

Main Directions of Physical Geography Research in Azerbaijan

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Abstract: Specialists who master the specialty of physical geography have the ability to effectively use nature. Physical geography is one of the earliest branches of geography and is a section where research has been conducted for a long time. Physical geography is a main branch of geography and is connected to its other branches. Therefore, the study of this field is of great importance.

Keywords: geography, physical geography, landscape science, geomorphology, Caspian Sea, climatology, research.

1. Introduction

Physical geography — The branch of science that studies the Earth's geographical layer and its structural components. It is mainly divided into two branches: geography and landscape science.

The field of physical geography encompasses various science that examine individual components of the natural environment, including landscape science, geomorphology, climatology, hydrology, oceanology, glaciology, geocryology, soil geography, and biogeography. The study of these scientific disciplines has been systematically categorized as follows.

2. Material and methods

Physical geography in Azerbaijan has been studied as follows.

Landscape science research. Landscape science, one of the important branches of physical geography, began developing in Azerbaijan mainly in the 1960s. The research conducted has focused on the formation of the modern landscape environment, its types, varieties, factors, elements and mutual relationships, the role of new tectonic movements in this process, its differentiation in time and space, and more. In the following years, M.A. Museyibov's research on landscape science took a completely new direction, leading to significant findings regarding the territorial differentiation of the landscape, its horizontal and vertical structure, dynamics, ecology, anthropogenic transformation. These results, which are considered to be at a high scientific level, are reflected in various monographs. The studies enabled the creation of a medium-scale, rich-content landscape map of the Republic of Azerbaijan.

The textbook "Fundamentals of Landscape Science" by M.A.Suleymanov and I.S.Aliyeva (Süleymanov et al., 1998) can be considered a notable achievement in this field in recent years.

In this monographic work, the theoretical aspects of landscape science, its structure, dynamics, evolution, and changes under anthropogenic influence – are presented clearly and comprehensibly in the Azerbaijani language for the first time.

Prof. G.K.Gul, Prof. N.K.Karimov, Acad. B.A.Budagov and Prof. M.A.Museyibov have made significant contributions to the study of Azerbaijan's physical geography and landscapes.

Paleogeography research. Valuable research conducted by the country's paleogeographers draws attention. A number of studies have been completed on the dynamics of Azerbaijan's natural environment during the Quaternary period and the most recent geological history of the Caspian Sea. As a result of these studies, the Map of Azerbaijan's Quaternary Deposits, published in 1978, was awarded the State Prize. In addition, significant research has been carried out on Azerbaijan's Quaternary deposits and the study of these deposits.

In addition to the study of the Quaternary period, Azerbaijani paleogeographers have achieved significant scientific results in areas such as the ecology of primitive humans, the chronology, and natural conditions of the Pliocene in the South Caucasus. As a result of research on the ecology of the inhabitants of the Azikh Paleolithic camp, the absolute age of the oldest cultural layers was determined and the natural conditions of that period were reconstructed.

One of the achievements in the field of paleogeography is the reconstruction of the natural conditions that existed in the territory of Azerbaijan during the Pliocene climatic optimum. These studies are of great importance in predicting how unexpected global warming may impact the natural conditions of various country.

The formation of Azerbaijan's paleolandscape and the changes that have occurred in it over the past 13 million years were thoroughly analyzed by M.A. Museyibov in his fundamental research. (Museyibov 1981). Notably, one of the most remarkable achievements in paleogeographic research is the publication of a two-volume paleogeographic atlas in 1992 titled "Eurasian Shelves in the Mesozoic and Cenozoic". Of the 129 maps in this atlas, 19 are specifically dedicated to the Caspian Sea and were prepared by Azerbaijani paleogeographers (A.V. Mammadov, I.S. Hasanov, B.J. Alasgarov). These maps holds significant importance for studying the formation and development of the Caspian Sea, its regional and local tectonic structures, and identification of promising oil and gas reserves in the region.

The research work of our paleogeographic scientists on the problems of "The role of the natural environment in the development of primitive human society" conducted jointly with French scientists, and "The history of the development of the Earth's climate" carried out with American scientists, is noteworthy and demonstrates their international recognition.

Paleogeographic research in Azerbaijan is led by Prof.A.V.Mammadov, laureate of the State Prize of the Republic. The department he works in continues the paleogeographic work of international importance.

