Determining the Location of Open Magnetic Field Areas in Active Regions and their Potential as Sources of the Slow Solar Wind

Culhane, J. L. (1), j.culhane@ucl.ac.uk; L. K. Harra (1); S. J. Patten (2); C. E. Parnell (2); and D. H. Brooks (3,4).
(1) UCL / Mullard Space Science Laboratory, Holmbury St. Mary, UK
(2) University of St Andrews, School of Mathematics and Statistics, North Haugh, St. Andrews, UK
(3) George Mason University, Fairfax, VA, USA
(4) Hinode Team, ISAS/JAXA, Sagamihara, Kanagawa, Japan

Discovery of persistent plasma upflows from active region (AR) peripheries by the Hinode X-ray Telescope (XRT) and EUV Imaging Spectrometer (EIS) instruments attracted considerable attention since the flows could contribute ~ 25% of the slow solar wind if they reached the heliosphere. However, strong evidence for arrival of AR plasma in the slow solar wind measured by the ACE spacecraft has been established for only two AR complexes observed in December, 2007 and January, 2008. The present work seeks to enlarge the scope of these results by examining upflows from seven ARs observed in 2011 and 2012. These ARs were located over a range of latitudes, have a range of ages and were found with different neighbours e.g. other ARs, coronal holes. For each of the ARs examined, between one and four associated peripheral upflow regions were identified. Hinode/EIS was used to delineate the upflow regions, measure the flow velocities and establish the First Ionisation Potential (FIP)-bias of the upflowing plasma. For each of the observed ARs a potential field source surface (PFSS) model was constructed to determine the magnetic topology of the global field at times when the upflows were observed. In the presentation, the relationship of FIP-bias to the topology will be assessed and the presence of closed or open field regions and the role of separatrix surfaces will be examined for all of the upflow regions. Possible upflow contributions to the slow solar wind will be reviewed and future directions for AR upflow work will be discussed.