Time changes of solar activity and the interplanetary magnetic field at the earth's orbit in different spectral bands

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We present results of our analysis of time changes of different frequency components of spectra of the Interplanetary Magnetic Field (IMF) values (measured at the Earth's orbit for the period 1964-2004) and solar activity expressed by sunspot numbers W. Comparison of the spectra is natural because values of IMF have the highest correlation coefficient Cc=0.95 (compared with the other parameters of the solar wind) with W. This result allows to consider W as indicator of magnetic flux carried by the solar wind to the Earth's orbit. A method of non-linear spectral analysis named by us the Method of Global Minimum (MGM) is used to calculate the spectra. Spectra of the IMF and W are calculated to detect oscillations with the same periods including non-stationary (with varying phase and amplitude). All discussed peaks in the both spectra have statistical significance higher than 0.95. Analysis shows presence of cycles with the same periods in both spectra: oscillations with the periods T=10.8 year, T=8.8 year and T=3.7 year present in both long-periodic parts of the spectra. However, time changes of these oscillations demonstrate different character of connection between the solar activity and the IMF value. In particular, solar cycle at period T=10.8 yr varies in phase with the cycle at the same period from the IMF spectrum. But the solar oscillations at the period T=8.8 yr have phase shift relative to the IMF oscillations. Short-term spectral bands of both spectra in vicinity of well-known periods T$\sim$1.3 yr and T$\sim$150 days detected earlier both in the solar and solar wind data are discussed. The most power non-stationary oscillations at T=1.3 yr from the short-term part of the IMF spectrum do not present in the W spectrum. Instead we found power non-stationary oscillations at T$\sim$1.0 yr in the solar spectrum. We suggest explanation of the cause of difference of these periods. Complicated structure of spectral band of the IMF spectrum in vicinity of periods $\sim$150 days includes non-stationary sinusoid at T=142 days and stationary ones at T=137 days, T=151 days is not resolved in the solar spectrum. The solar spectrum has peaks with statistical significance at T=134 days and T=142 days. We discuss too other our results: such as behavior of the trends in the solar activity and the IMF spectra, change of period of the Suns rotation for the last solar cycle (compared with the previous solar cycles for the studied time interval).