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Oral
Global magnetic field models use as input synoptic data, which usually show "aging effects" as the 360° information is not obtained simultaneously. Especially during times of increased solar activity, the evolution of the magnetic field may yield large uncertainties. A significant source of uncertainty is the Sun’s magnetic field on the side of the Sun that is not visible to the observer. Various methods have been used to complete the picture: synoptic charts, flux-transport models, and far side helioseismology.
In this study, we present a new method to estimate the far-side open flux within coronal holes using STEREO EUV observations. First, we correlate the structure of the photospheric magnetic field as observed with HMI/SDO with features in the transition region. From the 304A intensity distribution, which we found to be specific to coronal holes, we derive an empirical estimate for the open flux. Then we use a large sample of 313 SDO coronal hole observations to verify this relation. Finally, we perform a cross-instrument calibration from SDO to STEREO data to enable the estimation of the open flux at solar longitudes not visible from Earth. We find that the properties of strong, unipolar magnetic elements in the photosphere, which determine the coronal hole's open flux, can be approximated by open fields in the transition region. We find that structures below a threshold of 78% (STEREO) or 94% (SDO) of the solar disk median intensity as seen in 304A filtergrams are reasonably well correlated with the mean magnetic field density of coronal holes (cc_sp = 0.59). Using the area covered by these structures (A_of) and the area of the coronal hole (A_ch), we model the open magnetic flux of a coronal hole as |Phi_ch| = 0.25 A_ch * exp(0.032 A_of) with an estimated uncertainty of 40 to 60%.
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