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GENERAL TRENDS OF CLIMATE CHANGE IN CENTRAL ASIA IN THE PLEISTOCENE-HOLOCENE

Abstract: *The article presents data on changes in climatic conditions during the Pleistocene-Holocene based on paleosoil and paleobotanical studies. The obtained results indicate the presence of repeated measurements of climate both in the flat territories of Central Asia and in the mountainous regions over a geological period of time.*

Key words: *global climate change, intracontinental basins, loess and loess-like rocks, Holocene, Pleistocene.*

Introduction. For the geological history of the Earth, the existence of fluctuations in climate is a proven fact. However, there is still no definitive opinion regarding the causes of such a phenomenon. Nevertheless, the current global climate change has attracted increasing interest in this problem recently [1,2,7].

The study of the history of the development of complex physico-geographical conditions for the formation of paleolandscapes of mountain, foothill, and plain territories of intracontinental basins is of great theoretical and practical interest. For this reason, for the past 100 years, one of the pressing issues of paleogeography has remained the determination of the presence and dynamics of climate change within Central Asia.

Research materials and methods. Based on literary sources, personal data, and using paleogeographical, archaeological, and paleobotanical research methods, the existence of Pleistocene-Holocene climate changes within Central Asia has been substantiated.

Comprehensive paleogeographical research in our region began with the works of I.V.Mushketov [7], L.S.Berg [1], K.K.Markov [6] and others, based mainly on the analysis of fluctuations in the level of the region's large water basins.

The main indicators in the analysis of climatic changes in the plains of Central Asia were the fluctuations in the level of the Aral Sea, as well as the transgressions and regressions of the Caspian Sea.

In the mountainous and foothill regions of Central Asia, much information was obtained based on the analysis of neotectonic movements of the Quaternary period by Yu.A. Skvorsov [8], moraine deposits by M.M. Mamatkulov [5] and others. In recent years, great successes have been achieved in reconstructing paleoclimatic conditions, as well as in studying the composition and structure of rocks. In this regard, the widely distributed loess and loess-like rocks with buried soil horizons within Central Asia proved to be particularly informative. The study of loess layers with a thickness of up to 30-40 meters shows that during the cycles of intensive sedimentation, there were periods of relative stabilization and rest, which allowed for the formation of soil horizons with a thickness of 2 to 4 meters, allowing them to be identified as the only ***visual marking*** horizons in loess deposits. Furthermore, fossil soils, as natural systems, record in their profile various states of past ecosystems, allowing for the restoration of soil formation processes and the identification of morpho-typical features characteristic of each paleo-soil based on their degree of preservation and a set of stable traits.

N.O.Kovaleva [3] notes that the informational function of soils has been repeatedly demonstrated in the stratification of loess deposits, reconstruction of the natural environment of various regions, and explanation of historical events, therefore, the widespread use of paleopedological methods in paleogeographical reconstructions yields good results. The theoretical concept of soil memory, developed by V.O.Targulyan and I.A.Sokolov [10], allows for the use of soil properties for paleoclimatic reconstructions. At the same time, the possibility of reading information from various media of soil memory: carbonate neoplasms, gross chemical elements of soils, magnetic minerals, spore-pollen composition of buried soils, and other soil properties has been well substantiated.

Research results and discussion. As confirmation of the above, it can be noted that as a result of many years of research of loess layers in different parts of

Central Asia, it was revealed that they consist of clearly expressed horizons of buried soils and separating them by loess-like loams. The paleozoic soils of loess horizons morphologically differ from the lower and upper horizons in their dark brown (to brown) color, density of composition, presence of characteristic structural clumps, and inclusion of carbonate concretions of elongated-circular shape with a diameter of 4-6 cm and length up to 15 cm. It should be noted here that, according to soil scientists' understanding, carbonate and clay-carbonate concretions are new formations of modern soil formation and are located at depths up to 4-5 meters [4]. Thus, the carbonate concretions of the lesso-soil complexes, located floors above each other, are the products of soil formation of a specific horizon of the paleopoch. Concretion sizes decrease from bottom to top, from ancient layers to younger ones. In the same direction, the decrease in the size of mollusks is also occurring, which probably indicates a trend towards climate change towards aridization. In the micromorphological structure of this age group of paleochrops, signs of increased hydromorphicity are observed in the form of clay-iron and carbonate microconcretions, sections of streamed-oriented clays (polinite). The presence of lighter-colored loams between paleozoic soils with unoxidized minerals of the magnetite-ilmenite and hematite-limonite groups indicates that the formation of loess horizons occurred during relatively cool and dry climates. The study of loess layers with a thickness of up to 30-40 meters shows that during the cycles of intensive sedimentation, there were periods of relative stabilization and rest, which allowed for the formation of soil horizons with a thickness of 2 to 4 meters, allowing them to be identified as the only visual marking horizons in loess deposits.

