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स्नातक अध्ययन मंडल Board of Graduate Studies

IIA - CU - PhD (Tech) Public Ph.D viva-voce examination

Speaker: Subhamoy Chatterjee

Title: Characterizing Image Quality Of Solar Ultraviolet Imaging Telescope On Board ADITYA L1-Mission And Long-Term Study Of The Sun

सार Abstract

Spatially resolved solar near ultraviolet (NUV, 200-400 nm) observations are important to understand the coupling between different layers of solar atmosphere and its impact on Earth's climate. Again, solar features in NUV regime are crucial in budgeting long-term variation of solar irradiance and probing solar magnetic cycle. Contextually, Solar Ultraviolet Imaging Telescope (SUIT), on-board upcoming ADITYA-L1 mission, attempts full-disc solar imaging with 1.4" resolution in NUV through 11 filters.

This talk will start with optimization of SUIT optics incorporating design requirements, constraints to generate an off-axis Ritchey-Chretien configuration. Ghost flux minimization, producing tilted filter configuration, will be depicted. Afterwards, derivation of fabrication, alignment and thermal tolerances putting constraint on image quality will be shown. Analysis of scattering caused by optical surface micro-roughness and particulate contamination, producing requirements on surface polish and assembly environment, will be illustrated. I will also discuss design of SUIT baffles to restrict scatter from entrance aperture. A flat-field model developed using light emitting diodes and a plan for SUIT optical alignment will be rendered.

Having relevance to SUIT observations, analysis of digitized Ca II K and H_α spectroheliograms from Kodaikanal Solar Observatory (KoSO) will be shown. Plage detection through an automated method from Ca II K series (1907-2007), Carrington map generation and correlation with modern magnetic maps for overlapping times will be illustrated confirming locational correspondence between plages and magnetic patches. It will also be shown how the Ca II K series was used in automated detection of supergranules, which represents solar magneto-convection. Time evolution of their morphological parameters near and away from active region will be depicted revealing contrasting correlations with sunspot cycle and hinting different dynamos involved. We calibrated full disc KoSO H_α images for the period 1914-2007 and produced Carrington maps. I will talk about a semi-automated technique, which we developed to detect filaments from Carrington maps. Time-latitude distribution of filaments, polar rush and its role in polar field reversal will be discussed. I will show how prominence locations were identified through an automated method for 10 solar cycles from a combined dataset with a major share from KoSO Ca II K discblocked series (1906-2002). The detection revealed nonlinear profile of prominence poleward migration for all solar cycles. I will illustrate the extraction of migration rates and its importance in constraining solar meridional flow rate.

This long-term study can complement SUIT data pipeline with relevant algorithms and build confidence for future cycle predictions.

मंगलवार Tuesday, 24 दिसंबर December 2019

Venue: प्रेक्षागृह Auditorium

Time: 9:30 AM

सभी का स्वागत है All are welcome.