



Asymmetry of solar polar fields and the southward shift of HCS observed by Ulysses

I.I. Virtanen and K. Mursula

Physics Dept., University of Oulu, Finland (kalevi.mursula@oulu.fi)

We study the hemispheric asymmetry of high-latitude unipolar fields and the latitudinal shift of the heliospheric current sheet using Ulysses magnetic field observations during the perihelion passes in 1994-1995, 2001-2002 and 2007. Using the cumulative flux density and the best fit lines to its high-latitude sections in the two hemispheres, we find that the absolute value of the high-latitude radial field of the southern hemisphere is larger than in the north during both minimum time scans in 1994-1995 and 2007. The hemispheric difference is about 0.2 nT during both scans, suggesting that the northern field area is some 5-10% (5-15%) larger than the southern area and that the HCS is shifted southward by about -2° (between -2° and -5°) in 1994-1995 (in 2007). The results resolve the discrepancy between earlier results in 1994-1995 and clarify similar observations in 2007 in the ecliptic. They also verify the southward shift of the HCS during the exceptional solar cycle 23°.

We also study the detailed structure of the equatorial region and compare Ulysses observations with simultaneous HMF predictions given by WSO synoptic maps. Using a simple HCS model, we find that even in case of southward shifted HCS, the highest peak of the cumulative flux density could be located above the equator. Thus, Ulysses observations around the heliographic equator can not alone give an unambiguous information of the HCS shift, which emphasizes the importance of studying the high-latitude sections of Ulysses orbit.