The research of geomorphology. Among the most significant works of Azerbaijani geographers, geomorphological studies stand out in particular. Geomorphological research on Azerbaijan has been conducted for many years at the Institute of Geography of the Azerbaijan National Academy of Sciences and Baku State University. As a result of these studies, the following have been explored: the characteristics of Azerbaijani relief; its origin and connection with geological structure; the role of exogenous processes and earthquakes in shaping the relief; the study of the morphostructures in the eastern part of the Greater Caucasus using aerospace methods; the development of modern relief in junction zones during a new tectonic stage based on paleogeomorphological studies; the morphostructure of the southern Caspian, etc. Recently published the fundamental works in geomorphology include the monographs "New Tectonics and Development History of the Oil and Gas Regions of the Southern Caspian" and "Relief of Azerbaijan" (Budaqov 1994), prepared jointly with Turkmenistan scientists. The latter monograph covers the genetic forms of relief and their distribution patterns; the determination of quantitative indicators for the speed and manifestation of tectonic movements in time and space and the identification of morphostructures on these indicators; as well as their role in solving theoretical geomorphological problems and in the search for mineral resources.

As a result of geomorphological research conducted at the Institute of Geography of the Azerbaijan National Academy of Sciences and Baku State University, a geomorphological map of the republic has been compiled. More precise large-scale maps for individual regions of Azerbaijan are being developed. These maps are of significant importance in construction activities, including urban planning, agriculture, transport, industrial construction, land structure and land reclamation projects.

Azerbaijani geomorphologists, maintaining close ties with scientists from neighboring republics, have studied the geomorphology of the Caucasus region and compiled its map.

They were able to establish a profound academic tradition with their research and achievements in this field.

For his extensive geomorphological research and map compilation, Azerbaijani geographer Academician B.A.Budagov was awarded the Gold Medal named after M.P.Przhevalsky by the former USSR Geographical Society.

The first geomorphological research was initiated by professor B.A.Antonov. Professor N.Sh.Shirinov, a laureate of the State Prize of the Republic, who had been conducting geomorphological research for many years at the Institute of Geography of the Azerbaijan Academy of Sciences, and professor M.A.Museyibov at Baku State University. Their worthy successors (R.Y.Guliyev, A.A.Mikayilov, X.K.Tanrıverdiyev, E.K.Alizadeh, etc.) have emerged.

Research in climatology and hydrology. One of the most important areas of geographical research conducted in the country has been climatology. Azerbaijani climatology, founded by N.M. Figurovsky, has achieved significant successes in studying the climate of both the country and its neighboring nations. Major research works have been carried out on climate zones, solar radiation, heat balance, synoptic processes occurring in the country, characteristics of air flows, the climate of the Caspian Sea, and more.

The authors who compiled the heat balance atlas of the Republic of Azerbaijan were awarded the State Prize of the country. A significant amount of work has been done on the relationship between climate and economic activities. Azerbaijani climatology was headed for a long time by A.M. Shikhliniski, a corresponding member of the Azerbaijan Academy of Sciences.

Although the agroclimatology school in Azerbaijan began to develop significantly in 1960, the first major work was written by I. Figrovsky ("Agrometeorology") in 1932. In the following years, extensive research in this field was conducted by A.J. Ayyubov (Əyyubov 1967).

Meteorologists and climatologists studied climate resources and explored ways to use them in agriculture. Agroclimatic zoning was carried out in the republic, and the potential for utilizing climate resources to support the development of various agricultural crops – such as cotton, grapes, mulberry, olives, etc. – was investigated.

The agroclimatic features of harvesting 2-3 times a year in the subtropical climatic zone of our country were determined, and an atlas of agroclimatic regions of the Azerbaijan Republic was compiled. The fundamental research published by A.J. Eyyubov in the field of agroclimatology during the 1960s-70s was awarded prizes from the former USSR. His map "Agroclimatic zoning of the Azerbaijan SSR" won a bronze medal at the National Economy Exhibition in 1976, and his monograph "Bonification of the climate of Azerbaijan" published in 1976 was awarded the Gold Medal of the USSR Geographical Society, named after F.P. Litke.

