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CLIMATIC FACTORS OF THE FORMATION OF THE GEOSYSTEMS OF THE UPPER ERTIS BASIN

Abstract. According to the authors, due to the large distance and isolation of mountain systems, warm and moist air masses from the Atlantic Ocean reach here transformed, having lost most of the moisture, and air masses penetrating from the Arctic Ocean are cold and dry. Hilly low-slope and flat areas of the Ertis left bank are especially dry. The highest moisture content is characteristic of the western and northern peripheral as well as central highland regions of Altai. Complex orography, the presence of closed basins and plateaus cause large differences in the climatic features of individual regions of Altai. The climate of Altai as a whole is much milder than in the neighboring areas, the summer is cool, and the winter is relatively warmer.

Keywords: climatic factors, geosystem, basin, upper Ertis, precipitation, continent.

INTRODUCTION

Climatic factors are the basic elements of climate: solar radiation (light, heat), precipitation and atmospheric pressure, air humidity, soil moisture, air circulation (wind), hydrospheric pressure. Climatic factors determine the development of biogenesis, or pricing systems.

The climate of East Kazakhstan is continental with large daily, seasonal and annual amplitudes of fluctuations in air temperature, which is determined by the deep inland position of the territory. Studies show that in the Quaternary, the alternation of pluvial and xerothermic eras took place on the territory of Kazakhstan, but the type of modern relief-forming processes more closely corresponds to the xerothermic epochs. This is evidenced by the reduction of runoff in the valleys, the partial transfer of concentrated runoff to the plane runoff (in the ancient valleys of Betpakdala and the Northern Balkhash region), reduction of the water area of the lakes, the presence of abandoned aryknyh systems far from the modern bed with water, the dying off of the tributaries of the right bank of the r. Ertis at the level of the modern floodplain. The right bank of the river is high, steep, and it is composed of loose rocks of sedimentary origin, which are easily eroded. The most common and most characteristic texture of sedimentary rocks is lamination, which is expressed in the alternation of layers with different composition or with different structure. More or less distinct stratification can be seen in almost every layer of the rock. It, along with other lithological signs of sedimentary rock, is one of the main indicators of the conditions for the formation of deposits.

MAIN PART

In the warm season, the radiation balance everywhere, with the exception of the high-alpine alpine belt, is positive with the largest values in June-July. The negative balance is observed everywhere from November to February and reaches the lowest values in December-January. Maximum monthly average amounts of radiation balance can reach from 9.8 to 10 J / m2, and minimum amounts from 1.7 to 1.9 J / m2. The total annual values of the radiation balance vary from 37 j / m2 in the high mountains to 42 j / m2 in the northern foothill areas and reach 40 j / m2 in the south of the Zhaysan depression, in the valley of Ertis and Buktyrma to 43 j / m2 [1].

Due to temperature inversion, the climate is milder on the slopes and well-blown valleys than in the closed valleys and basins. At the high-mountainous meteorological station Kara-Turek, located at an altitude of 2300 m, the average January temperature is -16.9 ° C [2].

The total solar radiation over the territory changes regularly from north to south and is 108-110 in the north, 122-124 in the valley of the Buktyrma river, and 134-135 kcal / cm2 in the south.

East Kazakhstan can be attributed as a whole to the well-humidified territories of Kazakhstan, if we consider that 30% of its territory is less than 200 mm / year and only 20% of the territory is 400 mm / year. [3].

The river basins Malaya Ulba, Uba, and Turgusun receive 2000 mm of precipitation per year, most of which fall in solid form in winter. Mezhgoryn hollows and leeward slopes of the Altai Mountains are depleted in rainfall -200-400 mm. In the basin of Lake Zhaisan, the annual precipitation does not exceed 160 mm [4].

The annual amounts of precipitation vary over the territory of the subregion from 119 to 220 mm in the central parts of the Zhaysan depression. On the foothill plains of Rudny Altai, they vary from 300 to 500 mm, and they reach 2000-2500 mm high in the mountains. In Southern Altai, they can fall to 1200-1500 mm. So, the mountains become a barrier or a kind of barrier to the air masses. Such a barrier is formed when air masses are forced to rise along the windward slopes of the mountains.

