THE ROLE OF CLIMATE IN THE FORMATION OF DESERT LANDSCAPES IN THE KYZYLKUM REGION

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Abstract: Recent studies of climate change in Kyzylkum show that climate change is closely related to rising air temperatures, and it is necessary to scientifically study the landscape of the region, and to preserve and use it as efficiently as possible.

Keywords: Kyzylkum, arid landscapes, deflation, erosion, meteorological station, atmospheric precipitation, low mountains, seasonally dry streams, livestock, thermal resources.

Deserts occupy about 25% of the world's land area, which is about 37 million km^2. The unique desert landscapes are combined with extreme temperatures and an extremely low level of precipitation, creating harsh living conditions. The deserts of the world, located in different hemispheres and on different continents, although they are subject to different climatic conditions, still have one common characteristic - a strong lack of moisture. The formation of the wind (eolian) relief of deserts is greatly influenced by daily and annual temperature changes, dry air and strong winds. For the current deserts of the Kyzylkum region, such relief forms as sand ridges and hills, hills and cells (formed when sand moves), basins, rocky ridges, etc. are characteristic.

The importance of the features of the continental climate of Central Asia in the formation and formation of the current arid landscapes in the Kyzylkum region is extremely great. The features that form arid landscapes are characterized by a sharp manifestation of the continentality of the climate, a long drought period, scorching heat in summer, somewhat cold winters, low atmospheric precipitation, high radiation balance, long periods of sunlight, and extremely high potential evaporation. The emergence and formation of such features characteristic of an arid climate in the Kyzylkum region is due, firstly, to its location at the junction of

temperate and subtropical desert climatic zones and its extreme richness in thermal resources, secondly, to the nature of atmospheric circulation and the nature of the recurrence of air masses, the frequent recurrence of clear, dry and slightly cloudy days, and thirdly, to the fact that Kyzylkum is located in the center of the continental Turanian Lowland, in the interior of the largest Eurasian continent and far from the oceans.

The formation and formation of arid climatic conditions and their characteristic features in the Kyzylkum desert began to manifest themselves sharply after the return of continental glaciations that occurred in the anthropogenic period. During the continental glaciation, the climate here was somewhat humid and cool. According to the paleogeographic scheme of I.P. Gerasimov (1937), pluvial climatic conditions arose in Central Asia and the Kyzylkum desert during the glacial period.

During this period, there was sufficient moisture, atmospheric precipitation was more than in the current continental climate, pluvial deposits were widespread throughout the Amudarya, Syrdarya, Zarafshan valleys and the Aral Sea lowland. Climate change in Central Asia began after the ice age, and this process gradually led to the aridification of long-established ecosystems. As a result, dynamic changes occurred in the structure of geosystems, and the original steppe landscapes were replaced by semi-deserts, and semi-desert landscapes by desert landscapes.

The aridification of the climate in Central Asia is inextricably linked to the Alpine orogenesis and new tectonic movements. Because as a result of the Alpine folding, large mountain systems appeared in the southern and eastern regions of Central Asia, and due to new tectonic movements, the sea basin that had long dominated the Turanian Lowland retreated, and a sharply continental regime emerged in its place. Thus, the pluvial period with a humid and cool climate is replaced by an arid continental climate. That is why D.V. Nalivkin (1908), studying the paleogeography of the Cenozoic era of Central Asia, emphasizes that the steppe here was replaced by even drier semi-deserts.

In the formation of the climate of Kyzylkum, the role of the temperate latitude air mass coming from the west and northwest, the Siberian anticyclone coming from the northeast, and the dry tropical air mass coming from the south play a significant role. Kyzylkum is distinguished from other regions of Uzbekistan by such features as the long duration of the period of sunlight, and the extremely low humidity coefficient. Since the sun's rays fall quite steeply here, the sun shines for 2,800 hours a year in the north of the desert, and more than 2,900 hours in the south. The duration of the sun's rays depends on the number of cloudless days and the presence of clear weather throughout the summer. The most frequent clear days occur in July and August. The number of clear days increases from north to south from 130 to 170 days. The long sun shines, the fewest cloudy days, and the location of the region in southern latitudes also contribute to the high amount of solar radiation. Therefore, the total annual amount of solar radiation here is 140-150 kcal/cm^2.

The Kyzylkum Desert is dominated by a temperate air mass for most of the year. The transformation of this type of air mass in the desert area results in the formation of local tropical air with high temperatures and very low humidity. Local tropical air combines with dry tropical air masses coming from the south during the warm and hot months of the year, further increasing the degree of continentality of the climate. This situation, in turn, directly affects the formation and development of arid geosystems such as sandy, clayey, stony, saline and barren in the Kyzylkum region, which has a variety of lithological compositions.

The continentality of the Kyzylkum Desert climate is determined by air temperature and precipitation. In all parts of it, the weather is very hot, dry and clear in summer. The average July temperature in the north is 25-28°C. The highest temperature rises to 46-48°C. Summer lasts from four to 4.5 - 5 months. The beginning of summer falls on the end of April in the south and the first half of May in the north. The end of summer and the transition to autumn begin in the second and third decades of September.

Recent studies of changes in climatic elements in Kyzylkum show that climate change is closely related to the increase in air temperature, which causes a change in the vegetation period of desert plants. Changes in air temperature in Kyzylkum are expected to occur in all seasons. For example, in Navoi region, an increase in temperature of 0.7-20^0 C in spring, 2-2.5^0 C in summer, 0.7-2^0 C in autumn, and 1.5-3.5^{0}C in winter is observed (Chub, 2002). Such a change (warming) of the climate can cause the temperate climate zone to shift northward by 150-200 km, and in the altitudinal region by 150-200 m.

