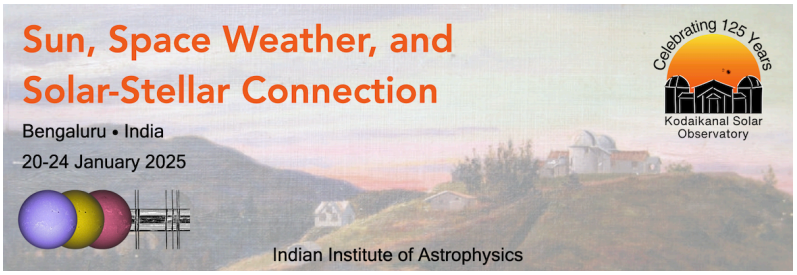

Contribution ID: **15** Type: **Poster**

Improving Solar Wind Forecasting Models Over the Phase of Solar Cycle: Source Surface Height Optimization and Magnetogram Impact

The operational solar wind prediction models used by the community are based on the Potential Field Source Surface (PFSS) model for the magnetic field using synoptic magnetograms. Previous studies comparing observed and modeled open magnetic flux at L1 based on PFSS extrapolations have suggested the need to optimize the source
surface (SS) height with the phase of the solar cycle. The current study investigates the effects and necessity of optimizing the source surface height in popular solar wind forecasting model, i.e., Wang Sheeley and Arge (WSA) model, along with the heliospheric extrapolation model, i.e., Heliospheric Upwind eXtrapolation (HUX). Conventionally, the Carrington rotation (CR) maps obtained from the GONG network have been used in the framework. We performed a long-term study from Jan 2010 to June 2023 spanning SC24 and SC25 to optimize SS height in the WSA model. Our study confirms the need for optimization with the solar cycle phase. We also performed a detailed study on 16 CRs that considers the effect of using different types of magnetograms obtained from the GONG network on the performance of the framework, i.e., Pearson's coefficient of the modeled and observed solar wind velocity profile at L1. Our findings based on 16 representative CRs at different phases of SC24 and SC25 confirm the need for optimization with the solar cycle phase and agree with the long-term study. A higher source surface height, i.e., 3.0 $R_{\odot}$ near the solar minimum, resulted in up to 30% increase in the average performance of the framework. Notably, the results also highlight the importance of using zero-point corrected maps, which improves the PFSS performance in solar wind prediction models.

Contribution Type

Theme

Connecting Solar Corona to Heliosphere

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