



INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY

DEPARTMENT OF EARTH AND SPACE SCIENCES

ASTROPHYSICS SEMINAR

SPECTRO-POLARIMETRY OF (EXO)PLANETARY ATMOSPHERES

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ABSTRACT

Spectro-polarimetry is a powerful yet underused tool for probing planetary atmospheres, offering unique sensitivity to atmospheric composition, clouds, and aerosols beyond intensity-only measurements. This talk discusses radiative transfer modeling of polarized light in planetary atmospheres with examples of Venus, Mars and Earth emphasizing on the cloud-induced polarization across optical and near-infrared wavelengths caused due to single and multiple scattering. The development of SHAPE (Spectropolarimetry of HAbitable Planet Earth), a near-infrared spectro-polarimeter aboard the Chandrayaan-3 orbiter, is described, including its design, calibration, and in-flight performance. First spectro-polarimetric observations of Earth as an unresolved planet are presented, providing a key benchmark for exoplanet studies and demonstrating the promise of spectro-polarimetry for characterizing habitable exoplanets.



SPEAKER

BHAVESH JAISWAL

U. R. Rao Satellite Centre of ISRO

ABOUT THE SPEAKER

Bhavesh Jaiswal is a scientist at Space Astronomy Group at U. R. Rao Satellite Centre of ISRO. He is an alumnus of IIST. He did his internship at the Lunar and Planetary Institute, Houston, USA and then joined ISRO in 2011. At SAG, he has initiated the research on the spectro-polarimetry of planetary atmospheres. He demonstrated the potential of polarimetry for atmospheric studies with the help of a polarized radiative transfer model which he developed from scratch. He then, in the lab, demonstrated the polarimetric capabilities of the Acousto-Optic Tunable Filters (AOTs) and created a concept design of a compact near infrared spectro-polarimeter instrument. This novel instrument concept, called SHAPE, has been developed and subsequently flown on Chandrayaan-3 mission to make first-of-its-kind measurements of Earth-as an exoplanet. Along with SHAPE, he currently leads the VASP spectro-polarimeter instrument on Venus mission and a polarization camera on the upcoming Mars mission. He has recently defended his PhD thesis titled: Spectro-polarimetric signatures of the pale blue dot: from planets to exoplanets, at the Physics Department of the Indian Institute of Science (IISc).