Monthly maximum precipitation is most often observed in June or July. In the South-West Altai there is still a second maximum, less pronounced, falling from October to November. In the remaining areas of Gorny Altai and Upper Ertis from summer to autumn there is a gradual decrease in the amount of precipitation (Tables 1 and 2).

The largest amount of precipitation falls in the region of r. Malaya Ulba, annual precipitation there is 1500-2000 mm and more (according to observations of the hydrometeorological service, in 1979 their amount was 4000 mm.). The second area of large precipitation is located in the Southern Altai, it is also a center of glaciations. From the station, the largest amount of precipitation falls in Ridder (675 mm), in Zyryanovsk (605 mm) and Ust-Kamenogorsk (498 mm).

The middle mountain and high mountain areas of Rudny and Southern Altai, the central part of Kalba and Sauyr belong to the zone of sufficient moisture. In mountainous areas, the amount of precipitation reaches 1000 and even 1500 mm / year. It is these sediments that feed the rivers originating in Altai. In the direction from the mountains to the valley Ertisa precipitation decreases sharply. In the middle course of Buktyrma they are only 400 mm. And within the eastern, higher part of Kalba rainfall reaches 700-800 mm, and in the foothills decreases to 300-400 mm. The least amount of precipitation is noted in Zhaisan (311 mm).

A significant amount of precipitation falls in the form of snow (Table 3). Average for the cold season, the height of the snow cover reaches 86 cm in Zyryanovsk, remaining high (about 0.5 m) and at other stations. In general, it should be noted that the presence of stable snow cover for 5 months a year or more is typical for East Kazakhstan (Table 3).

It is known that orographically complex regions are a significant obstacle to air flow. At none of the stations, the average annual wind speed does not exceed 3 m / s. At Zyryanovsk station, it is only 0.8 m/s.

The influence of orography is clearly visible: the wind blows along the Ertis valley up or down the valley. The frequency of calm is somewhat lower than in Zhaisan, but high - 31% per year. In winter, it exceeds 40%.

In the mountains of East Kazakhstan at altitudes from 600 to 1400 m, a belt of increased frequency of clear-sky conditions and intense solar radiation is distinguished.

Precipitation is most evenly distributed in the lowland areas of Priertis'ya, Zaisan depression and the Kazakh Hills. Their number on the slopes of Chingiz-Tau, Kalbinsky ridge and Sauro-Tarbagatai varies greatly depending on the height of the terrain and the orientation of the slopes with respect to the prevailing moisture transfer. Precipitation is especially unevenly distributed over the territory of Altai, where at a relatively short distance there are slopes and intermontane depressions that are well moistened with precipitation, which are characterized by a very small amount of precipitation. The difference in annual precipitation on differently oriented slopes of the ridges with respect to the moisture-bearing air masses reaches 300-500 mm. In orographically homogeneous regions, the height of the terrain has a decisive influence on the amount of precipitation [5].

The continent climate of the subregion is underlined by large amplitudes of annual and daily temperatures. The annual temperature amplitude in the Orlovsky settlement is 43, in the Zyryanovsky 42, on the foothill plains it is 35-37, on the slopes of the mountains about 30 ° C.

The average annual air temperature ranges from 3.0 ° C to minus 3.6 ° C in the flat south-western regions and near large water bodies (Zhaisan), to "minus" 6-7 ° C in high-mountainous areas (Table 4). In the lowland and foothill-lowland areas, there is an increase in average annual air temperature as it moves from north to south and from east to west [3].

Table 1 - Monthly, annual and seasonal precipitation, mm

Station	Height, m	Monthly precipitation												(XI-III)	(IV-X)	y.
		I	II	III	IV	V	VI	VI	VIII	IX	X	XI	XI			
Upper Ertis																
around the country	195	18	14	17	18	24	35	37	25	19	25	28	23	100	183	283
Kokpekty	510	24	19	18	18	26	31	33	27	18	22	35	35	131	175	306
Buktyrma	373	19	20	28	30	41	54	57	41	28	41	42	33	142	292	434
Katon-Karagay	1081	16	12	14	26	56	63	67	58	36	35	27	22	91	341	432
Buran	409	10	9	12	16	20	18	19	15	13	20	21	16	68	121	189
Zhaisan	604	9	9	16	28	40	41	37	27	23	24	21	16	71	220	291
Abay	617	11	10	13	20	28	38	42	23	13	11	20	16	70	175	245
Zharma	678	13	12	18	23	31	31	43	30	21	23	28	21	92	202	294

