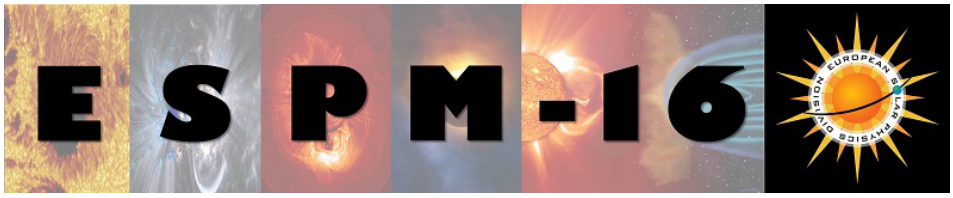


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# On how to estimate the far-side open flux using STEREO coronal holes

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Global magnetic field models use as input synoptic data, which usually show "aging effects" as the 360° information cannot be simultaneously gathered. Most uncertainties come from the far-side which can only be estimated using synoptic charts, surface flux-transport models, or data from helioseismology, however, these are naturally hard to verify.
We present a new method to estimate the far-side open flux from coronal holes using STEREO EUV observations. For this, we correlate the structure of the photospheric magnetic field with features in the transition region. We use properties of the 304Å intensity distribution specific to coronal holes to derive an empirical estimate for the open flux. Utilizing a large sample of over 300 SDO coronal hole observations we verify this relation. We perform a cross-instrument calibration of the relation to be able to use STEREO data to estimate the open flux at angles not visible from Earth.

We find that the strong, unipolar magnetic elements, that make up most of a coronal holes open flux, can be estimated in the solar transition region as open fields. This is done using the area coverage ($A_{OF}$) of coronal hole structures below a threshold of 78% (STEREO) or 94% (SDO) of the solar disk median intensity as seen in 304Å filtergrams. From this, it is possible to derive the open magnetic flux of a coronal hole using $|\Phi_{CH}| = A_{CH} * (0.25 \pm 0.06) exp((0.032 \pm 0.003) * A_{OF})$ (where $A_{CH}$ is the coronal hole area), with an estimated uncertainty of 40 to 60%.

**Primary author:** Dr HEINEMANN, Stephan G. (Max-Planck-Institut für Sonnensystemforschung)

**Co-authors:** Dr TEMMER, Manuela (University of Graz, Austria); HOFMEISTER, Stefan (stefan.hofmeister@columbia.edu); Mr STOJANKOVIC, Aleksander (University of Graz, Institute of Physics); Prof. GIZON, Laurent (Max-Planck-Institut für Sonnensystemforschung); Dr YANG, Dan (Max-Planck-Institut für Sonnensystemforschung)

**Presenter:** Dr HEINEMANN, Stephan G. (Max-Planck-Institut für Sonnensystemforschung)

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