Validation of MHD Simulated 3D CME Trajectories for the PUNCH Mission

Nathaniel
Laurent
Southwest Research Institute
Craig DeForest, Southwest Research Institute
Anna Malanushenko, HAO/NCAR

Oral

We present results of a single-blind analysis exercise validating a method for using polarized images to determine the 3D position and trajectory of Coronal Mass Ejections (CMEs) through utilizing polarized and unpolarized (pB and B) images of a simulated inner heliosphere to be gathered from the PUNCH Heliospheric Mission. We implement a custom background subtraction method to separate the K brightness of a particular feature from the K brightness of the rest of the corona along a given line of sight, achieved by modeling the radial dimming of background with an analytic function. Performing an inversion of the subtracted data using the polarization ratio reveals the out-of-plane scattering angle. We also apply a simple geometric perspective correction to account for the discrepancy between the location of the observed and actual CME front. Through comparison with ground-truth data, we find this method is effective in determining the approximate location and trajectory of a coronal mass ejection and distinguishing between “real” and “ghost” trajectories with time-series data. This technique will be extended to the PUNCH mission, validating the extraction of CME features from images that the four observatories will collect in orbit.

Presentation file

laurent-nathaniel.pdf

YouTube link

View recording

Meeting homepage

PUNCH 6 Science Meeting

Download to PDF