Table 2 - Monthly and annual precipitation (mm)

Station	Months												Year
	1	2	3	4	5	6	7	8	9	10	11	12	
Ust-Kamenogorsk	25	26	33	35	48	56	62	49	36	46	46	36	498
Ridder	17	17	25	52	87	87	10	82	70	67	43	24	675
Zyryanovsk	42	33	31	38	60	60	72	54	43	60	58	54	605
Shemonaiha	24	25	27	33	47	49	60	42	33	44	41	35	460
Samarka	26	22	23	26	35	41	46	34	29	38	47	33	400
Zhaisan	10	9	17	32	42	42	40	29	25	27	21	17	311
Semey	19	16	20	18	26	37	40	28	20	28	30	24	306

Table 3 - Snow depth (cm)

Station	Months							Year		
	10	11	12	1	2	3	4	Average	max	min
Ust-Kamenogorsk	1	12	28	40	5	32	13	57	93	11
Ridder	4	17	27	33	3	29	17	44	87	7
Zyryanovsk	1	24	51	67	7	70	43	86	132	47
Shemonaiha	1	12	30	37	4	27	11	47	98	10
Samarka	1	16	32	44	5	35	13	57	98	23
Zhaisan		7	15	18	1	10	3	22	42	6
Semey		6	15	19	2	13		27	83	5

The average temperature of the warmest month (July) everywhere (except for highlands) exceeds 15 ° C, reaching 20 ... 22 ° C in dry steppes and semi-deserts in the south-west and west of the territory (table 6), in the foothill plains 18 ... 23 ° C, on the slopes of the mountains 16 ... 18 ° C, in mountain hollows 14 ... 160C. By noon, the air temperature can usually reach 24 ... 26 ° C. Absolute maxima are 40 ... 42 ° C. The temperature gradient in July for mountainous areas is 0.5-0.7 0 per 100 m. Near the glaciers, the average July temperature does not exceed 6-10 ° C.

The coldest month is January. The distribution of January temperatures depends on macrocirculation factors and relief. The average January temperature here ranges from minus 14 to minus 19 ° C. The coldest place in winter on the territory of the region is in the closed Orel hollow, pos. Orlovsky (Kurshym district), where the average January temperature is "minus" 27 °, and the absolute minimum - "minus" 62 ° C.

Table 4 - Average monthly and annual air temperature, °C

Station	Height, m	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
Semey	195	-17,1	-16,6	-9,3	3,8	13,0	19,0	20,9	18,6	11,9	3,8	-6,8	-14,1	2
Kokpekty	510	-20,9	-19,5	-11,0	2,6	12,1	17,9	20,4	18,6	11,9	2,4	-9,3	-18,4	0
Buktyrma	373	-18,3	-16,0	-9,6	3,3	12,0	17,7	20,4	18,4	12,2	4,4	-7,6	-16,0	1
Katon-Karagay	1081	-14,8	-12,5	-6,1	3,2	10,2	15,1	17,2	15,2	10,6	2,8	-8,5	-13,6	1
Buran	409	-18,8	-16,5	-7,3	6,2	14,4	20,1	22,2	20,0	13,6	4,7	-6,2	-15,0	3
Zhaisan	604	-17,8	-15,8	-7,7	5,8	14,2	20,4	22,7	21,4	15,2	5.7	-6,1	-15,0	3
Abay	617	-14,1	-13,8	7 2	4,1	12,2	17,9	20,3	18,3	12,2	3,7	-6,2	-12,6	2
Zharma	678	-15,4	-15,2	-8,8	3,1	11,4	17,1	19,3	17,3	11,2	3,1	-7,4	-14,0	1

Due to the position almost in the center of the continent, very large amplitudes of temperature fluctuations are characteristic of the upper Ertis basin. The absolute minimum reaches "minus" of 62 ° C in high-mountainous areas, and "minus" of 53 ° C in the plains. The absolute maximum reaches 42 ° C (Semey) in the flat part, and in the high-mountainous part it is much less.

