Application of Mathematical-Statistical Techniques in Natural Geography

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Abstract- This article outlines the importance of mathematical-statistical techniques in natural geography. Also, the ideas of scientists who have studied mathematical-statistical techniques have been analyzed.

Index Terms- Mathematical statistics, Geography, correlation and regression analysis, the residential areas, cybernetics, information theory, semiotics, modern cartography, socio-economic geography.

I. INTRODUCTION

We know that quantitative methods are the basis of statistical methods and they are the sum of quantitative methods of collecting, processing and analyzing general data. These methods have been used for a long time. In this regard, it is enough to mention the XVIII century reference statistics in Germany. The main objective of the public service statistics was to collect and systematize information for the federal government's needs and government officials.

Depending on the nature of the research and the nature of the objects studied in our area, mathematical statistics methods and geographical statistics are widely used in social and economic statistical methods. Mathematical statistics methods allow to evaluate the accuracy and reliability of conclusions based on limited statistical material. Geography includes more mathematical-statistical methods of corollary, correlation and regression analysis, multi-dimensional statistical methods (factor analysis, basic component methods) and statistical modeling. Socio-economic statistics, first of all, is used for various social, economic, and other events and processes, including regional studies.

II. MATERIAL AND METHODS

An example of the application of statistical (mathematical) statistical methods in natural geography is the use of this method to calculate average annual and monthly parameters of air temperature, calculation of rainfall, calculation and dispersion of indicators, and their classification using different correlation. In the socio-economic geography, economic and social statistics is widely used, which describes the quantitative aspects of the production forces, and, more broadly, the events and processes that relate to the location and territorial organization of society. Multiple-factor analysis plays a major role, and its essence is to replace a large number of variable variables in countries and regions with less complex variables. Studying the geography of the population is based on the use of almost complete and complete statistical materials and, first of all, applies the method of grouping. This method is the starting point for the whole process of scientific research on all information about the residential areas. It is a demographic statistical material covering an independent and comprehensive research area.

Mathematical methods are a novel way of research that sets out a "quantitative revolution" not only in technical, but also in natural and social sciences, in modern interpretation of this concept, which is largely a scientific and technical revolution, cybernetics, electronic computing techniques. They all recognized mathematical logic, cybernetics, information theory, semiotics, theory of common systems.

Mathematics of natural and humanitarian sciences began in the 50s in the economics. Academicians L.V.Kantorovich, V. Nemchinov, N.P.Fedorenko were very important in this process. He later entered mathematics, geology, biology, philosophy, sociology, psychology, linguistics, and geography. The mathematics of geography is explained by a clearer understanding of the methodology, inclination of the phenomenon with abstract and simplified description with logical and mathematical formulas, and aspiration for a systematic approach. Mathematical logic theory and methods were also needed to verify the concepts in science, to create logical bases of geographical sciences, and to strengthen integration processes.

Mathematic process of geography passed through several development stages. Firstly, mathematical geography became the part of the fields closest to physics (oceanology, meteorology, hydrology) and statistics (economic geography). Later, articles on the use of mathematical techniques in other geographical sciences emerged. Mathematics of geography reached the peak in the 60s - early 70s. During this period most of the works in this field were published, translations of William Bunge, Peter Hagget, David Harvey, the Union of Special Union seminars and conferences, summer mathematics schools, and new faculties of mathematical techniques was launched. The initiators of this mathematical "rise"

are Yu.G.Saushkin, D. Armand, V.M.Gohman, A.Smirnov, L.I.Vasilevsky, B.Gurevich, N.I.Blajko, A.S.Devdariani, V.M.Mikheeva, A.Matlin, V.Preobrajensky, Yu.V.Medvedkov, Yu.G.Simonov, A.M.Trofimov, S.Y.Nimmik, A.G. .Topchiev, Yu.G.Lipets and many other geographical scholars. Some prominent supporters of mathematical mathematics left a little bit of mathematical techniques than others. Naturally, this has led to a reverse reaction, which includes academics S.V.Kalesnik, KMMarkov, B.N.Semevskiy, A.Probst, V.Anuchin, A.K.Kolotievsky and others have. V.A.Ansuchin: Mathematics in geography often demolishes scientific discoveries. According to A.M. Kolotievsky, in the theoretical geography, abstractness emerged as a result of excessive mathematics, which, in its own way, is virtually no different from the art of abstractism. In the press, academician A.N.Krilov's early thoughts could be found in math, which resembles mathematics like mills: what kind of wheat you can get. When you apply mathematical methods to foolishness, you usually have a bigger stupor. In 1995, Yu. E. Efremov called mathematical methods "mathematical siobism."

At present, the attitude to mathematical methods in geography is quite high. Obviously, they can not replace all other research methods. At the same time, using mathematical methods is absolutely necessary. It helps to solve the problems related to typology, classification, zoning and fishing, and an instrument of geography science with one of the common methods of scientific knowledge. Geography and mathematics are a combination of geographical and mathematical thinking, and make geography more precise and inconsistent.

At present natural and socio-economic geography uses mathematical logic, plurality, elementary and analytical geometry theories, numerical methods of mathematical analysis, linear algebra methods. It is widely used for square and square corners, linear programming, and graphics. Mathematics has penetrated deeper into modern cartography, with the use of numbers and dimensions to create completely new opportunities for solving scientific and practical issues.

