



Rebirth of the Bashful ballerina

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Heliospheric current sheet (HCS) is the continuation of the coronal magnetic equator into space, dividing the heliospheric magnetic field (HMF) into two sectors. Because of its wavy structure, the HCS is also called the ballerina skirt. Several recent studies have proven that the HCS is southward shifted during about three years in the solar declining to minimum phase. This persistent phenomenon, now called the Bashful ballerina, has been seen in geomagnetic indices since 1930s, OMNI data since 1960s, WSO data since mid-1970s and in Ulysses probe measurements during the fast latitude scans in 1994-1995 and 2007.

Here we study the long-term evolution of photospheric and coronal magnetic fields and the heliospheric current sheet since 1975 using synoptic maps from six observatories (WSO, MWO, Kitt Peak, SOLIS, SOHO/MDI and SDO/HMI). All data sets depict a fairly similar long-term evolution of magnetic fields and the heliospheric current sheet, and agree on the southward shift of the heliospheric current sheet during all the five included cycles. We show that during solar cycles 20 – 22, the southward shift of the HCS is due to the axial quadrupole term, reflecting the stronger magnetic field intensity at the southern pole during these times. During cycle 23 the asymmetry is less persistent and due to higher harmonics than the quadrupole term. Currently, in the early declining phase of cycle 24, the HCS is also shifted southward and is, again, due to the axial quadrupole, repeating the pattern of most previous cycles.