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The time varying Sun in the solar wind velocity and in the Inteplanetary Magnetic Field in near Earth space

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We present results of our analysis of spectra of module of the Interplanetary Magnetic Field (IMF), the solar wind velocity (V) calculated on the basis of data for the period of spaced measurements at the Earth's orbit and of solar activity (sunspot numbers W). We put as our aim to search for oscillations with common periods in the spectra in various frequency bands (with stress on the period T$\sim$11 yr of main solar cycle and its harmonics and on so called "intermittent" oscillations at periods T$\sim$1.3 yr and T$\sim$150 days); to extract trends from the data to determine value of long-periodic changes of IMF, V and W. A method of non-linear spectral analysis named by us the Method of Global Minimum (MGM) is used. MGM allows self-consistent identification of trends from data and non-stationary harmonics (amplitudes and phases depend on time) and estimation of statistical significance of spectral components. Spectra of the IMF value and W have main solar cycle at T=10.8 yr. besides, spectrum of the IMF (at confidence level 99.8%) has 6 overtones of the cycle at T=10.8 yr, the most power from them are at T=1.32 yr, T=151.4day, T=136.5 days. We detected non-stationary oscillations at T=1.3 yr in the spectra of IMF and V connected with periodic variations in the rotation velocity near the base of the convective zone of the Sun discovered in the SOHO data. These oscillations do not present in the W spectrum. Instead we found non-stationary oscillations at T$\sim$1.0 yr in the solar spectrum and suggested explanation for the difference of periods. The relation between the oscillations in the spectra of W and V is not evident as between W and the IMF, however, it exists. In particular, overtones of the 10.8-year solar cycle present in the spectrum of V (such as power oscillations at T=1.55 yr); main solar cycle at T=10.8 yr is the 5-th overtone of the longest period in the V spectrum at T=54 yr. Oscillations with common periods of T=10.8, T=8.8, and T = 3.73 yr have been identified in the spectra of W and of

IMF. The temporal variations of these cycles demonstrate the different nature of the relation between solar activity and the IMF value: the cycles with T = 10.8 yr vary in phase, variations of the cycles at T = 8.8 yrs are shifted in phase. Trends and the long-periodic part in the spectra have the highest amplitudes that points to their determining contribution to the data changes for the studied time interval. Trend in V described by non-stationary harmonic at T=54 yr shows temporary decreasing of V from $\sim$1992 and for now, amplitude of the cycle will be increasing in the future. The IMF trend extracted from the data by self-consistent method shows the 1.5 increasing of the IMF from 1964 (the 45% rise in the IMF strength over 1963-1990) and the IMF value decrease at present from its maximum at$\sim$1990. It is shown that tide forces of the planets can be cause of periodical changes in the analyzed data. Overtones of periods of perturbed tide forces of external planets and their overtones (connected with motion of the Sun relative to the mass center of the solar system) are detected in the spectra. It is interesting to mark that the power oscillations of spectrum of sunspot numbers W for the last solar cycle (1996-2004) can be interpreted by period of perturbed tide force of system Jupiter-Uranus at T=16.56 yr and its overtones (the spectrum of W has the main period and 7 overtones of this period).