



The wide skirt of the bashful ballerina: Hemispheric asymmetry of the heliospheric magnetic field in the inner and outer heliosphere

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We reanalyze the observations of the heliospheric magnetic field (HMF) made by the Pioneer 10 and 11 and Voyager 1 and 2 heliospheric probes since 1972, and calculate the HMF sector occurrence ratios and tangential component strengths in the different regions of the heliosphere. Observations at the distant probes and at 1 AU show a very consistent picture of the HMF sector structure in the entire heliosphere, and even beyond the termination shock. Pioneer 11 and Voyager 1 show that the development of northern polar coronal holes was very systematic and active during all the four solar minima since mid-1970s. On the other hand, Voyager 2 observations show a less systematic and delayed development of southern coronal holes in 1980s, 1990s and 2000s. This delay in the evolution of southern coronal holes with respect to the rapid and systematic evolution of northern coronal holes leads to a larger extent of northern coronal holes and a southward shift of the heliospheric current sheet (the bashful ballerina phenomenon) for a few years in the late declining phase of each solar cycle. HMF observations of the probes also directly verify the HCS southward shift, supporting earlier observations at 1-2 AU by the Ulysses probe and Earth-orbiting satellites and extending them into the more distant heliosphere. Although the evidence for the connection between the temporal difference in the evolution of polar coronal holes and the bashful ballerina times is based only on three solar cycles, this may be a common pattern for solar coronal hole evolution since the southward shift of the HCS has occurred at least since solar cycle 16.