WEAK EXTRA LOW FREQUENCY MAGNETIC FIELD AND CONDUCTIVITY FLUCTUATIONS IN AN ELECTRODE SYSTEM

N.I.Muzalevskaya*, V.M.Uritsky*, E.V.Korolyev*, S.M.Bezrukov, M.A.Pustovoit, A.I.Sibilev

* Leningrad State Technical University

In [1,2] it was found that weak extra low frequency (ELF) fluctuating magnetic field (MF) can modify functional state of a wide range of systems with phase boundaries. The present paper contains the results of the experimental study of effect of weak ELF MF on large-scale conductivity fluctuations in a model heterogeneous system.

The system under study [2] had two Pt electrodes immersed in bidistilled water and biased by adjustable d.c. voltage U_0. Proportional to conductivity fluctuations output electrical signal was amplified, filtered and

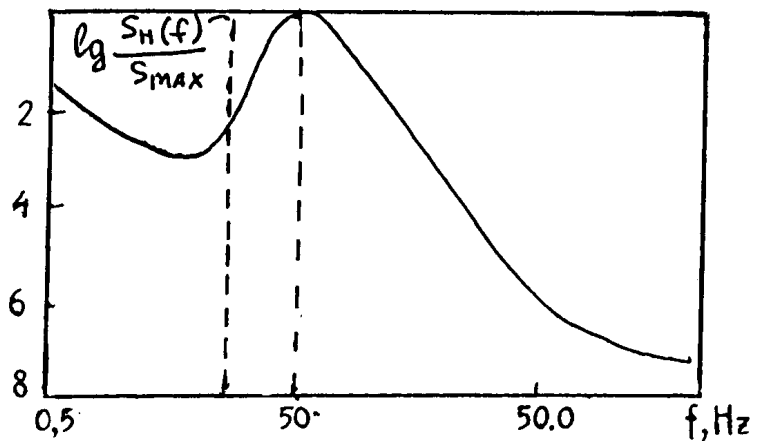

Fig.1. Fourier power spectrum of perturbing magnetic field

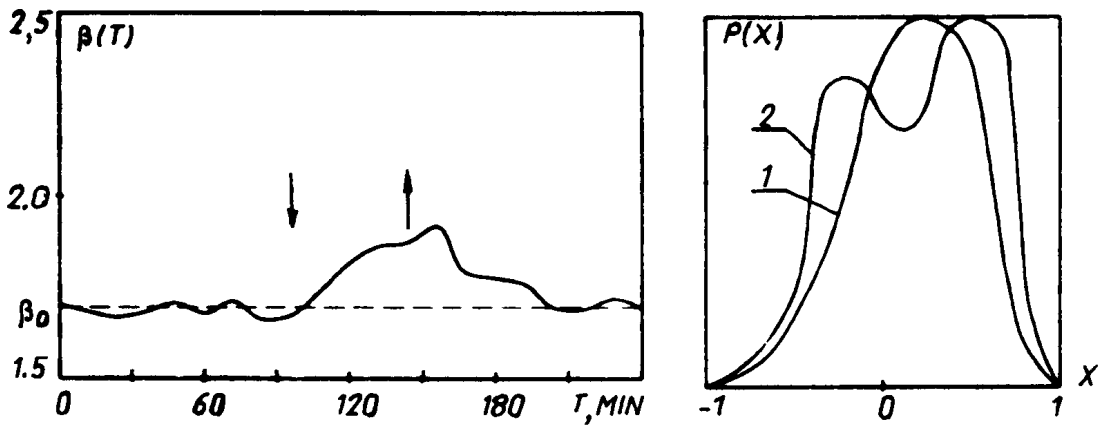

Fig.2. Modification of conductivity fluctuations in an electrode system in response to magnetic field for electrode bias $U_b < U_c$. (*a*) Change of β in response to magnetic field; (*b*) shape of probability density $P(X)$ for initial state (curve I) and for perturbed state (curve 2)

digitally analysed in the frequency band 0.1—330 *Hz*. Fourier power spectrum and probability density of the fluctuations were registered. Perturbing fluctuating MF was induced by a Helmholtz system and has a maximum amplitude 2.5 *A/m* on frequency 0.5 *Hz* (see fig.1). Expositions lasted for 40—50 *min* under the condition of acoustic isolation and screening from geomagnetic field.

It was found that fluctuations of unperturbed system had frequency spectrum of the type $1/f^{\beta}$ with $\beta = 1.5 - 1.7$ (figure 2a) and unimodal probability density (figure 2b—1). If U_0, correcponding to nonlinear regime, was chosen optimally, exposition in MF led to reliable change of the initial state (figure 2b—2). *I*t is important to notice that, perturbation power being small, there were no distortions due directly to magnetic field in the conductivity fluctuations spectrum, which remained hyperbolic.

The most impressive indication of the system's reaction to magnetic perturbation was splitting of conductivity fluctuations probability density, which became bimodal. At the same time low frequency noise dispersion increased by 20—25% due to increase of β by 10—15%. Fractal dimensionality of realizations, which for the noises of the class considered is linearly connected with β, decreased. The reaction of the system was nonstationary and had considerable relaxation time, so deviations from the initial state could be registered both during and 1.0—1.5 *h* after the exposition.

The experimental results described show the possibility of large-scale conductivity fluctuations in a model heterogeneous system by weak ELF magnetic perturbation.

References

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