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ELEvoHI ensemble modeling: CME arrival prediction based on heliospheric imager observations

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We present a statistical study on CME arrival prediction using ELEvoHI (ELlipse Evolution model based on Heliospheric Imager observations) ensemble modeling. ELEvoHI is the current state-of-the-art HI elongation fitting method that utilizes heliospheric imager data obtained by the STEREO (Solar TErrestrial RElations Observatory) twin spacecraft assuming that the drag force exerted by the ambient solar wind is the dominant force influencing the CME propagation in the IP-space. The HI time-elongation profiles needed by ELEvoHI as well as the in-situ data for validating the results are taken from the FP7 HELCATS project. GCS (Graduated Cylindrical Shell) fitting is applied for each CME separately. We perform a cut in the ecliptic plane, based on the GCS fit, to derive the initial values needed for the ELEvoHI ensemble modeling. In this study, we select CMEs in a 12-month interval (June 2009 to June 2010) corresponding to a location of STEREO-B close to Lagrange point 5 (60° trailing Earth), making the model results valuable for future studies (STEREO-A near L5 in mid 2020) and for a planned L5 mission. Our analysis contains two parts: First, a contingency table (hit/false alarms/misses) with the corresponding skill scores and second the times and speeds for the predicted and observed Earth arriving events. The statistical results are compared to other studies and will serve as benchmark for future enhanced ELEvoHI versions.