



Experimental observations of the interplanetary magnetic field distribution in the inner heliosphere: controversial points

O.V. Khabarova and V.N. Obridko

Institute of terrestrial magnetism (IZMIRAN) RAS, Heliophysical laboratory, Troitsk, Moscow, Russian Federation
(khabarova@izmiran.ru)

Interplanetary magnetic field (IMF) deviations from a Parker spiral are very often observed in the heliosphere at different distances from the Sun. Commonly, it is supposed that the IMF in the inner heliosphere corresponds to the Parker theory as a whole, but there is some turbulent component that impacts a full picture of the IMF spatial and temporal distribution and damages it. Meanwhile, the analysis of multipoint in-ecliptic IMF measurements from 0.23 AU to 5 AU shows that the radial IMF component in the inner heliosphere corresponds neither r^{-2} law nor the helicity assumption even under rough average.

The next problematic point is an explanation of observational results on the in-ecliptic IMF distribution shape at different AU. It is shown that a bimodal (two-humped) view of B_r , RTN (or B_x , B_y , GSE) distribution, well-known at 1 AU, is most brightly expressed at low heliolatitudes at 0.7-2 AU, but it disappears with an increasing heliocentric distance. The in-ecliptic IMF distribution shape becomes perfectly Gaussian-like at 3-4 AU. Such behaviour of the in-ecliptic IMF can not be explained by any theory of the IMF extension in space.

Therefore, experimental results, accumulated for the space era, demonstrates the barest necessity of the 3-D interplanetary magnetic field picture revisiting, looking for new theories of plasma and IMF expansion from the Sun, as well as further development of new models of the inner heliosphere.