भारतीय खगोलभौतिकी संस्थान
INDIAN INSTITUTE OF ASTROPHYSICS
कोरमंगला **Koramangala,** बेंगलूरु **Bengaluru – 560034.**

स्नातक अध्ययन मंडल **Board of Graduate Studies.**

Ph.D Synopsis Seminar

Speaker: Ms. Saraswathi Kalyani Subramanian

शीर्षक **Title:** Multi-Conjugate Adaptive Optics for Solar Telescopes.

सार **Abstract**

Ground-based telescopes are severely limited in their performance by the turbulence of the Earth's atmosphere. One solution to overcome these deleterious effects is to use adaptive optics (AO) systems to compensate for the distortions to the wavefront in real-time. The simplest AO systems offer an AO-corrected field of view of about 10 – 15 arc-seconds. Increasing this AO-corrected field of view is of interest for the study of extended objects like the Sun. This can be done by implementing a Multi-Conjugate AO (MCAO) system, which can offer AO correction over 1 arc-minute fields. One of the main design parameters of an MCAO system is the height of the strong layer of turbulence above the site. We need to study the vertical distribution of turbulence strength (C_N^2(h)) at the site to identify the strongest layer of turbulence. We have used S-DIMM+ and balloon-borne temperature sensors to measure the high-altitude and near-Earth turbulence, respectively. Initially, we performed simulations to study the performance of the S-DIMM+ method with our system parameters. Following this, we also carried out the experiment at the Kodaikanal Observatory to estimate C_N^2(h) up to ~6 km. Near-simultaneously, we used a tethered balloon for the other experiment to estimate C_N^2(h) up to 350 m. The isoplanatic angle is another parameter that can be used to describe the turbulence. It is defined as the angular region over which the wavefronts arriving from different directions have a significant correlation. We have established a new method to estimate the isoplanatic angle at a site using iterative deconvolution on long-exposure seeing-limited images of the sun. We used this method to estimate the isoplanatic angle from images taken with the 20 cm H-α telescope at Merak. We have also designed AO and MCAO systems for KTT. The AO system has been set up in the lab. Finally, we have developed simulations in Python to quantify the performance of solar AO systems using rms granulation contrast as the metric. We simulated the performance of most existing and planned ground-based solar telescopes at a variety of seeing conditions with different levels of AO correction. We then compared the results of our simulations with the values reported by existing AO systems to estimate the typical efficiency of solar AO systems.

गुरुवार Thursday 22, अगस्त August 2024

Venue: प्रेक्षागृह Auditorium

Time: 11:00

सभी का स्वागत है All are welcome.