One of the results of the Republic's agroclimatology school is the "Agroclimatic Atlas of the Republic of Azerbaijan", published in 1994. This atlas consists of 125 color maps and numerous additional supplementary materials. The scientific significance of the atlas lies in its development based on a comprehensive program, the originality of many of its maps, the sophistication of its scientific and methodological framework, and its provision of extensive and objective information about climate resources. Its practical significance lies in providing accurate survey data to agriculture workers on the correct assessment of agroclimatic resources, and the distribution of agroclimatic elements across various regions of the republic, and the climate's productivity. This atlas, created under the leadership and direct participation of Doctor of Geographical Sciences A.J. Ayyubov, was awarded the Zakir Tagiyev Prize in 1994. Moreover, with the involvement of this author, a comprehensive study of the climatic and resort resources of the Republic of Azerbaijan was initiated (Həsənov et al. 2001).

Under the leadership of Professor A.A. Madatzade, extensive synoptic meteorology studies have been conducted in our country. Azerbaijani geographers have made significant contribution to providing short- and long-term weather forecasts for the republic, the North Caucasus, and the Caspian Sea. The types of synoptic processes and synoptic climatic regions in Azerbaijan have been identified. Meteorologists have studied atmospheric processes that lead to extreme climatic events and their forecasts. The microclimates of the country's resorts have been examined and their impact on medical and health work has been investigated. Considerable attention has been given to studying the climatic conditions of the republic's industrial centers and the degree of air basin pollution.

At the Faculty of Geography of BSU, significant research has been conducted on the determination of various meteorological parameters in the territory of Azerbaijan, agroclimate, bioclimate and complex climatic characteristics of specific regions (Nakhchivan Autonomous Republic, Karabakh regions), as well as the protection of the atmosphere and climate changes (V.A. Nadirov, B.H. Mammadov, B.A. Mammadov, A.S. Mammadov).

Under the leadership of Honored Scientist, Professor S.H. Rustamov, extensive hydrological research has been conducted in Azerbaijan. The geographical characteristics of rivers and lakes have been studied using the most modern methods. The water regime of rivers, their balance, water resources, flow, energy resources, characteristics of lakes, their classification, reservoirs, dynamics of river and lake banks, etc., have been thoroughly studied, and hydrological maps have been compiled. Currently, the hydrology department of the institute is led by S.H. Rustamov's student R.N. Qashqai. In recent years, intensive research has been carried out, and new analysis methods, including mathematical statistics, have been employed. M.A. Mammadov calculated the maximum water discharge of mountain rivers by making

effective adjustments to the existing formulas used for calculating the coverage of each statistical series. (Mammadov 1989).

The new topical research on the hydrology of the regional includes F.A.Imanov's "Minimum water discharge of Caucasian rivers". (Baku, 2000), M.A.Mammadov, F.A.Mammadov, N.Sh.Huseynov's "Meteorological foundations of drought and hydrological processes" (Baku, BSU, 2000), M.A.Mammadov, F.A.Imanov, R.N.Mammadov's "Hydrometry" (textbook, Baku, 2000), etc. The work on more closely linking research in this field with production (M.A.Mammadov, H.Y.Fatullayev "The impact of human economic activity on water consumption", Baku, 1992) has been significantly expanded in recent years (Həsənov et al. 2001).

The conducted research is extensively used to address the following issues: determining the water consumption and level regime requirements of reservoirs and hydroelectric power stations, assessing the environmental the impact of large reservoirs under construction, and compiling a cadastre of reservoirs, among others.

One of the key areas of hydrology in Azerbaijan is the study of flood events, ecological flows, channel processes, and more, occurring in mountain rivers. Research of flood events has been conducted on some of the most dangerous mountain rivers, such as Kishcay, Kumrukay and other rivers in the Greater Caucasus. These studies have led to the development of flood formation characteristics, an assessment of flood safety for regions from an economic perspective, as well as the classification and zoning of flood-prone river basins, along with the formulation of flood control measures.

Research of caspian Sea. The Caspian Sea has a significant impact on the history, geography, nature and modern economic life of the Republic of Azerbaijan. Therefore, the study of this unique sea-lake has always been a focal point for the republic's Caspian scholars.

The foundation for the planned and systematic study of the Caspian was laid by Professor G.K. Gul. Under his leadership, extensive research on the Caspian was conducted, and numerous scientific works were written.

In 1972, the world's first marine observatory was established on a fixed platform in the open part of the Caspian. T.M. Tatarayev made invaluable contributions to the organization of this observatory and, more broadly, to the study of a number of new issues to the Caspian (Budaqov 1996).

