FREQUENCY SPECTRA OF SHORT-PERIOD VARIATIONS OF COSMIC RAY

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ABSTRACT. Frequency spectra for different periods of solar activity were calculated by 5-minutes data of neutron super-monitor of the Institute of Ionosphere of AN KazSSR (altitude 3340 m, cut-off rigidity is 6,7 GV, counting rate is about $4.5 \cdot 10$ per hour). It was shown that shifting of the spectrum power from low-frequency range to high-frequency range takes place from minimum to maximum of the solar activity. It was reliably distinguished the peak with 160-minutes period coincided with the period of the Sun's atmosphere oscillation and some types of geomagnetic pulsation by the method of accumulation of the frequency spectra. It was conducted the comparison of cosmic ray spectra with spectra of geomagnetic field for the same point of the registration and at the same period.

The short-period cosmic rays variations origins from different nonstationary processes in the interplanetary space, magnetosphere and atmosphere of the Earth and these variations may be used for the study of the such processes. The high-altitude neutron monitor of the Institute of Ionosphere of AN KazSSR permits to investigate the spectrum of cosmic ray fluctuations up to $1.7 \cdot 10^{-3}$ Hz. In this paper the spectral density of cosmic ray fluctuations in the range of 10^{-5}--$5 \cdot 10^{-4}$ Hz was calculated by the method of Blacman and Tukey /1/, using 15-minute data of this monitor for the time period from 1974 to 1983. The all data were corrected for the barometric pressure. The solar activity cycle was devided to the four periods: 1-1974-1976-the solar activity minimum, 2-1977-1978-solar activity increase, 3-1979-1980 -activity maximum and 4-1981-1983-activity decrease. The calculation of the spectral density was carried out on the week-interval data with the filtrating of the low-frequency band. It was obtained that at solar activity minima the main power of the spectral density concentrated in the low-frequency range. When the solar activity increased, the spectral power shifts to the high-frequency range. In Fig.1 are shown the summary power spectra $\tilde{G}_{xx}(f)$ for the period mentioned above; a-1st period, b-2nd period, c-3rd period and

d-4th period.The unifirm distribution of the spectral density at the all frequency interval at solar maximum and the presence of large power at low frequency range at solar minimum are observed.

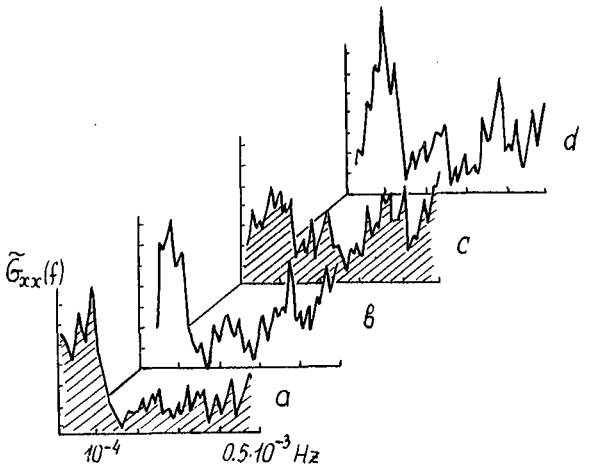

Figure 1.

It was shown earlier that the peak at frequency near 10^{-4} Hz (the period of 160 minutes) is presented in the frequency spectrum of the cosmic ray intensity,but ones was instable and observed irregular.The study of this peak is rather intresting becouse of the stable pulsations of the solar atmosphere /3,4/ and geomagnetic pulsations /5/ were observed at the same frequency.In this paper we calculated the summary power spectrum by the data for 1981-1983 (during the quiet periods) and this spectrum $\tilde{G}_{xx}(f)$ is shown in Fig.2.It is seems the peak at 160 minutes predominates in the summary spectrum.It should be noted that the period of this isolate peak equal to 160 minutes precisely in summary spectrum while it drifted around this period in separate frequency spectra.The amplitude of this peak,standing out against a background of intensity fluctuations, exceedes the 95-% significance level,which denoted the dotted line in fig.2.

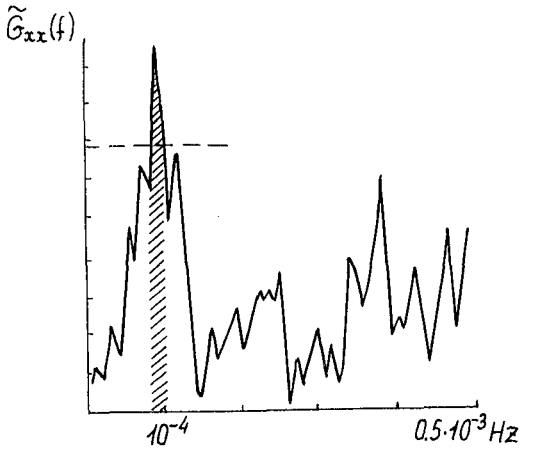

Figure 2.

It was compared the frequency spectra of cosmic ray intensity and the spectra of the geomagnetic field (H-component),registered in Alma-Ata also.The summary spectra of geomagnetic data are shown in Fig.3,for the same intervals of the solar activity cycle as in Fig.1.The main power in these spectra concetrated at low-frequency range and there no statistically significant peaks which could influenced on the cosmic ray fluctuations.There are no the statisti-

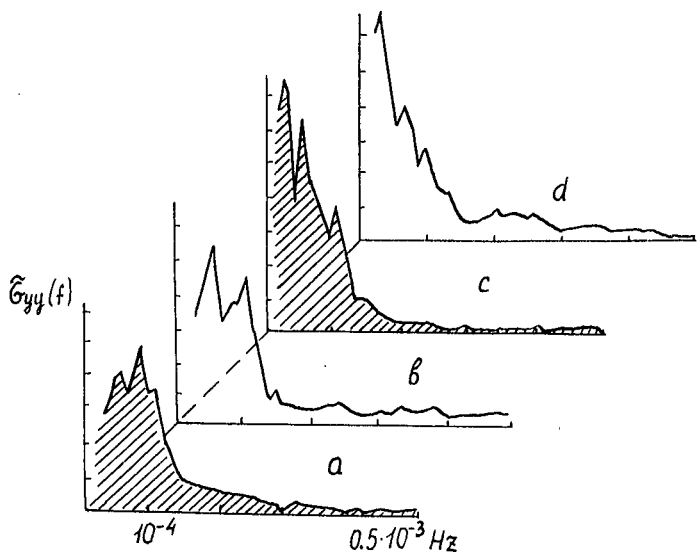

Figure 3.

cal significant values of the spectral density in the coherence spectra of cosmic ray intensity and quiet geomagnetic data for the all investigated periods from 1974 to 1983.

RESULTS. The frequency spectra of the cosmic ray intensity and H-component of the geomagnetic field were studied in the frequency range (10^{-5}-$5 \cdot 10^{-4}$)Hz for period 1974-1983.We can draw a following conclusions from obtained results:

1.The main power of the spectral density in the cosmic ray frequency spectra shifted from low-frequency range to high-frequency range when the solar activity increased.

2.The distinctive peak with the period of 160 minutes observed in the summary frequency spectrum of the cosmic ray intensity.

3.There is no relation between the cosmic ray fluctuations and fluctuations of the geomagnetic field during quiet periods.

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