The vegetation period (with an average daily temperature above 50) lasts from the second to the third decade of April - the second decade of May until the end of September or the end of October. With an increase in altitude, the length of the growing season is reduced from 190 days in the foothill area to 60 days a year in the highlands.

The first snowfalls and unstable snow cover in the north-western regions are observed in October, in the north-eastern foothill areas in September, and in the high-mountainous regions of Altai in late August-early September. A steady snow cover is formed on average 20-30 days later.

The duration of the occurrence of sustainable snow cover varies from 135-150 days in lowland and low-mountainous areas to 170 days in the north-eastern foothill areas of Altai.

CONCLUSION

Thus, due to the large distance and isolation of mountain systems, warm and moist air masses from the Atlantic Ocean reach here transformed, having lost most of the moisture, and air masses penetrating from the Arctic Ocean are cold and dry. Hilly low-slope and flat areas of the left bank of the Ertis River are particularly dry [6]. Complicated orography, the presence of closed plains and plateaus cause large differences in climatic features of individual regions. The climate of Altai as a whole is considerably milder than in the neighboring areas, the summer is cool, and the winter is relatively warm.

The climatic conditionality of environmental conditions leads to the following conclusions: the climate of Eastern Kazakhstan has a huge impact on the state of the environment, is a major environmental factor that has a strong impact on surface and groundwater, soil, vegetation, and natural-anthropogenic landscapes under the influence of various natural and anthropogenic factors), features of the circulation of air masses of the anticyclonic mode b contribute to atmospheric pollution and exacerbate air pollution in large cities and industrial centers of East Kazakhstan (Ust-Kamenogorsk, Ridder, Zyryanovsk).

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ЖОҒАРЫ ЕРТЕЗ БАҒДАРЛАМАСЫНЫҢ ГЕОЗИСТЕРІН ӨЗГЕРТІЛЕТІН КЛИМАТИКАЛЫҚ ФАКТОРЛАРЫ

Аннотация. Авторлардың пікірінше, тау жүйелерінің үлкен қашықтығы мен оқшауланууы арқасында Атлант мұхитының жылы және ылғалды ауа массалары ылғалдың көп бөлігін жоғалтып, Арктиканың мұхитына еніп келе жатқан ауаның массасы суық және құрғақ. Ертістің сол жағалауындағы шұңқырлы төмен жоталы және жазық жерлер әсіресе құрғақ. Батыс және солтүстік перифериянның, сондай-ақ Алтайдың орталық таулы аймақтарының жоғары ылғалдылығы тән. Күрделі орография, жабық бассейндер мен

платформалардың болуы Алтайдың жекелеген өңірлерінің климаттық ерекшеліктерінде үлкен айырмашылықтар туғызады. Алтайдың климаты тұтастай алғанда көрші аудандарға қарағанда әлдеқайда жұмсақ, жазы салқын, ал қыста салыстырмалы түрде жылырақ.

Түйін сөздер: климаттық факторлар, геосистема, бассейн, үстіңгі Ертіс, жауын-шашын, құрлық.

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КЛИМАТИЧЕСКИЕ ФАКТОРЫ ФОРМИРОВАНИЯ ГЕОСИСТЕМ БАССЕЙНА ВЕРХНЕЙ ЕРТИС

Аннотация. по мнению авторов, из-за большой удаленности и отгороженности горными системами теплые и влажные воздушные массы с Атлантического океана доходят сюда трансформированными, потерявшими большую часть влаги, а воздушные массы, проникающие с Северного Ледовитого океана, - холодными и сухими. Особенно большой сухостью отличаются холмисто-мелкосопочные и равнинные районы левобережья Ертиса. Наибольшая увлажненность характерна западным и северным периферийным, а также центральным высокогорным районам Алтая. Сложная орография, наличие замкнутых котловин и плоскогорий обусловливают большие различия климатических особенностей отдельных районов Алтая. Климат Алтая в целом значительно мягче, чем в соседних районах, лето прохладное, а зима относительно теплее.

Ключевые слова: климатические факторы, геосистема, бассейн, верхний Ертис, осадки, континент

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