The "Center for Caspian Sea Problems", which operated under various names and affiliations, was transferred to the Institute of Geography of the Azerbaijan Academy of Sciences in 1988. It then became to main headquarters for the comprehensive study of the Caspian Sea. At this center, the Caspian's regime, currents, the distribution of temperature and salinity both vertical and horizontally, the interaction of surface and internal waves with the atmosphere, the biological world, the hydrometeorological and ecological conditions of economic activity in the sea, among other aspects, were regularly studied (Həsənov 2001).

The zoning of the Caspian in terms of synoptic climate, the atmospheric processes that create weather conditions over it, the classification of winds, etc. were studied by A.A. Madatzadeh.

National Caspian scientists are closely involved in the study of sea level fluctuations and their primary factors. As a result of such studies, it has been determined that 80-90 percent of the Caspian Sea's level fluctuations are due to hydroclimatological factors while 10-20 percent are related to geological and anthropogenic factors (Budaqov 1996).

The internal structure of the Caspian current and the measurement of the pulsations occurring within them were first studied by R.M. Mammadov. A number of internationally significant projects related to the Caspian prepared by him in recent years have been implemented.

The relief of the Caspian Sea floor, the geomorphology and dynamics of the Absheron Peninsula, and the Azerbaijani coast of the southern Caspian have been studied in detail, and zoning has been carried out. In general, the role of natural factors in the formation of the Caspian's coasts has been analyzed and their morphometry has been studied. (N.Sh. Shirinov, A.I. Khalilov, N.M. Mehdiyev, X.A. Aliyev, R.X. Priyev). In the book by N.Sh. Shirinov, X.A. Valiyev, G.G. Aliyev, "The Nature and Ecology of the Caspian Sea, Its Coasts" (Baku, 1998), the origin, nature, the relief of its coasts, the changes occurring in them, and the ecology of the sea and its coasts have been studied in detail (Budaqov 2008).

The number of studies conducted and projects developed to assess the ecological condition of the Caspian Sea has increased significantly in recent years. The distribution of pollution in the sea from oil products, phenol and other substances has been classified, and detailed information on the amount and composition of the polluted waters discharged into Azerbaijan's coastal zone has been collected and analyzed (Budaqov 2001).

The application of aerospace methods in the study of the Caspian Sea has been significantly expanded, and the number of precise calculations has increased.

3. Conclusion and recommendation

Since physical geography combines natural phenomena, this field of science is constantly being updated. The results obtained in this field of science lose their significance after a certain period of time due to socio-physical changes. In particular, the application of technological innovations in various fields of science allows for the achievement of new and more perfect results, as well as the provision of broader forecasts. Therefore, the research and study of the field of physical geography remains relevant even in the modern era.

Conflict of Interest

The authors declared no competing interests.

References

1. "Azerbaijan Geographical Society in 60 Years". Baku: 1999 76p.
2. Budagov B.A. "Turkish International Place Names". Baku: 1994
3. Budagov B.A. Geography in 50 Years. Baku: 1996
4. Budagov Budag. Successes of Geography. Book I. 2001, 320 p.
5. Budagov B.A. Successes of Geography. Book V. Baku: "Nafta-Press". 2008. 336p
6. Eyyubov A.J. Climate and Weather. Baku: 1967.
7. Hasanov T., Hajizade A. "History of Geography" Baku: Baku University Publishing House. 2001. 94p.
8. Mahmudov F. "Political History and Geography of Azerbaijan". Baku: 1993
9. Mahmudov R.N. Modern climate changes and dangerous hydrometeorological events. Baku, 2018, 231 p.
10. Mammadov M.A. Calculation of the maximum water flow of mountain rivers. Leningrad. 1989.
11. Museyibov M.A., Physical geography of Azerbaijan. Baku: Maarif. 1998. 400p
12. Museyibov M.A., Landscape of Azerbaijan. Baku: 1981
13. Suleymanov M.A., Aliyev U. S., Fundamentals of Landscape Science. Baku. 1998
14. Soboleva N.P. Yazikov E.G. Landscape Science. Tomsk, 2010. 175 p.
15. Maksakovsky V.P. "Historical Geography". M: 1997
16. Martsinkevich G.I. Landscape Studies. M: 2005. 200 p.
17. Kalesnik S.V. General Geographical Patterns of the Earth. M: 1977. 260.