Modeling methods are one of the main categories in the theory of knowledge. Its essence is to investigate some phenomena, processes, or structures through the construction and study of their models. Accordingly, the object, event, or process being studied in the modeling process is replaced by another auxiliary or artificial system. The laws and trends identified in the modeling process are then applied to the real reality. Modeling simplifies and simplifies research, reduces labor costs and improves performance. It also provides a key to learning objects that are not directly quantifiable (e.g., Earth's nucleus).

The most common principles of simulation are analogy and systematics, which are dialectically interconnected. Systemic modeling also includes analytical and synthetic approaches. It is important to emphasize the importance of the other principles in the object being studied, as well as regular coordination of the model with a particular object. Using the model, you can experiment with various variants, ways to influence different ways. This means that you can create different models of one object.

According to A.Trofimov, modern mathematical-geographical modeling is a separate methodology, characterized by a certain structure and consistency of the research process. The following issues can be solved or resolved: a) processing of primary geographical information; b) the assessment and modeling of the homogeneity or gender of the geographic space; c) Evaluation of the composition, characteristics and relationships of the space; d) adaptive systems construction and imitation modeling; d) the construction of geo-information systems and obtaining accurate results for their purposes; e) automatic zoning and automatic classification; j) development of the theory of interests (conciliatory solutions).

In the modern natural geography, block (graphic) and mathematical models are widely used. Geomorphological processes, sea flows, climate change, especially natural-territorial complexes are modeled. Types of geographical models used in natural geography V.S. Preobrajensky describes in detail. It divides geographical models into objects, object-object and subject-object models, as well as mono- and politically-driven models. It is important to emphasize that in recent works of academician V. Kotlyakov certain emphasis is given to complex global models of natural-geographical processes. This is about the global climate improvement model and the overall global atmosphere of the geographical crust over the last 18,000 years, including the restoration of the global hydro-climate regime over the last 18 years.

Geography of the population is modeled on the networks and systems of settlements, urban systems, as well as the cities and agglomerations considered as complex systems. Population migration, including migration flows, migration factors, and mathematical models of migration structure are made. Various models of population reproduction, especially predictive models, have been widely developed. Estimated models are based on some or all of these hypotheses about the dynamics of birth and death, marriages, and divorce. Here, geographical modeling is closely linked to a large and complex class of demographic models.

In the field of economic geography, since the 70s of the last century, systematic modeling has come to the forefront, in which, according to Yu.G. Lipets, mathematical methods and systematic approach are united. The modeling includes logical, block, matrix, and cartographic models. In turn, it is possible to distinguish between band, regional and complex (inter-sectoral and inter-regional) models, depending on their characteristics and functions. In the theory and practice of geography in the 1970s, network models are presented as models of single energy system, traffic flows, transport systems and models, and regional models - primarily SSC models and complex models - models of inter-sectoral and inter-regional balances. Complex models can also include regional planning models, as a complex dynamic management system. Mathematical modeling in socio-economic geography has recently been written in detail by S.E. Khanin.

Global modeling of a particular type of socio-economic modeling is widespread in global models known to all Rome Club and some other international organizations. In the 1980s, in the former Soviet Union, models of "nuclear winter" and international relations were established.

In cartography modeling, it is often referred to as maps (not only as spatial imagery of realism), but also mathematical-cartographic modeling, which has been repeatedly mentioned by A.M. Berlian, A.Lutiy, V. Tikunov and and other experts in this field. Mathematical-cartographic modeling is a combination of mathematical and cartographic models for the design and analysis of thematic content of maps. In this modeling process, it is

possible to create not only elemental models of one ring, but also more complex chains, pitch and tree combinations. In turn, he encouraged the development of special car graphics and personalized cartographic techniques. Creating maps on the screen saver allows you to compare between the various content of maps and the way they are developed, which is especially useful for displaying the dynamics of processes and events. As a prime example of mathematical-cartographic modeling, V. Tikunov brings a model of studying the cosmic differentiation of the Atlantic Ocean, which is complex and sturdy and shows the point of view of the economic development of the ocean.

Geographical mathematical-cartographic models are of particular importance for geography, which are characterized by a rather complex synthetic significance. First of all, it is possible to add different models to the problem of interaction between society and nature. However, blocked models of this "population - economy - nature" class may also be general and specific. Overall, the basic model has a global aspect. On its basis, regional models can be created, specifying a particular feature, including the characteristics of one or another region. The most striking example of regional models is the model of various geo-systems. In the 1970s, W. Sochava recommended the separation of functional-component, functional-geomorphic and structural-dynamic models of geospaties based on the theory of geotimes. The geosystems were created by the scientists of the Institute of Geography of the Russian Academy of Sciences V.S.Preobrajensky, T.D. Alekandrova, L.I. Mukhina and others. It is found in V.Preobrajensky's cases. When it comes to scientific and practical experience, it has been primarily implemented in "Model Countries" (the "model countries" system has internationally recognized in the times of the Economic Cooperation Council as international teams of scientists have been working in such areas as Czech Republic, Slovakia, GFR, Poland, Bulgaria, which was a Kursk biosphere station at the Geography Institute of the same model).

Taking everything in consideration, it should be noted that mathematical and statistical methods in geography science and their application are of great importance in the age of modern information and innovation. Environmental pollution, global warming problems, ozone depletion, mineral extraction and other research and researches can not be achieved without mathematical and statistical methods. Therefore, the study of these techniques is considered to be an actual issue

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