



भारतीय ताराभौतिकी संस्थान

INDIAN INSTITUTE OF ASTROPHYSICS

कोरमंगला Koramangala, बेंगलूरु Bengaluru – 560034

स्नातक अध्ययन मंडल Board of Graduate Studies

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

वक्ता Speaker: Ritesh Patel

शीर्षक Title: Characterizing Solar Eruptions in Inner Corona using Ground and Space-based Data

सार Abstract

Aditya-L1 is India's first space mission to study the Sun from the Lagrangian-1 position scheduled to be launched in 2023. Visible Emission Line Coronagraph (VELC) is one of the seven payloads onboard *Aditya-L1* and will probe the inner corona from $1.05 - 3 R_{\text{sun}}$ with 10 \AA passband centred at 5000 \AA with high spatial ($2.51 \text{ arcsec/pixel}$) and temporal (10 s cadence) resolution to capture the initial dynamics of the primary drivers of space weather, i.e. Coronal Mass Ejections (CMEs). Due to the limited telemetry from the L-1 point, we developed a simple algorithm to be implemented in on-board electronics based on intensity and area threshold to identify the images containing CMEs. The CME images will be sent back to Earth discarding the rest. This algorithm has been tested on existing space-based and ground-based images of STEREO/COR-1A and K-Cor respectively and simulated CME images for VELC field of view (FOV). It has been reported in previous studies that CMEs in the inner corona ($< 4 R_{\text{sun}}$) show acceleration profiles. As VELC will be observing this region, the study of initial kinematics of CMEs will be a primary objective. The existing ground-based algorithms for automated CME detection e.g. CACTus, SEEDS, ARTEMIS, etc, have not been successfully implemented to derive CME accelerations in the limited inner corona images. So we developed an algorithm based on Parabolic Hough Transform to automatically identify and track the CMEs in this region and determine their kinematic properties. This algorithm has been tested in Extreme Ultra-Violet (EUV) images of STEREO/EUVI, SDO/AIA, and PROBA2/SWAP and is in process to be implemented on white-light coronagraph images of STEREO/COR-1. The following two aspects have been covered in this work, i) an on-board algorithm has been developed for VELC so that images containing CMEs are downloaded, ii) An on-ground automated CME detection has been developed to track CMEs in the inner corona as will be observed by VELC. An important aspect of the on-ground algorithm is enhancement of the erupting features throughout the field of view. I will discuss a simple radial gradient filter, its application on different ground- and space-based data and comparison with an existing algorithm. The merits and demerits of these algorithms and the prospects of future development and implementation will be discussed in this talk. Apart from the CME detection and coronagraph images enhancement algorithms a statistical study of the plasmoids associated with post-CME current sheet of September 10, 2017 has been carried out. We derived an empirical relation for the width distribution of plasmoids suggesting to follow a single power law. This study also brings out the kinematical properties of the plasmoids from inner to outer corona.

सोमवार Monday 08, अगस्त August 2022

Time: 11:00AM

Venue: प्रेक्षागृह Auditorium

सभी का स्वागत है All are welcome

All are cordially invited to attend the Ph.D. viva-voce which is being conducted hybrid mode or join online by clicking on the link given below.

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