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Research of Some Characteristics of Guria Magnetic Anomaly

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ABSTRACT. Man represents an open, dynamic, unbalanced self-organized system exchanging substance and energy with the surrounding environment. Our research aims to identify the existence in Georgia of areas of strong local anomalies of the geomagnetic field, to establish their physical characteristics, and to study, in cooperation with medical men, their possible impact on human beings, especially given the present-day scientific views that electromagnetic fields (including local magnetic anomalies) render a great impact (both positive and negative) on the health of living beings, their development. Gradients of the local magnetic field anomalies registered by us exceed several times the maximum values of magnetic storms observable in our latitudes, the full T component of the magnetic field on the studied territories undergoes significant changes – within several thousand gammas (whereas the maximum intensity of magnetic storms in our latitudes does not exceed 600-800 gammas). *© 2008 Bull. Georg. Natl. Acad. Sci.*

Key words: *environment, magnetic anomaly.*

In the late 20th century, a basically new, so-called synergic approach was established to study a wide spectrum of natural phenomena. The basis of the synergic approach is the taking account of cooperative phenomena/events influencing a specific system. The advances of scientific research attained in various branches made it possible to analyze the processes ongoing in open, unbalanced, dynamic systems, such as the environment where man has to live.

Man represents an open, dynamic, unbalanced self-organized system exchanging substance and energy with the surrounding environment. The second half of the 20th century was characterized by a plethora of studies of the effects of different physical fields on human beings and on bio systems in general.

All physical fields where man had to function, may, by its nature, by divided into three principal groups: (1) Cosmic fields – generated principally by the Sun and possibly other space objects; (2) Geomagnetic and geological-geophysical fields – which are generated by geological bodies, the Earth and its nucleus; and (3) Technogenic fields – generated by technical objects: radio, television, communications systems, electrical devices, etc. The objective of the research is to determine quantitative parameters of the cooperative impact of the fields generated by different sources - from cell to man.

Special importance in our research is given to the study of the effects of the geomagnetic field and of the fields generated by lithospheric structures. As is well known, the Earth's geomagnetic field consists of inter-

nal and external components. The internal is conditioned by the Earth's structure as of a space body and these components give rise to slow and secular variations of the Earth's constant magnetic field. The external effect includes the ionosphere and the electrical fields related to it.

The Earth's magnetic field is the habitat of all living organisms. Man is especially responsive to any variations of the geomagnetic field.

The stationary effect of different geophysical anomalies caused by geological bodies also impacts geomagnetic fields and vital activity. The following anomalous manifestations caused by geological structures can be named:

1. Dispersal of clouds above the zones of abyssal fracture.
2. Screening of the displacement of cumulus by abyssal fractures.
3. Creation of auroral effect above abyssal fractures.
4. Screening of radar returned signal above the abyssal fracture zone.
5. Creation of various field value gradients in the areas of different geological bodies.

Since the territory of Georgia is known for both regional and local magnetic anomalies, their research, identification of the ranges, recording the upper and lower levels of the magnetic field intensity growth is a very urgent problem, especially as significant gradients of the magnetic fields in various districts of the Guria regional anomaly have been detected as a result of repeated measurements of the magnetic field intensity by a complex field expeditionary team (the measurements were made by means of a proton magnetometer MMP-2003). A large volume of literary material on magnetic prospecting has been studied. It has been found that under the South Caucasus conditions, namely in Georgia, taking into consideration its mountainous terrain, the tested aeromagnetic prospecting is adequately effective [1]. Accordingly, all magnetic anomalies need to be thoroughly studied by the earth surface magnetic research method, especially, given the contemporary scientific views that electromagnetic fields (including local magnetic anomalies) exert a significant impact on the health of living beings (both positive and negative) [2, 3].

The issue concerning definite effects of local magnetic anomaly upon the human organism as a permanent troublesome factor of homeostasis [4] is not devoid of interest. It is to be mentioned that presumably the local population has become adapted to the said effects, otherwise its influence should have manifested itself, for example in peculiar health statistical parameters against other regions. At this stage, the medical side of our research was the very aspect of the problem.

In order to handle the problem set, the statistics available in the health care system have been retrieved and analyzed together with the information obtained through direct polling of the population. The polling took place by means of a questionnaire, which provides a rather comprehensive picture of the population, for it encompasses a series of indigenous population of both genders and of all the ages. Information on approximately 200 inhabitants and the 2002-2005 statistics on the Ureki township population have been obtained.