According to climate change forecasts, the increase in temperature in 2020-2030 will, on the one hand, increase the productivity of pasture plants, and on the other hand, optimize weather conditions. According to the forecast of V.E.Chub (2002), climate change will increase the productivity of pastures in Kyzylkum in some areas, and vice versa, reduce it in some areas. The decrease in productivity will fall on the northern and western regions of Kyzylkum. In some areas, pasture productivity is expected to increase. An example of this is the southwestern regions of the Gazli and Nurata mountains of the southwestern Kyzylkum. Thus, changes in agroclimatic conditions, or rather, an increase in temperature, do not have the same effect on pastures by season and region.

Winter in the Kyzylkum desert is quite cold and long. This is due to the influence of the Siberian anticyclone, which blows from the northeast in the winter months, and the cold Arctic air mass that periodically enters from the north. The average temperature in January varies from -4, -10^o C in the north to -1, -2^0 C in the south. When the Arctic air mass arrives, the temperature drops sharply, dropping to -30, -35^0 C, and frosty weather lasts for several days. The beginning of winter in the northern part of the desert falls on the end of October or the first decade of November, and its end falls on the middle of March. The winter period lasts 4-5 months in the north and 3 months in the south. Therefore, the vegetative winter is around 0% in the north, and reaches 16% in the south. The desert area is very rich in thermal resources. The number of days without frost during the year is 153-210 days in the Northern Kyzylkum, and 210-230 days in the Southern

Kyzylkum. Also, the annual sum of the temperature on days with an average daily temperature above + 10^0 C is 4340^0 in the Northern Kyzylkum and 4850^0 in the Southern Kyzilkum (Babushkin, Kogay, 1964).

Kyzylkum is one of the driest regions of the Republic of Uzbekistan and the Turan Lowland. Precipitation is very low throughout the year and is unevenly distributed. The least precipitation is observed in the northwestern and western parts of the region, with an annual precipitation of 75-100 mm. As you move to the southeast and east, the amount of precipitation increases, reaching 138 mm in Jangeldi, 120-140 mm around the Oyakogitma depression, and 200 mm in the mountains. Part of the precipitation falls in the form of snow. However, the thickness of the snow cover does not exceed 15-20 cm and does not persist for a long time. According to E.N. Balashova, O.M. Zhytomirskaya and O.A. Semyonova (1960), the snow cover lasts no more than 20 days.

The amount of precipitation in the Kyzylkum region is also unevenly distributed by season. 48% of the annual precipitation falls on spring, 30% on winter, 19% on autumn and 3% on summer.

To the north of Central Asia, there is a high-pressure area of the mainland, or the Voeykov axis. Therefore, in the deserts of the Turan Lowland, including Kyzylkum, northern and northeastern winds prevail. In winter, mainly northeastern winds blow, their average monthly speed is 5-7 m/sec. In spring, winds of the same direction also prevail, but at this time their speed is around 5 m/sec. Strong winds play a significant role in the formation of various relief forms in sandy deserts. Strong winds are most often observed in the spring months. Their frequency in the Kyzylkum region is not uniform. The frequency of strong winds throughout the year is 10 days in Tomdi and 48 days in Kolquduq.

Dunes formed in Kyzylkum due to strong winds

The evaporation coefficient also plays a major role in the formation and development of arid landscapes in Kyzylkum. It is known that in arid regions, in particular in the Kyzylkum desert, the amount of possible evaporation is 10-12 times greater than the amount of precipitation, that is, with an average annual precipitation of about 80-100 mm, the amount of possible evaporation is 1000-1400 mm. According to L.A. Molchanov (1955), this indicator exceeds 1500 mm in the southeastern part of Kyzylkum. In this case, the moisture accumulated in the soil during the winter and spring months is quickly consumed with the onset of warm days. Plants, however, have the opportunity to use only a part of the atmospheric precipitation for a certain period of time. Therefore, the long dry period has a strong impact on the landscape-forming plants of the Kyzylkum desert. The dry period here lasts 4-5 months. Thus, the emergence of arid conditions is closely related to the extreme lack of moisture and the abundance of heat. Long hot days with high temperatures create a hot situation in the summer and autumn months, which allows the formation, development and seasonal dynamic change of landscape-forming desert plants in typical arid conditions. Here we find it necessary to mention the opinion of Ye.P. Korovin (1961). According to

him, long hot days in the summer and autumn months bring the life of desert plants closer to the end point and increase their level of cold resistance.

Thus, the analysis of the climatic conditions and climatic elements of Kyzylkum shows that they change in space and time in the latitudinal and meridional directions, actively participate in the formation and development of arid landscapes, create zonal and regional differences. This is reflected in the climatic, agroclimatic, natural geographical, landscape-ecological, bioecological zoning of the Kyzylkum region. For example, E.M. Murzayev (1953, 1958) included the Kyzylkum region in the natural geographical zoning scheme of Central Asia into the northern and southern desert zones, dividing it into two regions - Northern Kyzylkum and Southern Kyzylkum. Ye.P. Korovin (1961) divided the Kyzylkum region into two climatic facies in the climatic zoning map of Central Asia and Kazakhstan - the desert climate of the Turan facies and the desert climate of the Kazakhstan facies. L.N. Babushkin (1964) divided the Kyzylkum region into thermal zones, taking into account the increase in air temperature from north to south and the increase in the amount of thermal resources in this direction. S.N. Konovalova (1972) divided the Kyzylkum desert into three agro-climatic regions for agricultural purposes. These are the northern, central and southern agro-climatic regions.

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