भारतीय खगोलभौतिकी संस्थान

INDIAN INSTITUTE OF ASTROPHYSICS

कोरमंगला **Koramangala,** बेंगलूरु **Bengaluru – 560034.**

स्नातक अध्ययन मंडल Board of Graduate Studies.

STUDENT SEMINAR
(Part of Comprehensive Examination)

Speaker: Ms. Swagata Mukhopadhyay

Title: Evolution of aerosol optical and radiative properties: Insights from multi-wavelength sun- photometer measurements over the Hindu Kush Himalayan region.

सार Abstract

This study presents a comprehensive investigation of aerosol optical and radiative properties at Leh, located in the climate-sensitive Hindu Kush Himalayan (HKH) region. Conducted for the first time in this area, data were systematically collected over a one-year period (July 2023 to June 2024) using a newly installed sky radiometer (POM-01, Prede, Japan), which operates in a robotic mode, at the Raman Science Center, Indian Astronomical Observatory, Leh, Ladakh. The instrument measures direct and diffuse sun-sky radiance at seven optical filters and among them five filters are influenced by mostly aerosols. The measured raw-data were processed using a radiative transfer algorithm incorporated in the SKYRAD.pack software (Versions 4.2 and 5.0), written in Fortran. Sensitivity analyses of aerosol optical and radiative properties were performed by comparing data from the Leh station, as well as observations taken from the Hanle and Merak sites. These additional sites had similar instrument, used for the NLST/NLOT projects of IIA. Further, Hanle and Merak sites are part of the SKYNET (Sky Radiometer Network) group, operated on a global network of sky radiometer instruments for studies of aerosol and its relevant areas. The current study location observed a significant contribution of absorbing aerosols, unlike Hanle and Merak, which may be responsible for increasing surface temperature over the last few decades. Further, this study is also important for filling the information gap on aerosol optical and radiative properties in the HKH region in particular. The study also assessed precipitable water vapor content in the atmosphere using 940 nm channel and the data were used to validate the reanalysis (ERA-5) data. To expand the scope of the current research, regional data were supplemented with global aerosol data from NASA's Aerosol Robotic Network (AERONET). In addition, the current study also utilized particle linear depolarization ratio data from the AERONET, measured at multi-wavelength spectral bands, which provided further insights into aerosol optical and radiative properties. A novel aspect of this research was the introduction of machine learning techniques to enhance the aerosol classification process, offering an improvement over traditional classification schemes. This work underscores the critical importance of understanding aerosol properties and their implications for both local and global climate dynamics. The details of scientific results are discussed in the presentation.

गुरुवार Thursday 13, मार्च March 2025

Venue: प्रेक्षागृह Auditorium

Time: 11 AM

सभी का स्वागत है All are welcome