The cultural horizons of numerous Paleolithic sites in Central Asia also testify to changes in paleogeographical conditions. In particular, for the Early Holocene deposits of Southern Fergana, palinological data revealed the dominance of wormwood- diverse herbaceous communities with abundance of representatives of the diverse herbaceous families *Rosaceae, Leguminosae, Polygonaceae, Cruciferae, as well as Liliaceae, Plantaginaceae, Labiana, Cruciferae,* *Ranunculaceae, Scrophulariaceae, Dipsacaeae, Caryophyllaceae, Geraniaceaen* and other species. In individual spectra, the pollen of the hydrophytes *Butomaceae, Alismataceaen,* etc. was found. Cereals, complex-flowered plants, and aquatic plants such as *Typha, Potamogeton, Altsmataceae, Butomaceae,* etc., were found consistently, but in small quantities. Single finds of *Juniperus, Pinus, and Betula* wood species were noted. The results of radiocarbon dating of early Holocene sediment samples from the Karkidon section determined their age to be 8,525 thousand years. [9].

The Middle Holocene of the foothill wavy plains zone is characterized by the distribution of diverse grasses and cereal communities. In addition to the pollen of cereals, which are present in large quantities in the sediments of the upper part of the section, the pollen of Leguminosae, Saxifragaceae, Caryophyllaceae is present in the pollen of various herbs. Straw and wormwood pollen are found in small quantities, while the pollen of other complex-flowered plants and ephedra is quite significant. Radiocarbon dating allows us to attribute the time of formation of the lithological deposits of the horizon to the middle stage of the Holocene climate optimum, 5,680 thousand years ago [9].

Thus, in the early Holocene, there is a relatively dry stage between 10 and 7.5 thousand years ago, characterized by the predominance of reed communities, which currently play a dominant role in the main landscapes of the plains of semi-deserts and deserts.

The average Holocene between 7.5 and 5 thousand years ago is characterized by increased dryness of the climate and xerophytization of vegetation. Based on the generalization of the results of spore-pollen and lithological-facial studies, the chronostratigraphic stage of the late Holocene, encompassing a time interval of 5 - 4.5 thousand years ago, has been determined [9].

Conclusion. The material collected in various parts of Central Asia allows us to assert that throughout the entire Pleistocene-Holocene, against a backdrop of increasing contrast and aridization, the main patterns in the alternation of dry and more humid periods, fluctuations in the climatic conditions of Central Asia occurred. However, the cyclical nature and sequence of climatic changes from the Pleistocene to the Holocene repeat within a shorter timeframe. Therefore, a more detailed, comprehensive study of Holocene deposits, against the backdrop of modern climate change, must be considered in the medium-term forecasting of regional development.

References:

1. Берг Л.С. Аральское море. Опыт физико-географической монографии. – СПб, 1908. –С.508.

2. Глазьев С.Ю. и др. Климатические изменения и энегопереход. Экономические стратегии. 2023.№6.PP.16-29.

3. Ковалева Н.О. Почвы как индикатор изменений климата последних 30 тысяч лет в горных регионах Средней Азии // Труды ИП МГУ-РАН, выпуск 1, -М, Макс Пресс, 2002.-С. 6-26.

4.Ковда И.В., Сычева С.А. Морфология и свойства карбонатных новообразований как индикаторы возраста и условий почвообразовании //Материалы конференции «Проблемы истории, методологии и философии почвоведения. – Пущино, 2007. – С.191-194 .

5. Маматкулов М.М. Некоторые проблемы формирование рельефа и четвертичных отложений долины реки Сандалаш (Западный Тянь-Шань). Автореферат диссерт. на соискание канд. г-м.наук,.-Ташкент, 1961. – С.24 стр.

6. Марков К.К. Палеогеография. -М., Изд-во МГУ, 1960. – С. 286.

7. Мушкетов И.В. Туркестан. - С-Пб.: 1886. – С. 741.

8. Скворцов Ю.А. Метод геоморфологичемкого анализа и картирования // Изв. АН СССР, серия геол. и геофиз. 1941 №5,6. – С. 501-522.

9. Серебрянный Л.Р., Халмухамедова Р.А., Пуннинг Я. Изменения климата Ферганы в позднее четвертичное время/ Колебания увлажненности Арало-Каспийского региона в голоцене. – Москва; 1977. – С. 35-36..

10. Таргульян В.О., Соколов И.А. Структурный и функциональный подход к почве: почва-память и почва-момент. Математическое моделирование в экологии. – М.: 2008. – С.17-33.