EVOLUTIONARY CHARACTERISTICS OF THE INTERPLANETARY MAGNETIC FIELD INTENSITY

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We use several mathematical methods, such as Continuous Wavelet Transform (CWT), Wavelet coherence (WTC) and Partial Wavelet Coherence (PWC), to investigate the distribution and oscillation periods of daily interplanetary magnetic field (IMF) intensity as well as the connection between IMF fluctuations and solar activity indices (Magnetic Plage Strength Index and Mount Wilson Sunspot Index). The daily IMF intensity is generally following the log-normal distribution approximately, which is directly related to distribution of active region flux. The short-term periods of IMF are about 13.7, 27.6, 37.1 and 75.3 days, which are driven by the quasi-periodicity of magnetic surges on the solar surface. The mid-term periods of 1.07 and 1.82 yr should be derived from the stochastic interaction of local fields and meridional flows, since coronal holes reflect the transport of magnetic flux on the solar surface and variations in the meridional flow are seen in the heliosphere. The 10.9-year period is the Schwabe solar cycle and it should be first mentioned. The solar cycle variation of IMF should not be related to solar weak magnetic activity but dominated by solar strong magnetic field activity seen on the disk, because the time-varying component of interplanetary magnetic flux has foot points rooted in regions near the sources of CMEs which are related to active regions, while the constant component in IMF should initially and mainly come from the solar weak magnetic field activity. Finally, the slow variation of the IMF indicates that it may have a period of longer than 50 yr.