About properties and character of latitudinal dependence of geomagnetic field variations statistical distributions

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In many problems of both applied and fundamental nature, which are directly or indirectly related to the assessment of geomagnetic activity, an understanding of nature of latitudinal dependence of geomagnetic field variations (GMF) main statistical characteristics is of definite interest.

In addition, according to the type of function approximating the probability density distribution of geomagnetic variations (GMV) values, it is possible to define the physical mechanism determining them. So, for example, as a result of observing the sum effect of many random, weakly interdependent quantities, each of which makes a small contribution to the total sum, a normal distribution is formed; in a closed system the energy of its components is distributed according to the exponential law or the Laplace law (double exponential distribution); the random multiplicative choice of several parameters leads to a log-normal distribution, etc. And the analysis of heavy tails of distribution is a separate task, since in distributions of this kind the variance of studied quantity is determined mainly by rare intense (rather than frequent small) deviations.

In a number of scientific works some data are given regarding the dependence of GMV parameters values on geographic latitude, but nevertheless it remains unclear how any analytical (graphical) form has the dependence, nor how the form of the probability density function changes from poles to equator. In this case, as a rule, it is considered only the average values of GMV certain parameters, which are characteristic for the latitude range, operating with which without a comprehensive statistical analysis can lead to erroneous conclusions when studying the properties of the system and its internal relations.

Thus, in the paper on the basis of data of INTERMAGNET network magnetic observatories located along one meridian, the latitudinal dependence of statistical parameters is investigated, the nature of the change in shape of probability density function and distribution law for northern and eastern components of geomagnetic field variations is analyzed. Dependencies that reflect the observed patterns are described in graphical and analytical form.