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On the Origin of the sudden Heliospheric Open Magnetic Flux Enhancement during the 2014 Pole Reversal

Coronal holes are known to be the main source of open magnetic flux (OMF) in the heliosphere. However, there's a notable difference between OMF measured in-situ and the flux estimated from solar observations. This study looks at OMF changes and their link to solar coronal holes and active regions, focusing on a significant OMF increase in September-October 2014.

Firstly, we establish a correlation between the noteworthy OMF increase and the modeled magnetic field on the Sun utilizing the Potential Field Source Surface (PFSS) model. Additionally, we investigate the correlation between the OMF and the open flux derived from solar coronal holes and while the OMF evolution is linked to the evolution of the coronal hole open flux, there is no significant correlation with the evolution of the coronal hole area. Furthermore, the temporal increase in OMF aligns well with the disappearance of the residual magnetic field at the southern pole, which resulted from poleward flux circulations induced by the decay of multiple active regions in the southern hemisphere several months earlier.

Additionally, the OMF jump coincided with the emergence of the largest active region of solar cycle 24 in October 2014. This study provides insights into this sudden rise in OMF during this period, enhancing our understanding of Sun-Earth dynamics and helping with space weather prediction and magnetospheric research.

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