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Testing the current paradigm for space weather prediction with heliospheric imagers

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Predictions of the arrival of four coronal mass ejections (CMEs) in geospace are produced through use of CME geometric models combined with CME drag modelling, constraining these models with the available Coronagraph and Heliospheric Imager data. The efficacy of these predications is assessed by comparison with the SWPC forecasts of these same events. It is found that rarely can such a prediction technique outperform the standard SWPC forecast procedure. We test the Harmonic Mean, Self Similar Expansion and Ellipse Evolution geometric models, and find that generally the differences between the models are smaller than the observational errors. Comparison of the CME kinematics estimated independently from the STEREO-A and STEREO-B Heliospehric Imager data reveals inconsistencies that cannot be explained within the observational errors and model assumptions. We argue that these observations imply that the assumptions of the CME geometric models are routinely invalidated and question their utility in a space weather forecasting context. These results argue for the development of more advanced techniques to best exploit the Heliospheric Imager observations for Space Weather forecasting.