distribution born out of this molecular gas is expected to adopt a similar hierarchical nature. My work aims to explore this hierarchical nature using multi-wavelength tracers of star formation across different galaxy morphologies and environments.

The first part of my talk will focus on a study in which we investigated the hierarchical distribution of stellar matter in the form of star forming clumps (SFCs) in 4 nearby spiral galaxies : NGC 1566, NGC 5194, NGC 5457 and NGC 7793, using high resolution FUV & NUV observations from the UltraViolet Imaging Telescope (UVIT). Using the two-point correlation function, we showed that the young ( $< 10$  Myr) SFCs in galaxies are hierarchically distributed, but only up to a maximum scale which ranges from 0.5 kpc to 3.1 kpc. Turbulence in the ISM is likely responsible for sustaining the hierarchical distribution of SFCs up to this scale. We found that in our galaxy sample, the hierarchical distribution of SFCs dissipates within 10-50 Myr, signifying the migration of SFCs away from their birthplaces with increasing age. Overall, our results suggest that the hierarchical properties of star formation in galaxies are dependent on large-scale galaxy properties such as galaxy mass and the nature of spiral arms. Our study demonstrates the capabilities of UVIT in quantitatively studying hierarchical star formation. For the future, we have finalized a bigger sample of galaxies which will be employed to understand the role of physical processes such as feedback, turbulence and shear in imposing a dependence of hierarchical star formation on large-scale galaxy properties.

In the second part of my talk, I will discuss our ongoing study of the hierarchical distribution of ionized gas via HII regions in nearby galaxies. As young, massive stars and HII regions share co-spatiality, the stellar and ionized gaseous matter in galaxies can be expected to show similar hierarchical properties. We found that unlike the stellar distribution in galaxies, HII region distribution shows only weak hierarchical signatures. This could be because, quite like stellar matter, HII regions distribution too loses its hierarchical nature with age. Subsequently, we isolated presumably young HII regions in our sample galaxies to find that they can better reveal the hierarchical distribution expected from the ionized gas in galaxies. In future, we aim to compare the gaseous and stellar distribution in a small subsample of galaxies to address how stellar feedback interacts with the gas distribution in different galaxies.

शुक्रवार Friday 20, सितम्बर September 2024

Time: 11:00 AM

Venue: प्रेक्षागृह Auditorium

सभी का स्वागत है All are welcome.