To ensure reliability of the study, the obtained data were to be collated with the control or comparison group data, for which purpose the relevant information regarding the Telavi region population was taken. The initial interpretation of the obtained results gives a more reliable picture with respect to a definite group of diseases in the Ureki population against the one observable in the comparison group. We believe that the obtained result should be perceived only as an indicator of prospects of continuation of a serious, multifactor research in the given direction.

Thus, based on the analysis of the research and the obtained results we can ascertain that thanks to the methodology developed on the basis of the further profound, serious, multifactor and strict standardization of both the engaged personnel as well as of the technical equipment, and all other research-involved factors it will be possible to receive specific information concerning the effects of the local geomagnetic anomaly upon the statistical picture of health parameters of the indigenous population.

From this standpoint, special importance will be given to the study of Guria regional magnetic anomaly (a larger part of the constituent anomalies of which, namely, the Ureki local magnetic anomaly, has been comprehensively studied by us) [5]. This approach, based on the analysis of the research results and conclusions, will be applied to study peculiarities of local magnetic anomalies on the territory of Georgia, to compile in the future a surface magnetic map of regional and local magnetic anomalies in Georgia, where special attention will be given to a detailed geomagnetic investigation of the capital and its adjoining territories with due regard for its global and strategic significance (especially as we had measured in different periods the full T component of the Earth's magnetic fields of Lake Lisi, Mtatsminda Park, a part of Varketili, Gotua street, Academy campus, Vazha-Pshavela Avenue blocks, the National Bank, the

University High-rise Building, etc. where significant magnetic gradients have been recorded).

The expedition has studied in detail Ureki, Tsqaltsminda, Mamati, Guliani, Atsana, and other local magnetic anomalies within the Ureki regional anomaly. The full T component of the magnetic field is liable to significant variations within a small area, maximum to 9000 gamma (whereas the maximum intensity of magnetic storm in our latitude is within 600-800 gamma). Special mention should be made of Atsana north-western slope, where the full T component of magnetic field varies from 45800 to 54800 gamma. Measurements were made by a standard 10- meter step. In our opinion, the anomaly should be associated with the volcanic rocks containing ferromagnetic minerals, which are characterized by significant gradients. Also, significant magnetic field gradients were registered in the River Atsaura basin (47900-55600 gamma), as well as in (the North-Eastern) Serbeti area adjoining Atsana (46400-51400 gamma) and in other places.

Notwithstanding the scanty financial, instrumental and human resources, the volume of the work performed and of the results obtained by the expedition and the value of the obtained information make it possible to hope that, in cooperation with medical men and on condition the above organizational problems are settled, further research will yield results and conclusions that will prove useful not only for Georgian geophysics but also the future of this country.

გეოფიზიკა

გურიის მაგნიტური ანომალიის ზოგიერთი მახასიათებლის კვლევა

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ადამიანი წარმოადგენს ღია, დინამიურ, არაწონასწორულ, თვითორგანიზებულ სისტემას; იგი ცვლის ნივთიერებასა და ენერგიას გარემოსთან, რომელიც მას გარს ერტყმის. სტატიის ავტორთა კვლევები შეეხება დედამიწის მაგნიტური ველის საქართველოში არსებული ძლიერი ლოკალური მაგნიტური ანომალიების არეების გამოვლენას, მათი ფიზიკური მახასიათებლების დადგენასა და, მედიკოსებთან თანამშრომლობით, ადამიანზე მათი შესაძლო გავლენის შესწავლას, განსაკუთრებით, თუ გავითვალისწინებთ თანამედროვე მეცნიერულ შეხედულებებს, რომ ელექტრომაგნიტური ველები (მათ შორის ლოკალური მაგნიტური ანომალიები) მნიშვნელოვან გავლენას ახდენენ ცოცხალი არსებების ჯანმრთელობაზე, მათ განვითარებაზე (როგორც დადებითს, ასევე უარყოფითს). ავტორთა მიერ დაფიქსირებული ლოკალური ანომალიური მაგნიტური ველების გრადიენტები რამდენიმეჯერ აღემატება ჩვენს განედებზე მაგნიტური ქარიშხლების მაქსიმალურ მნიშვნელობებს. შესწავლილ ტერიტორიებზე მაგნიტური ველის სრული თ მდგენელი მცირე ტერიტორიაზე განიცდის ძალზე მნიშვნელოვან ცვლილებებს — რამდენიმე ათასი გამის ფარგლებში (მაშინ, როდესაც ჩვენს განედებზე მაგნიტური ქარიშხლის მაქსიმალური ინტენსივობა არ აღემატება 600-800 გამას).

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