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Peculiarities of spatial and temporal distribution of the interplanetary magnetic filed

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According to classical models of the solar wind and the interplanetary magnetic field (IMF) expansion, distributions in the ecliptic plane of both the IMF at 1 AU and the radial magnetic field on the Sun are expected to be identical . We found that photospheric (as well as the solar wind source surface) magnetic field distribution is purely Gaussian, but the distribution of the in-ecliptic and radial IMF at the Earth orbit demonstrates two-humped shape. It was previously supposed that interplanetary sector structure is responsible for the latter phenomenon. Our results indicate that picture of the IMF expansion into space is more complicated than usually considered. IMF histograms were based on data from OMNI2, as well as Pioneer Venus Orbiter, Helios 2, Ulysses and Voyager 1 spacecraft, obtained at the distances from 0.29 AU to 4 AU from the Sun. The shape of the radial IMF component distribution strongly depends on a heliocentric distance and a heliolatitude. The “two-humped IMF” effect is most brightly expressed at 0.7-2 AU. At 3-4 AU, it fully disappears in low heliolatitudes, but still is seen in the polar solar wind. There is also dependence of the discussed effect on a solar cycle due to active processes, such as solar flares and CMEs. We suppose that the in-ecliptic solar wind field at 1 AU is influenced by field of solar active regions in a high degree, and actually the distribution is the three-humped – two humps are for the IMF from the middle and high heliolatitudes and the third one is the expected distribution from solar field nearby the heliomagnetic equator. The central (zero-round) part of the in-ecliptic IMF distribution falls down with heliocentric distance (it is visible up to the Venus orbit). Vanishing of the IMF zero-component partially could be a result of magnetic reconnection, responsible for solar flares, or be a consequence of reconnection at X-lines in the solar wind.