Climate, Modern Glaciation and River Network of the Northern Part of the Central and Eastern Caucasus

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ABSTRACT

The Caucasus is located in the border zone of the spheres of influence of the moist air masses of the Atlantic and the Mediterranean Sea on the one hand, and the dry continental spaces of the interior of Eurasia on the other, i.e. on the border of temperate and subtropical climatic zones. The North Caucasus belongs to the temperate zone (Milkov, Gvozdetsky, 1969). The mountainous relief of the Greater Caucasus determines the altitudinal zonality of the climate, which is expressed in changes in temperature and precipitation with increasing altitude: the amount of precipitation increases to 2500 m above sea level, then begins to decrease. Also, the climate of the Greater Caucasus significantly changes in the direction from west to east in the direction of increasing dryness and continentality. The climate problem of highlands has attracted the attention of many researchers, such as N.A. Gvozdetsky (1954), V.Z. Gusilashvilli (1964) and others.

The climate of the highlands is characterized as severe, with a long winter and long snow cover and frosts down to -31 C. Summer is short and cool. The average temperature in January is -11.5, in July +10 degrees. The amount of precipitation in the central part is 1500 mm / year (Gulisashvili, 1964). Alpine subnival landscapes are widespread within the range of altitudes of 3000-3100 m and higher. Only on some northern and northeastern slopes of the highest mountain ranges and ranges are they replaced by glacial-nival landscapes. They are characterized by ancient glacial forms, rocky areas with a wide development of rocky scree and islands of low-grass wasteland meadows on primitive soils. The climate is severe, with cold and long winters, spring is late and very extended in time. The cold period lasts from October to May, with temperatures ranging from -3.5° to -15.3° C. In February, a minimum temperature of -15.3° C is observed. The relatively warm period lasts only 3 months from June to August with temperature fluctuations from -0.3 to + 3.4° C. Positive temperatures cross the lower border at the end of May and by the end of July rise to the absolute height (3900-4000 m). Such an increase in temperatures is explained by the large heat consumption for melting the snow cover and ice (Ataev, 2007, 2011).

Spring begins in May and June. Summer is short (July-August), cool, average temperature up to +10 ºC.

In autumn (September-October), mild and moderate frosts are observed, in the eastern part of the study area the amount of precipitation is less, in the western part -800-1200 mm per year. In winter, the eastern part is colder than in the west, and vice versa in summer. When moving east, the climate is drier and more continental, which is clearly visible along the border of the snow line and vegetation.

A small amount of water vapor and low atmospheric pressure leads to dry air. The relief plays an important role in the distribution of climatic factors. Citing the climate of the study area, it should be noted that the existing meteorological stations cannot completely cover the entire observation of this area, which is so geographically dissected. It is often quite impossible to establish the expression of a particular climatic element not only for a certain geographical point, but also for a rather vast territory, such as the northern depression within the same republic of the North Caucasus. At the studied altitudes in Dagestan, there is only one weather station - Sulak-alpine (Ataev, 2011), located on the territory of the Tsumadinsky district

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on the slope of Mount Adalla-Shukhgelmeer, in the upper Tindinskaya (Kila) river at an altitude of 2927 m above sea level. The averaged data for 1981-2010 are given for this station. There are three high-altitude weather stations on the Elbrus massif – Cheget (3040 m above sea level), Garabashi glacier (2326), Terskol (2140). For these stations, information is provided for 2019, as well as data for the adjacent territory from the Klukhor pass station (2039 m above sea level). The tables show that in the highlands in the central part of the North Caucasus at an altitude of more than 3,000 m, the average annual temperature changes significantly (in the direction of decreasing) and the amount of precipitation increases compared to the downstream stations (2362 and 2140 m above sea level). In the eastern part of the North Caucasus at an altitude of about 3000 m above sea level. the average annual temperature is slightly lower than in the central part, but the annual rainfall is much higher.

For comparison, below are the data on the highlands of Dagestan for 1967 (Himmelreich, 1967), which show that for almost a fifty-year period, the average annual temperature increased by 0.4° C, while the amount of precipitation remained the same. The averaged data on the main climatic indicators of the Alpine belt of the Caucasus, collected for the period 1966-1973, are as follows: the average annual temperature is -0.3° C, the average rainfall is 930 mm. The first parameter does not give a complete description of the thermal regime in the highlands, but it characterizes the thermal conditions in which there is alpine vegetation quite well (Grebenshchikov, 1974). These data are close in modern indicators for high-altitude weather stations in Cheget and Sulak-alpine.

Most of the glaciers are located on the northern slope of the Central Caucasus (55%). In general, the Greater Caucasus is characterized by small glaciers with an area of up to 1.0 km², but there are also large glaciers with an area of more than 20 km², there are six of them, the largest of which is Bezengi (17.6 km in length). The largest center of glaciation in the Central Caucasus is Elbrus, the total area of its glaciers is 144 km2. The main types of glaciers of the Caucasus are caravan, hanging and valley. It has been established that over the past 200 years in the high mountains of the Greater Caucasus, the size of glaciation is decreasing, namely, the area of glaciers is decreasing, and, accordingly, their number is increasing, which is associated with the decay of large glaciers into small morphological forms. (Efremov, 1988) in connection with the emerging trend of climate warming.

The rivers of the study area belong to the basin of the Caspian Sea, only in the western part of the upper Kuban and its tributaries belong to the basin of the Sea of Azov. All of them in the upper reaches are mountainous, flowing in narrow and deep valleys, but flowing relatively calmly on the foothill plains. The main rivers are Sulak and Terek. The Terek begins from the glaciers of the Zilgakhokh massif in the Lateral Ridge, passing through the Lateral Ridge (Darial Gorge), the cuest ridges of the Ossetian inclined plain, takes a number of left tributaries: Gizeldon, Fiagdon, Ardon, Urukh, Cherek Balkarsky, Cherek Malaysky, Cherek Besengi, Assa, Argun, Avarskoy Koisu, Andean Koisu, Karakoysu, Samur and others. They begin in the zone of eternal snows and glaciers and divide the northern slope of the Greater Caucasus. The specificity of these rivers is determined by the participation in their nutrition of a significant proportion of melt water of eternal snows and ice, as well as seasonal snow cover, which melts in the alpine zone later than in other parts of the Greater Caucasus. High water on these rivers lasts about six months (Efremov, 1988). The observed climate warming is accompanied not only by a decrease in the total area and dissection of glaciers in the mountains, but also with a shift in the upper border of the forest, and a decrease in the area of forestsin river basins in connection with economic activity is fraught with a reductiontheir total drainage of the river network.

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