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On the importance of IMF |BY| on polar cap patch formation

Q.-H. Zhang (1), B. -C. Zhang (1), R. -Y. Liu (1), M. W. Dunlop (2), M. Lockwood (2,3), J. Moen (4), H. -G. Yang (1), H. -Q. Hu (1), Z. -J. Hu (1), S.-L. Liu (1), I. McCrea (2), and M. Lester (5)

(1) Polar Research Institute of China, UAP, Shanghai, China (zhangqinghe@pric.gov.cn), (2) SSTD, Rutherford-Appleton Laboratory, Chilton, Didcot, Oxfordshire, OX11 0QX, UK, (3) Space Environment Physics Group, Department of Meteorology, University of Reading, Earley Gate, PO Box 243, Reading RG6 6BB, UK, (4) Department of Physics, University of Oslo, Blindern, Oslo, Norway, (5) Department of physics and Astronomy, University of Leicester, Leicester, UK

A number of poleward-moving events were observed between 1130-1300 UT on 11 Feb 2004, during periods of southward interplanetary magnetic field (IMF), while the steerable antenna of the EISCAT Svalbard Radar (ESR) and the Tromsø VHF Radar pointed nearly northward at low elevation. In this interval, simultaneous SuperDARN CUTLASS Finland radar measurements showed poleward-moving radar aurora forms (PMRAFs) which appeared very similar to the density enhancements observed by the ESR northward-pointing antenna. These events appeared quasi-periodically with a period of about 10 minutes. Comparing the observations from the above three radars, it is inferred that there is an almost one-to-one correspondence between the Poleward-Moving Plasma Concentration Enhancements (PMPCEs) observed by the ESR and the VHF radar, and the PMRAFs measured by the CUTLASS Finland radar. These observations are consistent with the interpretation that the polar cap patch material was generated by photo-ionisation at sub-auroral latitudes, and that the plasma was structured by bursts of magnetopause reconnection giving access to the polar cap. There is clear evidence that plasma structuring into patches was dependent on the variability in IMF |BY|. The duration of these events implies that the average evolution time of the newly opened flux tubes from the sub-auroral region to the polar cap was about 33 minutes.